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Electronic railway equipment - Train communication network - Part 1: TCN - Train Communication Network general architecture (IEC 61375-1:2012)

Elektronische Betriebsmittel für Bahnen – Zug-Kommunikations-Netzwerk (TCN) - Teil 1: Allgemeiner Aufbau (IEC 61375-1:2012)

Matériel électronique ferroviaire - Réseau embarqué de train (TCN) - Partie 1: Architecture générale (CEI 61375-1:2012)

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Elektronische Betriebsmittel für Bahnen - Zug-Kommunikations-Netzwerk (TCN) - Teil 1: Allgemeiner Aufbau (IEC 61375-1:2012)

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CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

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Foreword

The text of document 9/1641/FDIS, future edition 3 of IEC 61375-1, prepared by IEC/TC 9 "Electrical equipment and systems for railways" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61375-1:2012.

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)	2013-04-26
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2015-07-26

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, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 61375-1:2012 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 61375-2-1	NOTE	Harmonized as EN 61375-2-1.
IEC 61375-3-1	NOTE	Harmonized as EN 61375-3-1.

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

Publication	Year	Title	EN/HD	Year
ISO/IEC 7498-1	-	Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model	-	-
ISO/IEC 8824-1	2002	Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation	-	-
ISO/IEC 9646-1	1994	Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts	-	-
ISO/IEC 19501	2005	Information technology - Open Distributed Processing - Unified Modeling Language (UML)	-	-
UIC CODE 556	-	Information transmission in the train (train-bus)	-	-

Annex ZZ
(informative)

Coverage of Essential Requirements of EU Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers all relevant essential requirements as given in Annex III of the EU Directive 2008/57/EC.

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive concerned.

WARNING: Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Electronic railway equipment – Train communication network (TCN) – Part 1: General architecture

Matériel électronique ferroviaire – Réseau embarqué de train (TCN) – Partie 1: Architecture générale

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRONIC RAILWAY EQUIPMENT – TRAIN COMMUNICATION NETWORK (TCN) –

Part 1: General architecture

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.
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International Standard IEC 61375-1 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This third edition cancels the second edition published in 2007 and constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

- new structuring of standard parts. The content of the previous edition has now been moved to IEC 61375-2-1 and IEC 61375-3-1.
- this part of the standard describes now the general architecture of the onboard train communication network.

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

FDIS	Report on voting
9/1641/FDIS	9/1665/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 the ISO/IEC Directives, Part 2.

A list of all parts of IEC 61375 series, under the general title *Electronic railway equipment – Train communication network (TCN)*, can be found on the IEC website.

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

IEC 61375-1 defines the general architecture of the Train Communication Network (TCN) so as to achieve compatibility between consist networks defined by this part of IEC 61375 and train backbones defined by this part of IEC 61375.

The TCN has a hierarchical structure with two levels of networks, a train backbone and a consist network:

a) for interconnecting vehicles in close or open trains, this part of IEC 61375 specifies train backbones with different characteristics;

b) for connecting standard on-board equipment, this part of IEC 61375 specifies consist networks with different characteristics.

The general architecture of the TCN, which is defined in this part of the standard, shall

c) establish the rules for interconnecting consist networks with train backbones, as
   - identifying the interfaces;
   - defining the principles of how train topology changes can be discovered;
   - defining the basic communication services provided by train backbones to be used by consist networks;

d) establish basic rules for the train backbone and for the consist network;

e) establish rules for communalities in operation, as:
   - patterns for the communication between users;
   - addressing principles;
   - data classes to be supported.

ELECTRONIC RAILWAY EQUIPMENT – TRAIN COMMUNICATION NETWORK (TCN) –

Part 1: General architecture

1 Scope

This part of IEC 61375 applies to the architecture of data communication systems in open trains, i.e. it covers the architecture of a communication system for the data communication between vehicles of the said open trains, the data communication within the vehicles and the data communication from train to the ground.

The applicability of this part of IEC 61375 to the train network technologies allows for interoperability of individual vehicles within open trains in international traffic. The data communication systems inside vehicles are given as recommended solutions to cope with the said TCN. In any case, proof of compatibility between a proposed train backbone and a proposed consist network will have to be brought by the supplier.

This part of IEC 61375 may be additionally applicable to closed trains and multiple unit trains when so agreed between purchaser and supplier.

NOTE 1 For a definition of open trains, multiple unit trains and closed trains, see Clause 3.

NOTE 2 Road vehicles such as buses and trolley buses are not considered in this part of IEC 61375.

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.

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

ISO/IEC 8824-1:2002, *Information technology – Abstract Syntax Notation One (ASN.1): specification of basic notation*

ISO/IEC 9646-1:1994, *Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 1: General concepts*

ISO/IEC 19501:2005, *Information technology – Open Distributed Processing – Unified Modeling Language (UML) Version 1.4.2*

UIC CODE 556, *Information transmission in the train (train-bus)*

3 Terms, definitions, abbreviated terms, acronyms, and conventions

3.1 Terms and definitions

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

3.1.1
active train backbone node
train backbone node receiving a sequence number during inauguration and forwarding user data packets between consist network and train backbone

3.1.2
application layer
upper layer in the OSI model, interfacing directly to the Application

3.1.3
application layer interface
definition of the services offered by the application layer

3.1.4
application process
an element within a real open system which performs the information processing for a particular application

3.1.5
bridge
device which stores and forwards frames from one bus to another on the base of their link layer addresses

3.1.6
broadcast
nearly simultaneous transmission of the same information to several destinations. Broadcast in the TCN is not considered reliable, i.e. some destinations may receive the information and others not

3.1.7
bus
communication medium which broadcasts the same information to all attached participants at nearly the same time, allowing all devices to obtain the same sight of its state, at least for the purpose of arbitration

3.1.8
closed train
train composed of one or a set of consists, where the composition does not change during normal operation, for instance metro, sub-urban train, or high speed train units

EXAMPLE Consists are coupled in a workshop to establish a closed train for operation.

3.1.9
communication devices
devices connected to consist network or train backbone with the ability to transport, source or sink data

3.1.10
composition
number and characteristics of the vehicles forming a train

3.1.11
configuration
definition of the topology of a network, the devices connected to it, their capabilities and the traffic they produce; by extension, the operation of loading the devices with the configuration information before going to regular operation