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**Industrial communication networks – Fieldbus specifications –
Part 6-5: Application layer protocol specification – Type 5 elements**

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CONTENTS

| | |
|---|-----|
| FOREWORD..... | 7 |
| INTRODUCTION..... | 9 |
| 1 Scope..... | 10 |
| 1.1 General..... | 10 |
| 1.2 Specifications..... | 11 |
| 1.3 Conformance..... | 11 |
| 2 Normative references | 11 |
| 3 Terms, definitions, symbols, abbreviations and conventions | 11 |
| 3.1 Terms and definitions from other ISO/IEC standards | 11 |
| 3.2 IEC/TR 61158-1 terms..... | 12 |
| 3.3 Abbreviations and symbols..... | 16 |
| 3.4 Conventions | 17 |
| 3.5 Conventions used in state machines | 17 |
| 4 Protocol..... | 19 |
| 4.1 Overview | 19 |
| 4.2 FAL syntax description | 19 |
| 4.3 Transfer syntax | 19 |
| 4.4 FAL protocol state machine structure | 75 |
| 4.5 SMK state machine | 75 |
| 4.6 VCR state machine..... | 92 |
| 4.7 FAL service protocol machine (FSPM)..... | 93 |
| 4.8 Application relationship protocol machines (ARPMs) | 93 |
| 4.9 DLL mapping protocol machine (DMPM)..... | 108 |
| Bibliography..... | 114 |
| | |
| Figure 1 – State transition diagram for SMK..... | 77 |
| Figure 2 – State transition diagram of client / server ARPM | 97 |
| Figure 3 – State transition diagram of the publisher / subscriber ARPM | 104 |
| Figure 4 – State transition diagram of DMPM..... | 110 |
| | |
| Table 1 – Conventions used for state machines | 17 |
| Table 2 – Data types..... | 20 |
| Table 3 – Data types..... | 20 |
| Table 4 – APDU header format | 21 |
| Table 5 – FDA address use..... | 22 |
| Table 6 – FDA address header field APDUs sent by a client VCR endpoint..... | 23 |
| Table 7 – FDA address header field APDUs sent by a server VCR endpoint | 24 |
| Table 8 – FDA address header field APDUs sent by a publisher VCR endpoint..... | 24 |
| Table 9 – FDA address header field APDUs sent by a report source VCR endpoint | 25 |
| Table 10 – APDU trailer fields..... | 25 |
| Table 11 – Request APDU parameters..... | 27 |
| Table 12 – SMK FDA address values | 29 |
| Table 13 – SMK FDA address values | 30 |

| | |
|---|----|
| Table 14 – Request APDU parameters..... | 31 |
| Table 15 – SMK FDA address values for SM identify | 32 |
| Table 16 – SMK FDA address values for SMK set assignment info request APDUs | 32 |
| Table 17 – SMK clear address request APDU parameters..... | 33 |
| Table 18 – SMK FDA address values for SMK set assignment info request APDUs | 33 |
| Table 19 – SMK set assignment info request APDU parameters | 34 |
| Table 20 – SMK set assignment info response APDU parameters..... | 35 |
| Table 21 – SMK FDA address values for SMK device clear assignment Info APDUs..... | 36 |
| Table 22 – SMK clear assignment info request APDU parameters | 36 |
| Table 23 – SMK FDA address values for SMK device annunciation request APDUs..... | 36 |
| Table 24 – SMK device annunciation request APDU parameters..... | 37 |
| Table 25 – Initiate request APDU parameters | 40 |
| Table 26 – Initiate response APDU parameters..... | 40 |
| Table 27 – Abort request APDU parameters | 40 |
| Table 28 – Get response APDU parameters..... | 41 |
| Table 29 – Identify response APDU parameters..... | 41 |
| Table 30 – Get OD request APDU parameters | 41 |
| Table 31 – Get OD response APDU parameters..... | 42 |
| Table 32 – Initiate put OD request APDU parameters | 42 |
| Table 33 – Put OD request APDU parameters..... | 42 |
| Table 34 – Generic initiate download sequence request APDU parameters..... | 43 |
| Table 35 – Generic download segment request APDU parameters..... | 44 |
| Table 36 – Generic terminate download sequence request APDU parameters | 44 |
| Table 37 – Response APDU parameters | 44 |
| Table 38 – Initiate download sequence request APDU parameters..... | 45 |
| Table 39 – Download segment request APDU parameters | 45 |
| Table 40 – Download segment response APDU parameters..... | 45 |
| Table 41 – Terminate download sequence request APDU parameters | 46 |
| Table 42 – Initiate upload sequence request APDU parameters | 46 |
| Table 43 – Upload segment request APDU parameters..... | 47 |
| Table 44 – Upload segment response APDU parameters | 47 |
| Table 45 – Terminate upload sequence request APDU parameters..... | 47 |
| Table 46 – Request domain download request APDU parameters | 48 |
| Table 47 – Request domain upload request APDU parameters | 48 |
| Table 48 – Create program invocation request APDU parameters..... | 49 |
| Table 49 – Create program invocation response APDU parameters | 49 |
| Table 50 – Delete program invocation request APDU parameters | 49 |
| Table 51 – Start request APDU parameters | 50 |
| Table 52 – Stop request APDU parameters..... | 50 |
| Table 53 – Resume request APDU parameters | 50 |
| Table 54 – Reset request APDU parameters..... | 51 |
| Table 55 – Kill request APDU parameters | 51 |
| Table 56 – Read request APDU parameters..... | 51 |

| | |
|---|----|
| Table 57 – Read response APDU parameters | 52 |
| Table 58 – Read with subindex request APDU parameters..... | 52 |
| Table 59 – Read with subindex response APDU parameters | 52 |
| Table 60 – Write request APDU parameters..... | 52 |
| Table 61 – Write with subindex request APDU parameters..... | 53 |
| Table 62 – Define variable list request APDU parameters | 53 |
| Table 63 – Define variable list response APDU parameters | 53 |
| Table 64 – Delete variable list request APDU parameters | 54 |
| Table 65 – Information report request APDU parameters | 54 |
| Table 66 – Information report with subindex request APDU parameters | 54 |
| Table 67 – Information report on change request APDU parameters | 55 |
| Table 68 – Information report on change with subindex request APDU parameters | 55 |
| Table 69 – Event notification request APDU parameters | 55 |
| Table 70 – Alter event condition monitoring request APDU parameters..... | 56 |
| Table 71 – Acknowledge event notification request APDU parameters..... | 56 |
| Table 72 – LAN redundancy diagnostic message request APDU parameters | 57 |
| Table 73 – LAN redundancy get information response APDU parameters | 59 |
| Table 74 – LAN redundancy get statistics request APDU parameters..... | 61 |
| Table 75 – Object description header..... | 63 |
| Table 76 – Null object..... | 63 |
| Table 77 – Structure of the list of object descriptions | 64 |
| Table 78 – Structure of a load region in the S-OD..... | 65 |
| Table 79 – Structure of a function invocation in the DP-OD..... | 66 |
| Table 80 – Structure of an event in the S-OD..... | 67 |
| Table 81 – Structure of a data type in the ST-OD..... | 67 |
| Table 82 – Structure of a data type structure description in the ST-OD | 68 |
| Table 83 – Structure of a simple variable in the S-OD..... | 68 |
| Table 84 – Structure of an array in the S-OD | 69 |
| Table 85 – Structure of a record in the S-OD | 70 |
| Table 86 – Structure of a variable list in the DV-OD | 71 |
| Table 87 – Common error parameters..... | 72 |
| Table 88 – PI error parameters | 72 |
| Table 89 – OD error parameters | 72 |
| Table 90 – Error class and error code values | 73 |
| Table 91 – SMKPM service primitives | 76 |
| Table 92 – SMKPM states..... | 77 |
| Table 93 – SMKPM state table – initialization | 78 |
| Table 94 – SMKPM state table – receive transitions..... | 78 |
| Table 95 – SMKPM state table – internal events | 83 |
| Table 96 – HseRepeatTimerExpires () | 84 |
| Table 97 – RcvNewNetworkAddress (interface, address) | 84 |
| Table 98 – RcvMsg ()..... | 84 |
| Table 99 – SntpSyncLost ()..... | 84 |

| | |
|---|-----|
| Table 100 – AddressToClear (sm_svc) | 85 |
| Table 101 – AssignmentInfo_Set () | 85 |
| Table 102 – ConfigurationSessionActive () | 85 |
| Table 103 – DeviceRedundancyState () | 85 |
| Table 104 – DevId_Match (sm_svc) | 86 |
| Table 105 – DuplicateQueryIdMatch (sm_svc) | 86 |
| Table 106 – DuplicatePdTagDetected () | 86 |
| Table 107 – FdaAddressType (sm_svc) | 86 |
| Table 108 – IsValid (sm_svc) | 87 |
| Table 109 – NetworkAddressChange (interface, address) | 87 |
| Table 110 – NumberOfAssignedAddresses () | 87 |
| Table 111 – OperationalRestore () | 87 |
| Table 112 – PdTag_Match (sm_svc) | 87 |
| Table 113 – PdTagDeviceIndex_Check (sm_svc) | 88 |
| Table 114 – Query_Match (sm_svc) | 88 |
| Table 115 – QueryType (sm_svc) | 88 |
| Table 116 – SmCacheEntry (sm_svc) | 88 |
| Table 117 – Clear_Address (interface_to_clear) | 89 |
| Table 118 – Clear_DuplicatePdTagFlag () | 89 |
| Table 119 – Get_AddlCode () | 89 |
| Table 120 – New_Address (interface, address) | 89 |
| Table 121 – Restart_HseRepeatTimer () | 90 |
| Table 122 – Restore_Defaults () | 90 |
| Table 123 – Send_SM_CommonErrorRsp (sm_service_type, svc_spec_params) | 90 |
| Table 124 – Send_SM_ReqRspMessage (sm_svc) | 90 |
| Table 125 – Set_Assignment_Data (sm_svc) | 90 |
| Table 126 – Set_DuplicatePdTagFlag () | 91 |
| Table 127 – SvcType (sm_svc) | 91 |
| Table 128 – Additional code used by error class and code | 91 |
| Table 129 – Additional code parameter IDs | 92 |
| Table 130 – Primitives issued by FSPM to ARPM | 94 |
| Table 131 – Primitives issued by ARPM to FSPM | 94 |
| Table 132 – Parameters used with primitives exchanged between FSPM and ARPM | 95 |
| Table 133 – Client / Server ARPM states | 97 |
| Table 134 – Client / server ARPM state table – sender transitions | 98 |
| Table 135 – Client / server ARPM state table – receiver transitions | 99 |
| Table 136 – Primitives issued by FSPM to ARPM | 101 |
| Table 137 – Primitives issued by ARPM to FSPM | 102 |
| Table 138 – Parameters used with primitives exchanged between FSPM and ARPM | 102 |
| Table 139 – Publisher / subscriber ARPM states | 103 |
| Table 140 – MulticastARPM state table – sender transitions | 104 |
| Table 141 – MulticastARPM state table – receiver transitions | 105 |
| Table 142 – BuildFAL-ErrPDU() | 105 |

| | |
|---|-----|
| Table 143 – BuildFAL-ReqRspPDU() | 106 |
| Table 144 – GetArepld() | 106 |
| Table 145 – ConfigurationArCheckOK() | 106 |
| Table 146 – FAL_Pdu_BufferSize()..... | 106 |
| Table 147 – FAL_Pdu_Confirmed() | 106 |
| Table 148 – FAL_Pdu_DuplicateMsg () | 106 |
| Table 149 – FAL_Pdu_GetVcrlid() | 107 |
| Table 150 – FAL_Pdu_InactivityCloseTime()..... | 107 |
| Table 151 – FAL_Pdu_TransmitDelayTime()..... | 107 |
| Table 152 – FAL_Pdu_SvcType() | 107 |
| Table 153 – FAL_Pdu_RemoteAddress() | 107 |
| Table 154 – FAL_Pdu_TrailerFields()..... | 107 |
| Table 155 – FAL_Pdu_ServiceSpecificParameters() | 108 |
| Table 156 – FAL_Pdu_Valid() | 108 |
| Table 157 – MaxOutstandingReached() | 108 |
| Table 158 – StartInactivityCloseTimer() | 108 |
| Table 159 – Primitives issued by ARPM to DMPM | 109 |
| Table 160 – Primitives issued by DMPM to ARPM | 109 |
| Table 161 – Parameters used with primitives exchanged between ARPM and DMPM | 109 |
| Table 162 – Primitives exchanged between the socket model and DMPM | 109 |
| Table 163 – Parameters of DMPM/socket model primitives | 110 |
| Table 164 – DMPM state descriptions | 110 |
| Table 165 – DMPM state table – sender transitions | 111 |
| Table 166 – DMPM state table – receiver transitions | 112 |
| Table 167 – ConnectionOriented..... | 112 |
| Table 168 – GetBufferedData | 112 |
| Table 169 – GetConnectionId | 112 |
| Table 170 – LoadBuffer | 113 |
| Table 171 – RemainingBufferSizeCheck | 113 |
| Table 172 – StartTransmitDelayTimer | 113 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
FIELDBUS SPECIFICATIONS –****Part 6–5: Application layer protocol specification – Type 5 elements**

FOREWORD

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NOTE Use of some of the associated protocol types is restricted by their 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 particular data-link layer protocol type to be used with physical layer and application layer protocols in Type combinations as specified explicitly in the IEC 61784 series. Use of the various protocol types in other combinations may require permission from their respective intellectual-property-right holders.

International standard IEC 61158-6-5 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This first edition and its companion parts of the IEC 61158-6 subseries cancel and replace IEC 61158-6:2003. This edition of this part constitutes an editorial revision.

This edition of IEC 61158-6 includes the following significant changes from the previous edition:

- a) deletion of the former Type 6 fieldbus for lack of market relevance;

- b) addition of new types of fieldbuses;
- c) partition of part 6 of the third edition into multiple parts numbered -6-2, -6-3, ...

The text of this standard is based on the following documents:

| | |
|--------------|------------------|
| FDIS | Report on voting |
| 65C/476/FDIS | 65C/487/RVD |

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

NOTE The revision of this standard will be synchronized with the other parts of the IEC 61158 series.

The list of all the parts of the IEC 61158 series, under the general title *Industrial communication networks – Fieldbus specifications*, can be found on the IEC web site.

INTRODUCTION

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/TR 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 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.

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-5: Application layer protocol specification – Type 5 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 5 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 Type 5 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

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

This standard specifies the protocol of the Type 5 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 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 61158-5-5.

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 IEC 61158-6.

1.3 Conformance

This standard-6 does not specify individual implementations or products, nor does it constrain the implementations of application layer entities within industrial automation systems. 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 61158-3-1, *Industrial communication networks – Fieldbus specifications – Part 3-1: Data-link layer service definition – Type 1 elements*

IEC 61158-4-1, *Industrial communication networks – Fieldbus specifications – Part 4-1: Data-link layer protocol specification – Type 1 elements*

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

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

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

ISO/IEC 8824, *Information technology – Open Systems Interconnection – Specification of Abstract Syntax Notation One (ASN.1)*

ISO/IEC 8825, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*