SLOVENSKI STANDARD
SIST-TP CLC/TR 61158-1:2011

01-januar-2011

Nadomešča:
SIST-TP CLC/TR 61158-1:2009

Industrijska komunikacijska omrežja - Specifikacije za procesna vodila - 1. del: Pregled in navodila za skupini IEC 61158 in IEC 61784 (IEC/TR 61158-1:2010)

Industrial communication networks - Fieldbus specifications - Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series (IEC/TR 61158-1:2010)

Industrielle Kommunikationsnetze - Feldbusse - Teil 1: Überblick und Leitfaden zu den Normen der Reihe IEC 61158 und IEC 61784 (IEC/TR 61158-1:2010)

Ta slovenski standard je istoveten z: **CLC/TR 61158-1:2010**

ICS:

25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control
35.110	Omreževanje	Networking

SIST-TP CLC/TR 61158-1:2011 **en,fr**

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CLC/TR 61158-1

October 2010

ICS 25.040; 35.100; 35.240.50

Supersedes CLC/TR 61158-1:2008

English version

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

(IEC/TR 61158-1:2010)

Industrielle Kommunikationsnetze - Feldbusse - Teil 1: Überblick und Leitfaden zu den Normen der Reihe IEC 61158 und IEC 61784 (IEC/TR 61158-1:2010)

This Technical Report was approved by CENELEC on 2010-09-01.

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

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. CLC/TR 61158-1:2010 E

Foreword

The text of the Technical Report IEC/TR 61158-1:2010, prepared by SC 65C, Industrial networks, of IEC TC 65, Industrial-process measurement, control and automation, was submitted to vote and was approved by CENELEC as CLC/TR 61158-1 on 2010-09-01.

This Technical Report supersedes CLC/TR 61158-1:2008.

This edition includes the following significant changes with respect to CLC/TR 61158-1:2008:

– Updates of the references to the EN 61158 series, EN 61784-1, EN 61784-3, EN 61784-5 series and EN 61918 throughout the document;

– new Type 21 and the related profile family CPF 17;

– new Type 22 and the related profile family CPF 18.

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

Endorsement notice

The text of the Technical Report IEC/TR 61158-1:2010 was approved by CENELEC as a Technical Report without any modification.

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

IEC 61158-3-1:2007	NOTE Harmonized as EN 61158-3-1:2008 (not modified).
IEC 61158-3-2:2007	NOTE Harmonized as EN 61158-3-2:2008 (not modified).
IEC 61158-3-3:2007	NOTE Harmonized as EN 61158-3-3:2008 (not modified).
IEC 61158-3-4:2007	NOTE Harmonized as EN 61158-3-4:2008 (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 61158-3-13:2007	NOTE Harmonized as EN 61158-3-31:2008 (not modified).
IEC 61158-3-16:2007	NOTE Harmonized as EN 61158-3-16:2008 (not modified).
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 61158-4-1:2007	NOTE Harmonized as EN 61158-4-1:2008 (not modified).
IEC 61158-4-4:2007	NOTE Harmonized as EN 61158-4-4:2008 (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 61158-4-13:2007	NOTE Harmonized as EN 61158-4-13:2008 (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 61158-5-4:2007	NOTE Harmonized as EN 61158-5-4:2008 (not modified).

IEC 61158-5-5:2007	NOTE Harmonized as EN 61158-5-5:2008 (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 61158-5-9:2007	NOTE Harmonized as EN 61158-5-9:2008 (not modified).
IEC 61158-5-11:2007	NOTE Harmonized as EN 61158-5-11:2008 (not modified).
IEC 61158-5-13:2007	NOTE Harmonized as EN 61158-5-13:2008 (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 61158-6-4:2007	NOTE Harmonized as EN 61158-6-4:2008 (not modified).
IEC 61158-6-5:2007	NOTE Harmonized as EN 61158-6-5:2008 (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 61158-6-13:2007	NOTE Harmonized as EN 61158-6-13:2008 (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 61508 series	NOTE Harmonized in EN 61508 series (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).

IEC/TR 61158-1

Edition 3.0 2010-08

TECHNICAL REPORT

colour inside

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE XB

ICS 25.040; 35.100; 35.240.50

ISBN 978-2-88912-137-3

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

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

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

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 its profile parts. Use of the various protocol types in other combinations may require permission of their respective intellectual-property-right holders.

IEC 61158-1, which is a technical report, 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 2007. It constitutes a technical revision.

This edition includes the following significant changes with respect to the previous edition:

- Updates of the references to the IEC 61158 series, IEC 61784-1, IEC 61784-3, IEC 61784-5 series and IEC 61918 throughout the document;
- new Type 21 and the related profile family CPF 17;
- new Type 22 and the related profile family CPF 18.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
65C/590A/DTR	65C/608/RVC

Full information on the voting for the approval of this technical report 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 the parts in 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.

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

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.

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

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

1 Scope

This technical report 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 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 parts of the IEC 61158-5 series.

2 Normative references

None

3 Abbreviations

For the purposes of this document, the following abbreviations, based partially on the concepts developed in ISO/IEC 7498-1, apply:

AL	**Application layer (N = 7)**
AR	**Application relationship**
AREP	**Application relationship endpoint**
DL-	**Data-link layer (as a prefix)**
DLL	**Data-link layer (N = 2)**
IETF	**Internet Engineering Task Force**
IP	**Internet Protocol (see RFC 791)**
(*n*)-layer	**Layer *n* of the OSI Basic Reference Model**
OSI	**Open systems interconnection**
Ph-	**Physical layer (as a prefix)**
PhL	**Physical layer (N = 1)**

4 Guidelines for implementers and users

4.1 Background and purpose

Communication in global markets requires a global understanding of a specification (standard or not). ISO/OSI related specifications provide a common basis for understanding and acceptance between international experts (manufacturers and end-users). Examples are

- ISO/IEC 7498 series for general layering and structuring;
- ISO/IEC 9545 for general application layer modeling;
- ISO/IEC 8886 for data-link layer modeling.

The IEC 61158 series specifies a number of different fieldbus types in each of the parts of the series (part 2 and the parts of part 3 through part 6). As a result of the editorial harmonization work done by IEC, each PhL, DLL and AL specification within IEC 61158 is shown in a homogeneous way. The description of each layer offers, as far as possible, common views, concepts, definitions, and descriptive methods.

This common approach has been adopted to assist users and implementers in understanding the several specifications. It is also intended to assist in comparing available products and their communications-related features.

4.2 Supported options

Most of the fieldbus types specified in the IEC 61158 series include a range of selectable and configurable options within their detailed specifications. In general, only certain restricted combinations of options will interwork or interoperate correctly.

The recommended combinations of options are collected in IEC 61784-1 and IEC 61784-2.

IEC 61784-1 and IEC 61784-2 provide users and implementers with details of supported fieldbus specifications based on selected options that are intended to work together consistently and correctly. In most cases, available product demonstrations and working plant experience support these profiles.

Annex A of IEC 61784-1 and IEC 61784-2 help select the needed fieldbus by showing the key features of each of the profiled fieldbus protocol families.

As a result, the route map recommended to select a fieldbus is:

- Clause 5 to Clause 8 of this Technical Report
- IEC 61784-1, Annex A: Communication concepts
- IEC 61784-2, Annex A: Performance indicator calculations
- IEC 61784-1 and IEC 61784-2, Communication profile family
- IEC 61158 series as appropriate for the particular fieldbus type of interest.

4.3 Benefits from using a common and formal style

The benefits gained from using a common and formal style to specify the communication system are:

- the common look and feel of a specification saves effort during evaluation;
- a common structure helps to identify and to specify common parts and contents;
- the common approach represents a first step to ensure long-term quality and stability;
- the missing parts and items of any specification are more readily identified by comparison with the other specifications, leading to a simplified review and evaluation procedure;
- a common basis facilitates the development of test and certification procedures;
- the modular concepts support future enhancements, extensions and adaptation of new technologies.

5 Concept of the IEC 61158 series

Conceptually, a fieldbus is a digital, serial, multidrop, data bus for communication with industrial control and instrumentation devices such as – but not limited to – transducers, actuators and controllers.

The IEC 61158 series specifies a number of fieldbus protocol types. Each protocol type is designed to permit multiple measurement and control devices to communicate on a shared medium. Devices communicate directly only with other devices of the same protocol type.

NOTE 1 Devices which use the same lower-layer protocols in a compatible fashion but differ in their higher-layer protocols may be able to share a lower-layer medium.

NOTE 2 In all cases, a particular data-link layer protocol type may be used without restriction when coupled with physical layer and application layer protocols of the same type or with other combinations as specified in IEC 61784-1 and IEC 61784-2. Use of the various protocol types in other combinations may require permission from their respective copyright holders.

These protocol types have been engineered to support information processing, monitoring and control systems for any industrial sector and related domains. An example application for high-integrity low-level communication between sensors, actuators and local controllers in a process plant, together with the interconnection of programmable controllers, is shown in Figure 1.

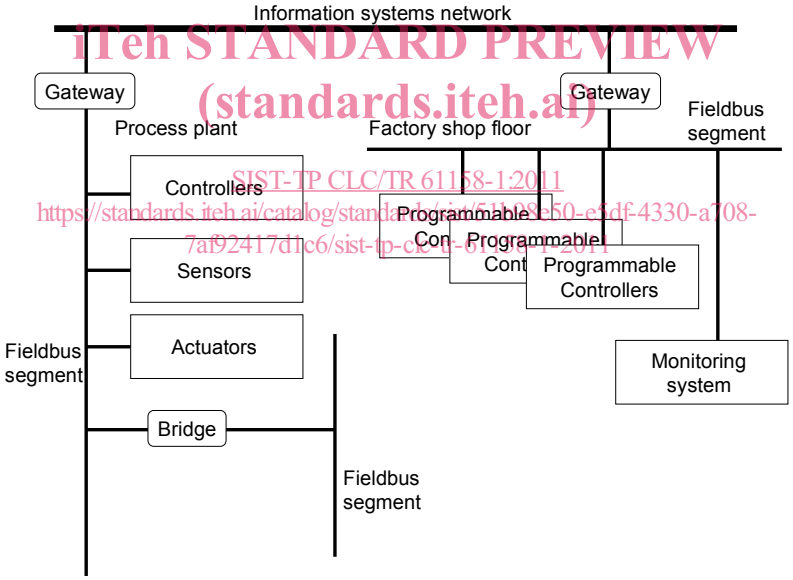

Figure 1 – Generic fieldbus network

A number of fieldbus types are specified in the IEC 61158 series using the following concepts for decomposition.

a) **First concept:** The complex communication task is divided into different layers based on an adaptation of ISO/IEC 7498, the ISO/OSI Basic Reference Model, thereby facilitating well-structured functions and interfaces (see Clause 6). This has the following benefits:

- decomposition of complex tasks;
- modular structure to adapt different technologies.

b) **Second concept:** Each fieldbus type is composed of one or more layer specifications.

Most types include a number of services and protocol options that require an appropriate selection to support a working system. Compatible selections of options and services within one of the IEC 61158 fieldbus types are specified as standardized communication