

STN	Elektronické železničné zariadenia Vlaková komunikačná sieť (TCN) Časť 1: Všeobecná architektúra	STN EN IEC 61375-1 34 2675
------------	---	--

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

Táto norma obsahuje anglickú verziu európskej normy.

This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 06/26

Obsahuje: EN IEC 61375-1:2026, IEC 61375-1:2026

Oznámením tejto normy sa od 30.04.2029 ruší

STN EN 61375-1 (34 2675) z februára 2013

142742



Úrad pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky, 2026

Slovenská technická norma a technická normalizačná informácia je chránená zákonom č. 60/2018 Z. z. o technickej normalizácii v znení neskorších predpisov.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN IEC 61375-1

April 2026

ICS 45.060.01

Supersedes EN 61375-1:2012

English Version

**Electronic railway equipment - Train communication network
(TCN) - Part 1: General architecture
(IEC 61375-1:2026)**

Matériel électronique ferroviaire - Réseau embarqué de
train (TCN) - Partie 1: Architecture générale
(IEC 61375-1:2026)

Elektronische Betriebsmittel für Bahnen - Zug-
Kommunikations-Netzwerk (TCN) - Teil 1: Allgemeiner
Aufbau
(IEC 61375-1:2026)

This European Standard was approved by CENELEC on 2026-04-09. 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



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

EN IEC 61375-1:2026 (E)**European foreword**

The text of document 9/3252/FDIS, future edition 4 of IEC 61375-1, prepared by TC 9 "Electrical equipment and systems for railways" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61375-1:2026.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2027-04-30 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2029-04-30 document have to be withdrawn

This document supersedes EN 61375-1:2012 and all of its amendments and corrigenda (if any).

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.

This document has been prepared under a standardization request addressed to CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 61375-1:2026 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 standard indicated:

IEC 62580 (series)	NOTE	Approved as EN 62580 (series)
IEC 62443 (series)	NOTE	Approved as EN IEC 62443-4-2:2019/AC:2022-09 (series)



IEC 61375-1

Edition 4.0 2026-03

INTERNATIONAL STANDARD

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

**THIS PUBLICATION IS COPYRIGHT PROTECTED****Copyright © 2026 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search -

webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Warning! Make sure that you obtained this publication from an authorized distributor.

IEC 61375-1:2026 © IEC 2026

CONTENTS

FOREWORD	5
INTRODUCTION	7
1 Scope	8
2 Normative references	8
3 Terms, definitions, abbreviated terms, acronyms, and conventions	8
3.1 Terms and definitions	8
3.2 Abbreviations and acronyms	16
3.3 Conventions	17
3.3.1 Base of numeric values	17
3.3.2 Naming conventions	17
3.3.3 State diagram conventions	17
4 Basic architecture	17
4.1 General	17
4.2 Technology and components	18
4.2.1 Technology classes	18
4.2.2 Component types	18
4.3 Hierarchical structure	18
4.3.1 Network levels	18
4.3.2 Train backbone level	19
4.3.3 Consist network level	19
4.3.4 Interface between train backbone and consist network	20
4.3.5 End devices connected to train backbone	21
4.4 Network configurations	21
4.5 Train to ground connection (option)	22
5 Train backbone	23
5.1 General	23
5.2 Train backbone topology	23
5.2.1 General	23
5.2.2 Train backbone based on bus technology	23
5.2.3 Train backbone based on switched technology	24
5.2.4 Train Backbone based on wireless technology	25
5.3 Train compositions	27
5.4 Train backbone node numbering	27
5.5 Train directions	28
5.5.1 Vehicle	28
5.5.2 Consist	28
5.5.3 Closed train	29
5.5.4 Train	29
5.6 Train inauguration	31
5.6.1 Objectives	31
5.6.2 Node sequence and orientation discovery	31
5.6.3 Train network directory	31
5.6.4 Train directory	31
5.6.5 Train inauguration control	34
5.6.6 Node states	35
5.6.7 Node roles	38

IEC 61375-1:2026 © IEC 2026

5.6.8	Performance	38
5.6.9	Independent consist orientation check (Option)	38
6	Consist network	39
6.1	General	39
6.2	Scope of standardization	39
6.3	Consist network topology	40
6.3.1	Consist network based on bus technology (MVB, CCN)	40
6.3.2	Consist network based on switched technology (ECN)	41
6.3.3	Consist network based on wireless technology (WLCN)	43
6.3.4	Sub-networks	43
6.3.5	Heterogeneous consist network	44
6.4	Gateway	44
6.4.1	General	44
6.4.2	Functional description	45
6.4.3	Application layer gateway	45
6.4.4	Gateway implemented by a router	45
6.4.5	Gateway implemented by a bridge	46
7	On-board data communication	46
7.1	General	46
7.2	Communication patterns	46
7.2.1	Purpose	46
7.2.2	Definitions	47
7.2.3	Push pattern	47
7.2.4	Pull pattern	48
7.2.5	Subscription pattern	50
7.3	Addressing	50
7.3.1	General	50
7.3.2	Network layer addressing	50
7.3.3	Application layer addressing	52
7.4	Availability of data communication	53
7.5	Data classes	53
7.5.1	General	53
7.5.2	Service parameters	53
7.5.3	TCN data class definition	54
7.6	Communication profile	55
7.7	Application profile	56
8	Cybersecurity	56
8.1	General	56
8.2	System under consideration	56
8.3	Lifecycle	57
8.3.1	General	57
8.3.2	Legacy systems	57
8.3.3	Protocol design	57
8.4	Guidelines	57
Annex A (informative)	High-level train architecture	59
A.1	General	59
A.2	Architectural realms	59
A.3	On-board network structures	61

IEC 61375-1:2026 © IEC 2026

Bibliography.....	63
Figure 1 – Train backbone and consist network	18
Figure 2 – Example of consist with 2 consist networks	19
Figure 3 – End device connected to the train backbone (example)	21
Figure 4 – Communication between train and ground (example)	22
Figure 5 – Interfaces between consists	23
Figure 6 – Train backbone bus topology	24
Figure 7 – Train backbone switched topology (aggregated transmission media).....	24
Figure 8 – Train backbone switched topology (segregated transmission media).....	25
Figure 9 – Wireless train backbone mesh topology	25
Figure 10 – Wireless train backbone base station topology	26
Figure 11 – Wireless train backbone mesh topology for redundancy	26
Figure 12 – Wireless train backbone base station topology for redundancy	27
Figure 13 – Directions and orientation in a vehicle	28
Figure 14 – Directions and orientations in a consist (example).....	29
Figure 15 – Directions and orientations in a closed train	29
Figure 16 – Directions and orientations in train (TCN directions).....	30
Figure 17 – Structure of train directory (example)	32
Figure 18 – Train inauguration block diagram	36
Figure 19 – Train inauguration state chart.....	37
Figure 20 – Independent orientation check with BEACON telegrams.....	38
Figure 21 – Consist network standard interfaces.....	40
Figure 22 – Consist network (bus technology).....	40
Figure 23 – Consist switches	41
Figure 24 – Examples of consist network topologies (switched technology)	42
Figure 25 – End device connected to two consist switches	42
Figure 26 – Wireless consist network	43
Figure 27 – Sub-networks in a consist network	44
Figure 28 – Implementation example for two vehicle busses	44
Figure 29 – Example of heterogeneous train control network architecture	45
Figure 30 – Point to point communication pattern (push).....	47
Figure 31 – Point to multi-point communication pattern (push)	48
Figure 32 – Point to point communication pattern (pull).....	49
Figure 33 – Point to multi-point communication pattern (pull)	49
Figure 34 – Subscription communication pattern	50
Figure A.1 – Example of architectural realm structure	60
Figure A.2 – Examples for network segregation of on-board physical networks	61
Table 1 – Train composition changes	27
Table 2 – Train specific parameters (example).....	33
Table 3 – Consist specific parameters (example)	33
Table 4 – Vehicle specific parameters (example)	33

IEC 61375-1:2026 © IEC 2026

Table 5 – Device specific parameters (example)	34
Table 6 – Point to point (Push).....	48
Table 7 – Point to multi-point (Push)	48
Table 8 – Point to point (Pull)	49
Table 9 – Point to multi-point (Pull)	50
Table 10 – Service parameters	53
Table 11 – Principal data classes.....	55

IEC 61375-1:2026 © IEC 2026

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.
- 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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

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

This fourth edition cancels and replaces the third edition published in 2012. This edition constitutes a technical revision.

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

- a) Extension of train backbone topologies: aggregated and segregated topology;
- b) Added independent consist orientation check with segregated train backbone topology;
- c) Introduction of wireless technologies: wireless train backbone and wireless consist network;
- d) Possibility of virtual networks;
- e) Definition of data classes and protocol requirements suitable for the OMTS domain;
- f) New clause about cybersecurity in train communication networks.

IEC 61375-1:2026 © IEC 2026

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

Draft	Report on voting
9/3252/FDIS	9/3293/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IEC 61375-1:2026 © IEC 2026

INTRODUCTION

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

The creation of this fourth edition of the standard has been motivated by advances in technology, namely in the fields of Ethernet communication, wireless communication, and cybersecurity, which made it necessary to adapt or to extend some sections of the TCN general architecture. These changes will then further on be reflected in the detailed technical specifications given in subsequent parts of the IEC 61375 series.

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

- a) for interconnecting vehicles in closed or open trains, this document specifies train backbones with different characteristics.
- b) for connecting standard on-board equipment, this document specifies consist networks with different characteristics.

The general architecture of the TCN, which is defined in this document, does

- c) establish the rules for interconnecting consist networks with train backbones, as
 - 1) identifying the interfaces;
 - 2) defining the principles of how train topology changes can be discovered;
 - 3) 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 commonalities in operation, as:
 - 1) patterns for the communication between users;
 - 2) addressing principles;
 - 3) data classes to be supported;
- f) establish rules to support cybersecurity of the TCN.

IEC 61375-1:2026 © IEC 2026

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 might be additionally applicable to closed trains and multiple unit trains when so agreed between purchaser and supplier.

NOTE 1 For definitions 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

There are no normative references in this document.

koniec náhľadu – text ďalej pokračuje v platenej verzii STN