

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

This document is a preview generated by EVS

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 61158-1:2014 sisaldab Euroopa standardi EN 61158-1:2014 inglisekeelset teksti.	This Estonian standard EVS-EN 61158-1:2014 consists of the English text of the European standard EN 61158-1:2014.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 19.09.2014.	Date of Availability of the European standard is 19.09.2014.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 25.040.40, 33.040, 35.100.05

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:
Aru 10, 10317 Tallinn, Eesti; www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:
Aru 10, 10317 Tallinn, Estonia; www.evs.ee; phone 605 5050; e-mail info@evs.ee

EUROPEAN STANDARD

EN 61158-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2014

ICS 25.040.40; 33.040; 35.100.05

Supersedes CLC/TR 61158-1:2010

English Version

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

Réseaux de communication industriels - Spécifications des
bus de terrain - Partie 1: Présentation et lignes directrices
des séries CEI 61158 et CEI 61784
(CEI 61158-1:2014)

Industrielle Kommunikationsnetze - Feldbusse -
Teil 1: Überblick und Leitfaden zu den Normen der Reihe
IEC 61158 und IEC 61784
(IEC 61158-1:2014)

This European Standard was approved by CENELEC on 2014-06-27. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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

Foreword

The text of document 65C/757/FDIS, future edition 1 of IEC 61158-1, 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 61158-1:2014.

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) 2015-03-27
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-06-27

This document supersedes CLC/TR 61158-1:2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard IEC 61158-1:2014 was approved by CENELEC as a European Standard without any modification.

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

IEC 60793-2-30:2012	NOTE	Harmonized as EN 60793-2-30:2013 (not modified).
IEC 60793-2-40:2009	NOTE	Harmonized as EN 60793-2-40:2011 (not modified).
IEC 61000-6-2	NOTE	Harmonized as EN 61000-6-2.
IEC 61131-2	NOTE	Harmonized as EN 61131-2.
IEC 61158 Series	NOTE	Harmonized as EN 61158 Series (not modified).
IEC 61158-2:2014	NOTE	Harmonized as EN 61158-2 ¹⁾ (not modified).
IEC 61158-3-1:2014	NOTE	Harmonized as EN 61158-3-1 ¹⁾ (not modified).
IEC 61158-3-2:2014	NOTE	Harmonized as EN 61158-3-2 ¹⁾ (not modified).
IEC 61158-3-3:2014	NOTE	Harmonized as EN 61158-3-3 ¹⁾ (not modified).
IEC 61158-3-4:2014	NOTE	Harmonized as EN 61158-3-4 ¹⁾ (not modified).
IEC 61158-3-7:2007	NOTE	Harmonized as EN 61158-3-7:2008 (not modified).
IEC 61158-3-8:2007	NOTE	Harmonized as EN 61158-3-8:2008 (not modified).
IEC 61158-3-11:2007	NOTE	Harmonized as EN 61158-3-11:2008 (not modified).
IEC 61158-3-12:2014	NOTE	Harmonized as EN 61158-3-12 ¹⁾ (not modified).
IEC 61158-3-13:2014	NOTE	Harmonized as EN 61158-3-13 ¹⁾ (not modified).
IEC 61158-3-14:2014	NOTE	Harmonized as EN 61158-3-14 ¹⁾ (not modified).
IEC 61158-3-16:2007	NOTE	Harmonized as EN 61158-3-16:2008 (not modified).

¹⁾ To be published.

IEC 61158-3-17:2007	NOTE	Harmonized as EN 61158-3-17:2008 (not modified).
IEC 61158-3-18:2007	NOTE	Harmonized as EN 61158-3-18:2008 (not modified).
IEC 61158-3-19:2014	NOTE	Harmonized as EN 61158-3-19 ¹⁾ (not modified).
IEC 61158-3-20:2014	NOTE	Harmonized as EN 61158-3-20 ¹⁾ (not modified).
IEC 61158-3-21:2010	NOTE	Harmonized as EN 61158-3-21:2012 (not modified).
IEC 61158-3-22:2014	NOTE	Harmonized as EN 61158-3-22 ¹⁾ (not modified).
IEC 61158-3-24:2014	NOTE	Harmonized as EN 61158-3-24 ¹⁾ (not modified).
IEC 61158-4-1:2014	NOTE	Harmonized as EN 61158-4-1 ¹⁾ (not modified).
IEC 61158-4-2:2014	NOTE	Harmonized as EN 61158-4-2 ¹⁾ (not modified).
IEC 61158-4-3:2014	NOTE	Harmonized as EN 61158-4-3 ¹⁾ (not modified).
IEC 61158-4-4:2014	NOTE	Harmonized as EN 61158-4-4 ¹⁾ (not modified).
IEC 61158-4-7:2007	NOTE	Harmonized as EN 61158-4-7:2008 (not modified).
IEC 61158-4-8:2007	NOTE	Harmonized as EN 61158-4-8:2008 (not modified).
IEC 61158-4-11:2014	NOTE	Harmonized as EN 61158-4-11 ¹⁾ (not modified).
IEC 61158-4-12:2014	NOTE	Harmonized as EN 61158-4-12 ¹⁾ (not modified).
IEC 61158-4-13:2014	NOTE	Harmonized as EN 61158-4-13 ¹⁾ (not modified).
IEC 61158-4-14:2014	NOTE	Harmonized as EN 61158-4-14 ¹⁾ (not modified).
IEC 61158-4-16:2007	NOTE	Harmonized as EN 61158-4-16:2008 (not modified).
IEC 61158-4-17:2007	NOTE	Harmonized as EN 61158-4-17:2008 (not modified).
IEC 61158-4-18:2010	NOTE	Harmonized as EN 61158-4-18:2012 (not modified).
IEC 61158-4-19:2014	NOTE	Harmonized as EN 61158-4-19 ¹⁾ (not modified).
IEC 61158-4-20:2014	NOTE	Harmonized as EN 61158-4-20 ¹⁾ (not modified).
IEC 61158-4-21:2010	NOTE	Harmonized as EN 61158-4-21:2012 (not modified).
IEC 61158-4-22:2014	NOTE	Harmonized as EN 61158-4-22 ¹⁾ (not modified).
IEC 61158-4-24:2014	NOTE	Harmonized as EN 61158-4-24 ¹⁾ (not modified).
IEC 61158-5-2:2014	NOTE	Harmonized as EN 61158-5-2 ¹⁾ (not modified).
IEC 61158-5-3:2014	NOTE	Harmonized as EN 61158-5-3 ¹⁾ (not modified).
IEC 61158-5-4:2014	NOTE	Harmonized as EN 61158-5-4 ¹⁾ (not modified).
IEC 61158-5-5:2014	NOTE	Harmonized as EN 61158-5-5 ¹⁾ (not modified).
IEC 61158-5-7:2007	NOTE	Harmonized as EN 61158-5-7:2008 (not modified).
IEC 61158-5-8:2007	NOTE	Harmonized as EN 61158-5-8:2008 (not modified).
IEC 61158-5-9:2014	NOTE	Harmonized as EN 61158-5-9 ¹⁾ (not modified).
IEC 61158-5-10:2014	NOTE	Harmonized as EN 61158-5-10 ¹⁾ (not modified).
IEC 61158-5-11:2007	NOTE	Harmonized as EN 61158-5-11:2008 (not modified).
IEC 61158-5-12:2014	NOTE	Harmonized as EN 61158-5-12 ¹⁾ (not modified).
IEC 61158-5-13:2014	NOTE	Harmonized as EN 61158-5-13 ¹⁾ (not modified).
IEC 61158-5-14:2014	NOTE	Harmonized as EN 61158-5-14 ¹⁾ (not modified).
IEC 61158-5-15:2010	NOTE	Harmonized as EN 61158-5-15:2012 (not modified).
IEC 61158-5-16:2007	NOTE	Harmonized as EN 61158-5-16:2008 (not modified).
IEC 61158-5-17:2007	NOTE	Harmonized as EN 61158-5-17:2008 (not modified).
IEC 61158-5-18:2010	NOTE	Harmonized as EN 61158-5-18:2012 (not modified).

¹⁾ To be published.

IEC 61158-5-19:2014	NOTE	Harmonized as EN 61158-5-19 ¹⁾ (not modified).
IEC 61158-5-20:2014	NOTE	Harmonized as EN 61158-5-20 ¹⁾ (not modified).
IEC 61158-5-21:2010	NOTE	Harmonized as EN 61158-5-21:2012 (not modified).
IEC 61158-5-22:2010	NOTE	Harmonized as EN 61158-5-22:2012 (not modified).
IEC 61158-5-23:2014	NOTE	Harmonized as EN 61158-5-23 ¹⁾ (not modified).
IEC 61158-5-24:2014	NOTE	Harmonized as EN 61158-5-24 ¹⁾ (not modified).
IEC 61158-6-2:2014	NOTE	Harmonized as EN 61158-6-2 ¹⁾ (not modified).
IEC 61158-6-3:2014	NOTE	Harmonized as EN 61158-6-3 ¹⁾ (not modified).
IEC 61158-6-4:2014	NOTE	Harmonized as EN 61158-6-4 ¹⁾ (not modified).
IEC 61158-6-5:2014	NOTE	Harmonized as EN 61158-6-5 ¹⁾ (not modified).
IEC 61158-6-7:2007	NOTE	Harmonized as EN 61158-6-7:2008 (not modified).
IEC 61158-6-8:2007	NOTE	Harmonized as EN 61158-6-8:2008 (not modified).
IEC 61158-6-9:2014	NOTE	Harmonized as EN 61158-6-9 ¹⁾ (not modified).
IEC 61158-6-10:2014	NOTE	Harmonized as EN 61158-6-10 ¹⁾ (not modified).
IEC 61158-6-11:2007	NOTE	Harmonized as EN 61158-6-11:2008 (not modified).
IEC 61158-6-12:2014	NOTE	Harmonized as EN 61158-6-12 ¹⁾ (not modified).
IEC 61158-6-13:2014	NOTE	Harmonized as EN 61158-6-13 ¹⁾ (not modified).
IEC 61158-6-14:2014	NOTE	Harmonized as EN 61158-6-14 ¹⁾ (not modified).
IEC 61158-6-15:2010	NOTE	Harmonized as EN 61158-6-15:2012 (not modified).
IEC 61158-6-16:2007	NOTE	Harmonized as EN 61158-6-16:2008 (not modified).
IEC 61158-6-17:2007	NOTE	Harmonized as EN 61158-6-17:2008 (not modified).
IEC 61158-6-18:2010	NOTE	Harmonized as EN 61158-6-18:2012 (not modified).
IEC 61158-6-19:2014	NOTE	Harmonized as EN 61158-6-19 ¹⁾ (not modified).
IEC 61158-6-20:2014	NOTE	Harmonized as EN 61158-6-20 ¹⁾ (not modified).
IEC 61158-6-21:2010	NOTE	Harmonized as EN 61158-6-21:2012 (not modified).
IEC 61158-6-22:2014	NOTE	Harmonized as EN 61158-6-22 ¹⁾ (not modified).
IEC 61158-6-23:2014	NOTE	Harmonized as EN 61158-6-23 ¹⁾ (not modified).
IEC 61158-6-24:2014	NOTE	Harmonized as EN 61158-6-24 ¹⁾ (not modified).
IEC 61326 Series	NOTE	Harmonized as EN 61326 Series (not modified).
IEC 61508 Series	NOTE	Harmonized as EN 61508 Series (not modified).
IEC 61784-1:2014	NOTE	Harmonized as EN 61784-1 ¹⁾ (not modified).
IEC 61784-2:2014	NOTE	Harmonized as EN 61784-2 ¹⁾ (not modified).
IEC 61784-3:2010	NOTE	Harmonized as EN 61784-3:2010 (not modified).
IEC 61784-3-1:2010	NOTE	Harmonized as EN 61784-3-1:2010 (not modified).
IEC 61784-3-2:2010	NOTE	Harmonized as EN 61784-3-2:2010 (not modified).
IEC 61784-3-3:2010	NOTE	Harmonized as EN 61784-3-3:2010 (not modified).
IEC 61784-3-6:2010	NOTE	Harmonized as EN 61784-3-6:2010 (not modified).
IEC 61784-3-8:2010	NOTE	Harmonized as EN 61784-3-8:2010 (not modified).
IEC 61784-3-12:2010	NOTE	Harmonized as EN 61784-3-12:2010 (not modified).
IEC 61784-3-13:2010	NOTE	Harmonized as EN 61784-3-13:2010 (not modified).
IEC 61784-3-14:2010	NOTE	Harmonized as EN 61784-3-14:2010 (not modified).

¹⁾ To be published.

IEC 61784-3-18:2011	NOTE	Harmonized as EN 61784-3-18:2011 (not modified).
IEC 61784-5-1:2013	NOTE	Harmonized as EN 61784-5-1:2013 (not modified).
IEC 61784-5-2:2013	NOTE	Harmonized as EN 61784-5-2:2013 (not modified).
IEC 61784-5-3:2013	NOTE	Harmonized as EN 61784-5-3:2013 (not modified).
IEC 61784-5-4:2010	NOTE	Harmonized as EN 61784-5-4:2012 (not modified).
IEC 61784-5-6:2013	NOTE	Harmonized as EN 61784-5-6:2013 (not modified).
IEC 61784-5-8:2013	NOTE	Harmonized as EN 61784-5-8:2013 (not modified).
IEC 61784-5-10:2010	NOTE	Harmonized as EN 61784-5-10:2012 (not modified).
IEC 61784-5-11:2013	NOTE	Harmonized as EN 61784-5-11:2013 (not modified).
IEC 61784-5-12:2010	NOTE	Harmonized as EN 61784-5-12:2012 (not modified).
IEC 61784-5-13:2013	NOTE	Harmonized as EN 61784-5-13:2013 (not modified).
IEC 61784-5-14:2013	NOTE	Harmonized as EN 61784-5-14:2013 (not modified).
IEC 61784-5-15:2010	NOTE	Harmonized as EN 61784-5-15:2012 (not modified).
IEC 61784-5-16:2013	NOTE	Harmonized as EN 61784-5-16:2013 (not modified).
IEC 61784-5-17:2013	NOTE	Harmonized as EN 61784-5-17:2013 (not modified).
IEC 61784-5-18:2013	NOTE	Harmonized as EN 61784-5-18:2013 (not modified).
IEC 61784-5-19:2013	NOTE	Harmonized as EN 61784-5-19:2013 (not modified).
IEC 61804 Series	NOTE	Harmonized as EN 61804 Series (not modified).
IEC 61918:2013	NOTE	Harmonized as EN 61918:2013 (modified).
IEC 62439 Series	NOTE	Harmonized as EN 62439 Series (not modified).
IEC 62453 Series	NOTE	Harmonized as EN 62453 Series (not modified).
IEC 62591	NOTE	Harmonized as EN 62591.
IEC 62657-2	NOTE	Harmonized as EN 62657-2 ²⁾ .
IEC 62734	NOTE	Harmonized as EN 62734 ²⁾ .
IEC/TR 62685:2010	NOTE	Harmonized as CLC/TR 62685:2011 (not modified).

²⁾ At draft stage.

CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Terms, definitions and abbreviated terms	6
3.1 Terms and definitions	6
3.2 Abbreviations	7
4 Guidelines for implementers and users	7
4.1 Background and purpose.....	7
4.2 Supported options	8
4.3 Benefits from using a common and formal style.....	8
5 Concept of the IEC 61158 series	9
6 Mapping onto the OSI Basic Reference Model.....	11
6.1 Overview	11
6.2 Physical layer service and protocol.....	11
6.3 Data-link layer service.....	12
6.4 Data-link layer protocol	13
6.5 Application layer service.....	13
6.6 Application layer protocol	14
7 Structure of IEC 61158 and IEC 61784 series.....	15
7.1 The IEC 61158 physical layer.....	15
7.2 The IEC 61158 data-link layer	15
7.3 The IEC 61158 application layer.....	16
7.4 IEC 61784-1 and IEC 61784-2 fieldbus profiles	16
7.5 IEC 61784-3 functional safety communication profiles	20
7.6 IEC 61784-5 installation profiles.....	22
7.7 Communication profiles for wireless communication networks	24
8 Brief summary of the characteristics of service and protocol for each fieldbus type	25
8.1 Summary of the physical layer service and protocol characteristics	25
8.2 Summary of data-link layer service characteristics	27
8.3 Summary of data-link layer protocol characteristics	29
8.4 Summary of application layer service characteristics	30
8.5 Summary of application layer protocol characteristics.....	32
9 Application layer service description concepts	34
9.1 Overview	34
9.2 Architectural relationships	34
9.3 Fieldbus application layer structure	36
9.4 Fieldbus application layer naming and addressing.....	48
9.5 Architecture summary.....	49
9.6 Notional FAL service procedures	50
9.7 Common FAL attributes	51
9.8 Common FAL service parameters.....	52
9.9 APDU size.....	53
10 Data type ASE.....	53
10.1 Overview	53
10.2 Formal definition of data type objects	55

11	Fieldbus system requirements	57
11.1	General	57
11.2	Industrial control network	57
11.3	Communication between industrial control networks and other networks	58
11.4	Quality of service features of an industrial control network	58
11.5	Special requirements for wireless networks	59
Annex A	(informative) Trade name declarations	60
Annex B	(informative) Media selection for fieldbus systems	62
B.1	General	62
B.2	Cabled media	62
B.3	Wireless media	62
B.4	Media needing special consideration	62
B.5	Performance characteristics of open and public networks	63
	Bibliography	64
	Figure 1 – Example of a fieldbus system	9
	Figure 2 – Concept of DL/AL to separate service and protocol parts	10
	Figure 3 – Basic fieldbus reference model	11
	Figure 4 – General model of physical layer	12
	Figure 5 – Relationship of the Data-link layer to other fieldbus layers and to users of the fieldbus data-link service	13
	Figure 6 – Relationship of the fieldbus Application layer to other fieldbus layers and to users of the fieldbus application service	14
	Figure 7 – Structure of communication profile families	17
	Figure 8 – Example of a CPF structure	18
	Figure 9 – Document structure of IEC 61918 and the CPF specific part of IEC 61784-5	24
	Figure 10 – Relationship to the OSI Basic Reference Model	35
	Figure 11 – Architectural positioning of the fieldbus application layer	35
	Figure 12 – Client/server interactions	38
	Figure 13 – Pull model interactions	39
	Figure 14 – Push model interactions	39
	Figure 15 – APOs services conveyed by the FAL	41
	Figure 16 – Application entity structure	43
	Figure 17 – Example FAL ASEs	44
	Figure 18 – FAL management of objects	45
	Figure 19 – ASE service conveyance	46
	Figure 20 – Defined and established AREPs	48
	Figure 21 – FAL architectural components	50
	Figure 22 – Data-type class hierarchy example	53
	Table 1 – OSI and IEC 61158 layers	11
	Table 2 – CPF, CP, and type relations	19
	Table 3 – Types of timeliness defined for publisher/subscriber interactions	40
	Table A.1 – Trade names of CPFs and CPs	60

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series

1 Scope

This document specifies the generic concept of fieldbuses.

This document also presents an overview and guidance for the IEC 61158 series by:

- explaining the structure and content of the IEC 61158 series;
- relating the structure of the IEC 61158 series to the ISO/IEC 7498-1 OSI Basic Reference Model;
- showing the logical structure of the IEC 61784 series;
- showing how to use parts of the IEC 61158 series in combination with the IEC 61784 series;
- providing explanations of some aspects of the IEC 61158 series that are common to the type specific parts of the IEC 61158-5 including the application layer service description concepts and the generic fieldbus data types.

2 Normative references

None.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

3.1.1

communication system

arrangement of hardware, software and propagation media to allow the transfer of messages from one application to another

3.1.2

fieldbus

communication system based on serial data transfer as typically used in industrial automation and process control applications

3.1.3

fieldbus system

system using a fieldbus with connected devices

3.1.4

message

ordered series of octets intended to convey information

[SOURCE: ISO/IEC 2382-16:1996, 16.02.01, modified]