

**Industrial communication networks - Fieldbus  
specifications -- Part 2: Physical layer specification and  
service definition**

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61158-2:2010 sisaldab Euroopa standardi EN 61158-2:2010 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 31.10.2010 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 08.10.2010.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 61158-2:2010 consists of the English text of the European standard EN 61158-2:2010.

This standard is ratified with the order of Estonian Centre for Standardisation dated 31.10.2010 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 08.10.2010.

The standard is available from Estonian standardisation organisation.

ICS 25.040, 35.100, 35.240.50

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**Industrial communication networks -  
Fieldbus specifications -  
Part 2: Physical layer specification and service definition  
(IEC 61158-2:2010)**

Réseaux de communication industriels -  
Spécifications des bus de terrain -  
Partie 2: Spécification des couches  
physiques et définition des services  
(CEI 61158-2:2010)

Industrielle Kommunikationsnetze -  
Feldbusse -  
Teil 2: Spezifikation  
und Dienstfestlegungen des Physical  
Layer (Bitübertragungsschicht)  
(IEC 61158-2:2010)

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

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

## Foreword

The text of document 65C/598/FDIS, future edition 5 of IEC 61158-2, 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 was approved by CENELEC as EN 61158-2 on 2010-09-01.

This European Standard supersedes EN 61158-2:2008.

This EN 61158-2:2010 includes the following significant technical changes with respect to EN 61158-2:2008:

- for Type 18, Table 157 reduced tolerance to 5 %;
- for Type 18, in 32.5.3.1 removed minimum cable length;
- for Type 18, in 32.5.4, and R.2.2 cable reference removed;
- for Type 18, Table 160 and 161 terminating resistor value changed to 680  $\Omega$ .

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.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2011-06-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2013-09-01

Annex ZA has been added by CENELEC.

## Endorsement notice

The text of the International Standard IEC 61158-2:2010 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 60079-0         | NOTE Harmonized as EN 60079-0.                        |
| IEC 60079-27        | NOTE Harmonized as EN 60079-27.                       |
| IEC 60875-1         | NOTE Harmonized as EN 60875-1.                        |
| IEC 60947-5-2       | NOTE Harmonized as EN 60947-5-2.                      |
| IEC/TR 61158-1      | NOTE Harmonized as CLC/TR 61158-1.                    |
| 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 61158-4-16:2007 | NOTE Harmonized as EN 61158-4-16:2008 (not modified). |
| IEC 61300-3-4       | NOTE Harmonized as EN 61300-3-4.                      |

|             |                                |
|-------------|--------------------------------|
| IEC 61491   | NOTE Harmonized as EN 61491.   |
| IEC 61596   | NOTE Harmonized as EN 61596.   |
| IEC 61784-1 | NOTE Harmonized as EN 61784-1. |

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## Annex ZA (normative)

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

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

| <u>Publication</u>   | <u>Year</u> | <u>Title</u>                                                                                                                                                                           | <u>EN/HD</u>              | <u>Year</u> |
|----------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------|
| IEC 60050-731        | -           | International Electrotechnical Vocabulary (IEV) - Chapter 731: Optical fibre communication                                                                                             | -                         | -           |
| IEC 60079-11         | -           | Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"                                                                                                          | EN 60079-11               | -           |
| IEC 60079-14         | 2002        | Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines)                                                           | EN 60079-14 <sup>1)</sup> | 2003        |
| IEC 60079-25         | -           | Explosive atmospheres - Part 25: Intrinsically safe electrical systems                                                                                                                 | EN 60079-25               | -           |
| IEC 60169-17         | 1980        | Radio-frequency connectors - Part 17: R.F. coaxial connectors with inner diameter of outer conductor 5 mm (0,256 in) with screw coupling - Characteristic impedance 50 ohms (type TNC) | -                         | -           |
| IEC 60189-1          | 2007        | Low-frequency cables and wires with PVC insulation and PVC sheath - Part 1: General test and measuring methods                                                                         | -                         | -           |
| IEC 60255-22-1 (mod) | 1988        | Electrical relays - Part 22: Electrical disturbance tests for measuring relays and protection equipment - Section 1: 1 MHz burst disturbance tests                                     | -                         | -           |
| IEC 60364-4-41 (mod) | -           | Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock                                                                            | HD 60364-4-41             | -           |
| IEC 60364-5-54 (mod) | -           | Electrical installations of buildings - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements, protective conductors and protective bonding conductors     | HD 60364-5-54             | -           |
| IEC 60529            | -           | Degrees of protection provided by enclosures - (IP Code)                                                                                                                               | -                         | -           |

<sup>1)</sup> EN 60079-14 is superseded by EN 60079-14:2008, which is based on IEC 60079-14:2007.

| <u>Publication</u> | <u>Year</u> | <u>Title</u>                                                                                                                                                                                                                                                              | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------|
| IEC 60603-7-4      | -           | Connectors for electronic equipment -<br>Part 7-4: Detail specification for 8-way,<br>unshielded, free and fixed connectors, for data<br>transmissions with frequencies up to 250 MHz                                                                                     | EN 60603-7-4 | -           |
| IEC 60760          | -           | Flat, quick-connect terminations                                                                                                                                                                                                                                          | -            | -           |
| IEC 60793          | Series      | Optical fibres                                                                                                                                                                                                                                                            | -            | -           |
| IEC 60794-1-2      | 2003        | Optical fibre cables -<br>Part 1-2: Generic specification - Basic optical<br>cable test procedures                                                                                                                                                                        | EN 60794-1-2 | 2003        |
| IEC 60807-3        | -           | Rectangular connectors for frequencies below -<br>3 MHz -<br>Part 3: Detail specification for a range of<br>connectors with trapezoidal shaped metal<br>shells and round contacts - Removable crimp<br>types with closed crimp barrels, rear<br>insertion/rear extraction | -            | -           |
| IEC 60874-10-1     | -           | Connectors for optical fibres and cables -<br>Part 10-1: Detail specification for fibre optic<br>connector type BFOC/2,5 terminated to<br>multimode fibre type A1                                                                                                         | -            | -           |
| IEC 61000-4-2      | -           | Electromagnetic compatibility (EMC) -<br>Part 4-2: Testing and measurement<br>techniques - Electrostatic discharge immunity<br>test                                                                                                                                       | EN 61000-4-2 | -           |
| IEC 61000-4-3      | -           | Electromagnetic compatibility (EMC) -<br>Part 4-3: Testing and measurement<br>techniques - Radiated, radio-frequency,<br>electromagnetic field immunity test                                                                                                              | EN 61000-4-3 | -           |
| IEC 61000-4-4      | -           | Electromagnetic compatibility (EMC) -<br>Part 4-4: Testing and measurement<br>techniques - Electrical fast transient/burst<br>immunity test                                                                                                                               | EN 61000-4-4 | -           |
| IEC 61131-2        | -           | Programmable controllers -<br>Part 2: Equipment requirements and tests                                                                                                                                                                                                    | EN 61131-2   | -           |
| IEC 61156-1        | 2007        | Multicore and symmetrical pair/quad cables<br>for digital communications -<br>Part 1: Generic specification                                                                                                                                                               | -            | -           |
| IEC 61158-4-2      | -           | Industrial communication networks -<br>Fieldbus specifications -<br>Part 4-2: Data-link layer protocol<br>specification - Type 2 elements                                                                                                                                 | EN 61158-4-2 | -           |
| IEC 61158-4-3      | 2010        | Industrial communication networks -<br>Fieldbus specifications -<br>Part 4-3: Data-link layer protocol<br>specification - Type 3 elements                                                                                                                                 | -            | -           |
| IEC 61169-8        | 2007        | Radio-frequency connectors -<br>Part 8: Sectional specification - RF coaxial<br>connectors with inner diameter of outer<br>conductor 6,5 mm (0,256 in) with bayonet lock<br>- Characteristics impedance 50 ohms (type<br>BNC)                                             | EN 61169-8   | 2007        |
| IEC 61754-2        | -           | Fibre optic connector interfaces -<br>Part 2: Type BFOC/2,5 connector family                                                                                                                                                                                              | EN 61754-2   | -           |

| <u>Publication</u> | <u>Year</u> | <u>Title</u>                                                                                                                                                                                                                                                                                       | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------|
| IEC 61754-13       | -           | Fibre optic connector interfaces -<br>Part 13: Type FC-PC connector                                                                                                                                                                                                                                | EN 61754-13  | -           |
| IEC 61754-22       | -           | Fibre optic connector interfaces -<br>Part 22: Type F-SMA connector family                                                                                                                                                                                                                         | EN 61754-22  | -           |
| ISO/IEC 7498       | Series      | Information technology - Open Systems<br>Interconnection - Basic Reference Model: The<br>Basic Model                                                                                                                                                                                               | -            | -           |
| ISO/IEC 8482       | -           | Information technology -<br>Telecommunications and information<br>exchange between systems - Twisted pair<br>multipoint interconnections                                                                                                                                                           | -            | -           |
| ISO/IEC 8802-3     | -           | Information technology - Telecommunications -<br>and information exchange between systems -<br>Local and metropolitan area networks -<br>Specific requirements -<br>Part 3: Carrier sense multiple access with<br>collision detection (CSMA/CD) access method<br>and physical layer specifications | -            | -           |
| ISO/IEC 9314-1     | -           | Information Processing Systems - Fibre<br>distributed data interface (FDDI) -<br>Part 1: Token Ring physical layer protocol<br>(PHY)                                                                                                                                                               | -            | -           |
| ISO/IEC 10731      | -           | Information technology - Open Systems<br>Interconnection - Basic reference model -<br>Conventions for the definition of OSI services                                                                                                                                                               | -            | -           |
| ANSI TIA/EIA-232-F | -           | Interface between data terminal equipment<br>and data circuit - Terminating equipment<br>employing serial binary data interchange                                                                                                                                                                  | -            | -           |
| ANSI TIA/EIA-422-B | -           | Electrical characteristics of balanced voltage<br>digital interface circuits                                                                                                                                                                                                                       | -            | -           |
| ANSI TIA/EIA-485-A | -           | Electrical Characteristics of Generators and<br>Receivers for Use in Balanced Digital<br>Multipoint Systems                                                                                                                                                                                        | -            | -           |
| ANSI TIA/EIA-644-A | -           | Electrical Characteristics of Low Voltage<br>Differential Signaling (LVDS) Interface Circuits                                                                                                                                                                                                      | -            | -           |

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## 0 Introduction

### 0.1 General

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.

### 0.2 Physical layer overview

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 Ph-entities at the time of communication.

The physical layer receives data units from the data-link Layer, encodes them, if necessary by adding communications framing information, and transmits the resulting physical signals to the transmission medium at one node. Signals are then received at one or more other node(s), decoded, if necessary by removing the communications framing information, before the data units are passed to the data-link Layer of the receiving device.

### 0.3 Document overview

This standard comprises physical layer specifications corresponding to many of the different DL-Layer protocol Types specified in IEC 61158-4-1 to IEC 61158-4-18.

NOTE 1 The protocol Type numbers used are consistent throughout the IEC 61158 series.

NOTE 2 Specifications for Types 1, 2, 3, 4, 8, 16 and 18 are included. Type 7 uses Type 1 specifications. The other Types do not use any of the specifications given in this standard.

NOTE 3 For ease of reference, Type numbers are given in clause names. This means that the specification given therein applies to this Type, but does not exclude its use for other Types.

NOTE 4 It is up to the user of this standard to select inter-operating sets of provisions. Refer to the IEC 61784 series for standardized communication profiles based on the IEC 61158 series.

A general model of the physical layer is shown in Figure 1.

The common characteristics for all variants and types are as follows:

- digital data transmission;
- no separate clock transmission;
- either half-duplex communication (bi-directional but in only one direction at a time) or full-duplex communication.