BS EN IEC 61158-4-2:2019

BSI Standards Publication

Industrial communication networks - Fieldbus specifications

Part 4-2: Data-link layer protocol specification - Type 2 elements

bsi.

National foreword

This British Standard is the UK implementation of EN IEC 61158-4-2:2019. It is identical to IEC 61158-4-2:2019. It supersedes BS EN 61158-4-2:2014, which will be withdrawn on 23 May 2022.

The UK participation in its preparation was entrusted to Technical Committee GEL/65/3, Industrial communications: process measurement and control, including fieldbus.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 65C/946/FDIS, future edition 4 of IEC 61158-4-2, 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 IEC 61158-4-2:2019.

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) 2020-02-23
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-05-23

This document supersedes EN 61158-4-2:2014.

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

Endorsement notice

The text of the International Standard IEC 61158-4-2:2019 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 61158-1:2019 NOTE Harmonized as EN IEC 61158-1:2019 (not modified)
IEC 61158-2:2014 NOTE Harmonized as EN 61158-2:2014 (not modified)
IEC 61784-1:2019 NOTE Harmonized as EN IEC 61784-1:2019 (not modified)
IEC 61784-2:2019 NOTE Harmonized as EN IEC 61784-2:2019 (not modified)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

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FOREWORD

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Attention is drawn to the fact that the use of the associated protocol type is restricted by its 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 layer protocol type to be used with other layer protocols of the same type, or in other type combinations explicitly authorized by its intellectual-property-right holders.

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

International Standard IEC 61158-4-2 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This fourth edition cancels and replaces the third edition published in 2014. This edition constitutes a technical revision.

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

- clarifications of ControlNet object in 7.2;
- extensions and clarifications of TCP/IP interface object in 7.5;
- extensions and clarifications of Ethernet Link object in 7.6;
- clarifications of DeviceNet object in 7.7;
- extensions and clarifications of CCO object in 7.8;
- extensions and clarifications of DLR object in 7.9;
- extensions and clarifications of Port object in 7.11;
- addition of PRP/HSR Protocol and PRP/HSR Nodes Table objects in 7.12 and 7.13;
- extensions and clarifications of DLR protocol in Clause 10;
- addition of PRP/HSR protocol mapping in Clause 11;
- update of indicator behaviour in A.2.2 and A.2.4;
- miscellaneous editorial corrections.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
65C/946/FDIS	65C/955/RVD

Full information on the voting for the approval of this International 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.

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.

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 data-link protocol provides the data-link service by making use of the services available from the physical layer. The primary aim of this document is to provide a set of rules for communication expressed in terms of the procedures to be carried out by peer data-link entities (DLEs) 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:

a) as a guide for implementers and designers;

b) for use in the testing and procurement of equipment;

c) as part of an agreement for the admittance of systems into the open systems environment;

d) as a refinement to the understanding of time-critical communications within OSI.

This document is concerned, in particular, with the communication and interworking of sensors, effectors and other automation devices. By using this document together with other standards positioned within the OSI or fieldbus reference models, otherwise incompatible systems may work together in any combination.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents given in several subclauses as indicated in the table below. These patents are held by their respective inventors under license to ODVA, Inc:

US 5,400,331	[ODVA]	Communication network interface with screeners for incoming messages	Subclause 3.4, Clauses 4 to 9
US 5,471,461	[ODVA]	Digital communication network with a moderator station election process	
US 5,491,531	[ODVA]	Media access controller with a shared class message delivery capability	
US 5,493,571	[ODVA]	Apparatus and method for digital communications with improved delimiter detection	
US 5,537,549	[ODVA]	Communication network with time coordinated station activity by time slot and periodic interval number	
US 5,553,095	[ODVA]	Method and apparatus for exchanging different classes of data during different time intervals	
US 8,244,838	[ODVA]	Industrial controller employing the network ring topology	Clause 10

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 4-2: Data-link layer protocol specification – Type 2 elements

1 Scope

1.1 General

The data-link layer provides basic time-critical messaging communications between devices in an automation environment.

This protocol provides communication opportunities to all participating data-link entities, sequentially and in a cyclic synchronous manner. Foreground scheduled access is available for time-critical activities together with background unscheduled access for less critical activities.

Deterministic and synchronized transfers can be provided at cyclic intervals up to 1 ms and device separations of 25 km. This performance is adjustable dynamically and on-line by re-configuring the parameters of the local link whilst normal operation continues. By similar means, DL connections and new devices may be added or removed during normal operation.

This protocol provides means to maintain clock synchronization across an extended link with a precision better than 10 μs.

This protocol optimizes each access opportunity by concatenating multiple DLSDUs and associated DLPCI into a single DLPDU, thereby improving data transfer efficiency for data-link entities that actively source multiple streams of data.

The maximum system size is an unlimited number of links of 99 nodes, each with 255 DLSAP-addresses. Each link has a maximum of 2^{24} related peer and publisher DLCEPs.

1.2 Specifications

This document specifies

a) procedures for the timely transfer of data and control information from one data-link user entity to a peer user entity, and among the data-link entities forming the distributed data-link service provider;

b) the structure of the fieldbus DLPDUs used for the transfer of data and control information by the protocol of this document, and their representation as physical interface data units.

1.3 Procedures

The procedures are defined in terms of

a) the interactions between peer DL-entities (DLEs) through the exchange of fieldbus DLPDUs;

b) the interactions between a DL-service (DLS) provider and a DLS-user in the same system through the exchange of DLS primitives;

c) the interactions between a DLS-provider and a Ph-service provider in the same system through the exchange of Ph-service primitives.