

<b>STN</b>	<b>Priemyselné komunikačné siete. Špecifikácie prevádzkových zberníc. Časť 5-2: Definícia služieb aplikačnej vrstvy. Prvky typu 2.</b>	<b>STN EN 61158-5-2</b>  18 4020
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Industrial communication networks - Fieldbus specifications - Part 5-2: Application layer service definition - Type 2 elements

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 01/15

Obsahuje: EN 61158-5-2:2014, IEC 61158-5-2:2014

Oznámením tejto normy sa od 22.09.2017 ruší  
STN EN 61158-5-2 (18 4020) z decembra 2012

**120041**

EUROPEAN STANDARD

**EN 61158-5-2**

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2014

ICS 25.040.40; 35.100.70; 35.110

Supersedes EN 61158-5-2:2012

English Version

**Industrial communication networks - Fieldbus specifications -  
Part 5-2: Application layer service definition - Type 2 elements  
(IEC 61158-5-2:2014)**

Réseaux de communication industriels - Spécifications  
des bus de terrain -  
Partie 5-2: Définition des services de la couche application -  
Eléments de type 2  
(CEI 61158-5-2:2014)

Industrielle Kommunikationsnetze - Feldbusse -  
Teil 5-2: Dienstfestlegungen des Application Layer  
(Anwendungsschicht) - Typ 2-Elemente  
(IEC 61158-5-2:2014)

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**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

## Foreword

The text of document 65C/763/FDIS, future edition 3 of IEC 61158-5-2, prepared by SC 65C "Industrial networks" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61158-5-2:2014.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-06-22
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-09-22

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61131-1	NOTE	Harmonized as EN 61131-1.
IEC 61158-2:2014	NOTE	Harmonized as EN 61158-2 <sup>1)</sup> (not modified).
IEC 61784-1:2014	NOTE	Harmonized as EN 61784-1:2014 (not modified).
IEC 61784-2:2014	NOTE	Harmonized as EN 61784-2 <sup>1)</sup> (not modified).
IEC 62026-3	NOTE	Harmonized as EN 62026-3 (not modified).

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<sup>1)</sup> To be published.

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61131-3	2003 <sup>2)</sup>	Programmable controllers - Part 3: Programming languages	EN 61131-3	2003 <sup>3)</sup>
IEC 61158-1	2014	Industrial communication networks - Fieldbus specifications - Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series	EN 61158-1	2014
IEC 61158-3-2	2014	Industrial communication networks - Fieldbus specifications - Part 3-2: Data-link layer service definition - Type 2 elements	EN 61158-3-2 <sup>4)</sup>	-
IEC 61158-4-2	2014	Industrial communication networks - Fieldbus specifications - Part 4-2: Data-link layer protocol specification - Type 2 elements	EN 61158-4-2 <sup>4)</sup>	-
IEC 61158-6-2	2014	Industrial communication networks - Fieldbus specifications - Part 6-2: Application layer protocol specification - Type 2 elements	EN 61158-6-2 <sup>4)</sup>	-
IEC 61588	2009	Precision clock synchronization protocol for networked measurement and control systems	-	-
IEC 61784-3-2	-	Industrial communication networks - Profiles - Part 3-2: Functional safety fieldbuses - Additional specifications for CPF 2	EN 61784-3-2	-
ISO/IEC 646	-	Information technology - ISO 7-bit coded character set for information interchange	-	-
ISO/IEC 7498-1	-	Information technology - Open Systems Interconnection - Basic reference model: The basic model	-	-

<sup>2)</sup> Superseded by IEC 61131-3:2013.

<sup>3)</sup> Superseded by EN 61131-3:2013 (IEC 61131-3:2013).

<sup>4)</sup> To be published.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO/IEC 8859-1	-	Information technology - 8-bit single-byte coded graphic character sets - Part-1: Latin alphabet No. 1	-	-
ISO/IEC 8859-5	1988 <sup>5)</sup>	Information processing - 8-bit single-byte coded graphic character sets - Part 5: Latin/Cyrillic alphabet	-	-
ISO/IEC 8859-9	1989 <sup>6)</sup>	Information processing - 8-bit single-byte coded graphic character sets - Part 9: Latin alphabet No. 5	-	-
ISO/IEC 9545	-	Information technology - Open Systems Interconnection - Application layer structure	-	-
ISO/IEC 10646	-	Information technology - Universal Coded Character Set (UCS)	-	-
ISO/IEC 10731	-	Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services	-	-
ISO/IEC/IEEE 60559	-	Information technology - Microprocessor Systems - Floating-Point arithmetic	-	-
ISO 639-2	-	Codes for the representation of names of languages - Part-2: Alpha-3 code	-	-
ISO 8859-1	1987 <sup>7)</sup>	Information processing - 8-bit single-byte coded graphic character sets - Part 1: Latin alphabet No. 1	-	-
ISO 8859-2	1987 <sup>8)</sup>	Information processing - 8-bit single byte coded graphic character sets - Part 2: Latin alphabet No. 2	-	-
ISO 8859-3	1988 <sup>9)</sup>	Information processing - 8-bit single-byte coded graphic character sets - Part-3: Latin alphabet no. 3	-	-
ISO 8859-4	1988 <sup>10)</sup>	Information processing - 8-bit single-byte coded graphic character sets - Part-4: Latin alphabet no. 4	-	-
ISO 8859-6	1987 <sup>11)</sup>	Information processing - 8-Bit single-byte coded graphic character sets - Part 6: Latin/Arabic alphabet	-	-

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<sup>5)</sup> Superseded by ISO/IEC 8859-5:1999.

<sup>6)</sup> Superseded by ISO/IEC 8859-9:1999.

<sup>7)</sup> Superseded by ISO/IEC 8859-1:1998.

<sup>8)</sup> Superseded by ISO/IEC 8859-2:1999.

<sup>9)</sup> Superseded by ISO/IEC 8859-3:1999.

<sup>10)</sup> Superseded by ISO/IEC 8859-4:1998.

<sup>11)</sup> Superseded by ISO/IEC 8859-6:1999.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 8859-7	1987 <sup>12)</sup>	Information processing - 8-bit single-byte coded graphic character sets - Part 7: Latin/Greek alphabet	-	-
ISO 8859-8	1988 <sup>13)</sup>	Information processing - 8-bit single-byte coded graphic character sets - Part-8: Latin/hebrew alphabet	-	-
ISO 11898	1993 <sup>14)</sup>	Road vehicles - Interchange of digital information - Controller area network (CAN) for high-speed communication	-	-
IETF RFC 1759	-	Printer MIB	-	-

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<sup>12)</sup> Superseded by ISO/IEC 8859-7:2003.

<sup>13)</sup> Superseded by ISO/IEC 8859-8:1999.

<sup>14)</sup> Superseded by ISO 11898-1:2003 and ISO 11898-2:2003.



# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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**Industrial communication networks – Fieldbus specifications –  
Part 5-2: Application layer service definition – Type 2 elements**

**Réseaux de communication industriels – Spécifications des bus de terrain –  
Partie 5-2: Définition des services de la couche application – Éléments de type 2**





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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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**Industrial communication networks – Fieldbus specifications –  
Part 5-2: Application layer service definition – Type 2 elements**

**Réseaux de communication industriels – Spécifications des bus de terrain –  
Partie 5-2: Définition des services de la couche application – Eléments de type 2**

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PRICE CODE **XH**  
CODE PRIX

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ICS 25.040.40; 35.100.70; 35.110

ISBN 978-2-8322-1731-3

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## CONTENTS

FOREWORD.....	6
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.....	13
3.1 ISO/IEC 7498-1 terms.....	13
3.2 ISO/IEC 8822 terms.....	13
3.3 ISO/IEC 9545 terms.....	13
3.4 ISO/IEC 8824-1 terms.....	13
3.5 Type 2 fieldbus data-link layer terms.....	14
3.6 Type 2 fieldbus application-layer specific definitions.....	14
3.7 Type 2 abbreviations and symbols.....	22
3.8 Conventions.....	23
4 Common concepts.....	26
5 Data type ASE.....	26
5.1 General.....	26
5.2 Formal definition of data type objects.....	26
5.3 FAL defined data types.....	26
5.4 Data type ASE service specification.....	36
6 Communication model specification.....	36
6.1 Concepts.....	36
6.2 ASEs.....	45
6.3 ARs.....	175
6.4 Summary of FAL classes.....	206
6.5 Permitted FAL services by AR type.....	206
Bibliography.....	208
Figure 1 – Overview of ASEs and object classes.....	38
Figure 2 – Addressing format using MAC, class, instance and attribute IDs.....	39
Figure 3 – Identity object state transition diagram.....	58
Figure 4 – Static Assembly state transition diagram.....	63
Figure 5 – Dynamic Assembly state transition diagram.....	64
Figure 6 – Typical timing relationships for acknowledged data production.....	74
Figure 7 – Example of a COS system with two acking devices.....	75
Figure 8 – Message flow in COS connection – one Connection object, one consumer.....	75
Figure 9 – Message flow in COS connection – multiple consumers.....	76
Figure 10 – Path Reconfiguration in a ring topology.....	88
Figure 11 – CPF2 time synchronization offset clock model.....	89
Figure 12 – CPF2 time synchronization system with offset clock model.....	90
Figure 13 – CPF2 time synchronization group startup sequence.....	93
Figure 14 – Parameter object state transition diagram.....	99

Figure 15 – Example of Find_Next_Object_Instance service .....	125
Figure 16 – Transmission trigger timer .....	169
Figure 17 – Inactivity watchdog timer .....	170
Figure 18 – Using tools for configuration .....	171
Figure 19 – Production inhibit timer .....	172
Figure 20 – Context of transport services within the connection model.....	178
Figure 21 – Application-to-application view of data transfer .....	178
Figure 22 – Data flow diagram for a link producer .....	179
Figure 23 – Data flow diagram for a link consumer.....	180
Figure 24 – Triggers .....	181
Figure 25 – Binding transport instances to the producer and consumer of a transport connection that does not have a reverse data path .....	182
Figure 26 – Binding transport instances to the producers and consumers of a transport connection that does have a reverse data path .....	182
Figure 27 – Binding transport instances to the producer and consumers of a multipoint connection when the transport connection does not have a reverse data path .....	183
Figure 28 – Binding transport instances to the producers and consumers of a multipoint connection when the transport connection does have reverse data paths .....	183
Table 1 – Valid IANA MIB printer codes for character set selection .....	35
Table 2 – Common elements .....	42
Table 3 – ST language elements.....	43
Table 4 – Type conversion operations.....	43
Table 5 – Values of implementation-dependent parameters .....	44
Table 6 – Extensions to IEC 61131-3:2003 .....	45
Table 7 – Identity object state event matrix .....	59
Table 8 – Static Assembly state event matrix.....	64
Table 9 – Static Assembly instance attribute access .....	64
Table 10 – Dynamic Assembly state event matrix .....	65
Table 11 – Dynamic Assembly instance attribute access.....	65
Table 12 – Message Router object Forward_Open parameters .....	68
Table 13 – Acknowledge Handler object state event matrix.....	71
Table 14 – Producing I/O application object state event matrix .....	72
Table 15 – Profile identification.....	85
Table 16 – Profile default settings and ranges .....	85
Table 17 – Profile transports.....	85
Table 18 – Default PTP clock settings.....	86
Table 19 – Hand_Set clock quality management.....	87
Table 20 – Path Reconfiguration Signalling message.....	88
Table 21 – Parameter object state event matrix .....	99
Table 22 – Status codes .....	101
Table 23 – Get_Attribute_All service parameters .....	104
Table 24 – Set_Attribute_All service parameters.....	106
Table 25 – Get_Attribute_List service parameters .....	108

Table 26 – Set_Attribute_List service parameters .....	110
Table 27 – Reset service parameters .....	112
Table 28 – Start service parameters .....	114
Table 29 – Stop service parameters .....	116
Table 30 – Create service parameters .....	117
Table 31 – Delete service parameters .....	119
Table 32 – Get_Attribute_Single service parameters .....	120
Table 33 – Set_Attribute_Single service parameters .....	122
Table 34 – Find_Next_Object_Instance service parameters .....	124
Table 35 – NOP service parameters .....	126
Table 36 – Apply_Attributes service parameters .....	127
Table 37 – Save service parameters .....	129
Table 38 – Restore service parameters .....	130
Table 39 – Get_Member service parameters .....	132
Table 40 – Set_Member service parameters .....	134
Table 41 – Insert_Member service parameters .....	135
Table 42 – Remove_Member service parameters .....	137
Table 43 – Group_Sync service parameters .....	138
Table 44 – Add_AckData_Path service parameters .....	140
Table 45 – Remove_AckData_Path service parameters .....	141
Table 46 – Get_Enum_String service parameters .....	142
Table 47 – Symbolic_Translation service parameters .....	144
Table 48 – CM_Open service parameters .....	152
Table 49 – CM_Close service parameters .....	154
Table 50 – CM_Unconnected_Send service parameters .....	156
Table 51 – CM_Get_Connection_Data service parameters .....	158
Table 52 – CM_Search_Connection_Data service parameters .....	160
Table 53 – CM_Get_Connection_Data service parameters .....	161
Table 54 – I/O Connection object attribute access .....	166
Table 55 – Bridged Connection object attribute access .....	166
Table 56 – Explicit messaging object attribute access .....	167
Table 57 – Connection_Bind service parameters .....	173
Table 58 – Service_Name service parameters .....	174
Table 59 – How production trigger, transport class, and CM_RPI determine when data is produced .....	177
Table 60 – Transport classes .....	188
Table 61 – UCMM_Create service parameters .....	199
Table 62 – UCMM_Delete service parameters .....	200
Table 63 – UCMM_Write service parameters .....	200
Table 64 – UCMM_Abort service parameters .....	202
Table 65 – TR_Write service parameters .....	203
Table 66 – TR_Trigger service parameters .....	203
Table 67 – TR_Packet_arrived service parameters .....	204

Table 68 – TR_Ack_received service parameters.....	204
Table 69 – TR_Verify service parameters .....	205
Table 70 – TR_Status_updated service parameters .....	205
Table 71 – FAL class summary .....	206
Table 72 – FAL services by AR type .....	207

**INTERNATIONAL ELECTROTECHNICAL COMMISSION****INDUSTRIAL COMMUNICATION NETWORKS –  
FIELD BUS SPECIFICATIONS –****Part 5-2: Application layer service definition –  
Type 2 elements****FOREWORD**

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NOTE Combinations of protocol types are specified in IEC 61784-1 and IEC 61784-2.

International Standard IEC 61158-5-2 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

- Updates of definitions used by the Time Sync ASE;
- Corrections to numbering of services in 6.2;
- Addition of “member” and and object specific services in 6.2.1.2.1, 6.2.1.2.3, 6.2.1.3.1, 6.2.1.3.20 to 6.2.1.3.23, 6.2.1.3.28, and 6.5;
- Updates of Identity ASE in 6.2.1.2.2;
- Updates of Assembly ASE in 6.2.1.2.3;
- Updates of Message Router ASE in 6.2.1.2.4;
- Updates of Time Sync ASE in 6.2.1.2.6;
- Updates of FAL service status codes in 6.2.1.3.3;
- Miscellaneous clarifications of FAL services in 6.2.1.3.4 to 6.2.1.3.19;
- Updates of Connection Manager ASE in 6.2.2;
- Updates of Connection ASE in 6.2.3;
- Removal of obsolete transport classes 4 to 6 in 6.3.1, 6.3.3 and 6.4;
- Miscellaneous editorial corrections.

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

FDIS	Report on voting
65C/763/FDIS	65C/773/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.

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

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.

**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 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.

The application service is provided by the application protocol making use of the services available from the data-link or other immediately lower layer. This standard defines the application service characteristics that fieldbus applications and/or system management may exploit.

Throughout the set of fieldbus standards, the term “service” refers to the abstract capability provided by one layer of the OSI Basic Reference Model to the layer immediately above. Thus, the application layer service defined in this standard is a conceptual architectural service, independent of administrative and implementation divisions.

## **INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –**

### **Part 5-2: Application layer service definition – Type 2 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 2 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 service provided by the Type 2 fieldbus application layer in terms of

- a) an abstract model for defining application resources (objects) capable of being manipulated by users via the use of the FAL service,
- b) the primitive actions and events of the service;
- c) the parameters associated with each primitive action and event, and the form which they take; and
- d) the interrelationship between these actions and events, and their valid sequences.

The purpose of this standard is to define the services provided to

- a) the FAL user at the boundary between the user and the application layer of the fieldbus reference model, and
- b) Systems Management at the boundary between the application layer and Systems Management of the fieldbus reference model.

This standard specifies the structure and services of the Type 2 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 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 characteristics of conceptual application layer services suitable for time-critical communications, and thus supplement the OSI Basic Reference Model in guiding the development of application layer protocols for time-critical communications.

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 services standardized as the various Types of IEC 61158, and the corresponding protocols standardized in subparts of IEC 61158-6.

This specification may be used as the basis for formal application programming interfaces. Nevertheless, it is not a formal programming interface, and any such interface will need to address implementation issues not covered by this specification, including

- a) the sizes and octet ordering of various multi-octet service parameters, and
- b) the correlation of paired request and confirm, or indication and response, primitives.

## 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 this application layer service definition standard. Instead, conformance is achieved through implementation of conforming application layer protocols that fulfill the Type 2 application layer services as defined in this standard.

## 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 61131-3:2003<sup>1</sup>, *Programmable controllers – Part 3: Programming languages*

IEC 61158-1:2014, *Industrial communication networks – Fieldbus specifications – Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series*

IEC 61158-3-2:2014, *Industrial communication networks – Fieldbus specifications – Part 3-2: Data-link layer service definition – Type 2 elements*

IEC 61158-4-2:2014, *Industrial communication networks – Fieldbus specifications – Part 4-2: Data-link layer protocol specification – Type 2 elements*

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<sup>1</sup> A newer edition of this standard has been published, but only the cited edition applies.

IEC 61158-6-2:2014, *Industrial communication networks – Fieldbus specifications – Part 6-2: Application layer protocol specification – Type 2 elements*

IEC 61588:2009, *Precision clock synchronization protocol for networked measurement and control systems*

IEC 61784-3-2, *Industrial communications networks – Profiles – Part 3-2: Functional safety fieldbuses – Additional specifications for CPF 2*

ISO/IEC 646, *Information technology – ISO 7-bit coded character set for information interchange*

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

ISO/IEC 8859-1, *Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1*

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

ISO/IEC 10646, *Information technology – Universal Coded Character Set (UCS)*

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

ISO/IEC/IEEE 60559, *Information technology – Microprocessor Systems – Floating-Point arithmetic*

ISO 639-2, *Codes for the representation of names of languages – Part 2: Alpha-3 code*

ISO 8859-12:1987, *Information processing – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1*

ISO 8859-2<sup>2</sup>:1987, *Information processing – 8-bit single-byte coded graphic character sets – Part 2: Latin alphabet No. 2*

ISO 8859-3<sup>2</sup>:1988, *Information processing – 8-bit single-byte coded graphic character sets – Part 3: Latin alphabet No. 3*

ISO 8859-4<sup>2</sup>:1988, *Information processing – 8-bit single-byte coded graphic character sets – Part 4: Latin alphabet No. 4*

ISO 8859-5<sup>2</sup>:1988, *Information processing – 8-bit single-byte coded graphic character sets – Part 5: Latin/Cyrillic alphabet*

ISO 8859-6<sup>2</sup>:1987, *Information processing – 8-bit single-byte coded graphic character sets – Part 6: Latin/Arabic alphabet*

ISO 8859-7<sup>2</sup>:1987, *Information processing – 8-bit single-byte coded graphic character sets – Part 7: Latin/Greek alphabet*

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<sup>2</sup> A newer edition of this standard has been published by ISO/IEC, but the cited edition is the one used in the referenced IETF standards.

ISO 8859-8<sup>2</sup>:1988, *Information processing – 8-bit single-byte coded graphic character sets – Part 8: Latin/Hebrew alphabet*

ISO 8859-9<sup>2</sup>:1989, *Information processing – 8-bit single-byte coded graphic character sets – Part 9: Latin alphabet No. 5*

ISO 11898:1993<sup>3</sup>, *Road vehicles – Interchange of digital information – Controller area network (CAN) for high-speed communication*

IETF RFC 1759, *Printer MIB*, available at <<http://www.ietf.org>>

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<sup>3</sup> A newer edition of this standard has been published, but only the cited edition applies.