



SLOVENSKI STANDARD
oSIST prEN IEC 61375-1:2025
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**Železniške elektronske naprave - Komunikacijsko omrežje vlaka (TCN) TCN -
Splošna arhitektura**

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

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

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

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The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

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TITLE:

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

PROPOSED STABILITY DATE: 2027

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRONIC RAILWAY EQUIPMENT – TRAIN COMMUNICATION NETWORK (TCN) –

Part 1: General architecture

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

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

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

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

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

FDIS	Report on voting
9/XXX/FDIS	9/XXXX/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.

1 INTRODUCTION

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

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

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

12 a) for interconnecting vehicles in closed or open trains, this part of IEC 61375 specifies train
13 backbones with different characteristics.

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

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

17 c) establish the rules for interconnecting consist networks with train backbones, as

18 • identifying the interfaces;

19 • defining the principles of how train topology changes can be discovered;

20 • defining the basic communication services provided by train backbones to be used by
21 consist networks;

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

23 e) establish rules for communalities in operation, as:

24 • patterns for the communication between users;

25 • addressing principles;

26 • data classes to be supported

27 f) establish rules to support cybersecurity of the TCN

28

ELECTRONIC RAILWAY EQUIPMENT – TRAIN COMMUNICATION NETWORK (TCN) –

Part 1: General architecture

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36 1 Scope

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

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

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

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

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

50 2 Normative references

51 There are no normative references in this document.

52 3 Terms, definitions, abbreviated terms, acronyms, and conventions

53 3.1 Terms and definitions

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

55 ISO and IEC maintain terminology databases for use in standardization at the following
56 addresses:

- 57 • ISO Online browsing platform: available at <https://www.iso.org/obp>
- 58 • IEC Electropedia: available at <http://www.electropedia.org>

59 3.1.1

60 **active train backbone node**

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

63 3.1.2

64 **application layer**

65 upper layer in the OSI model, interfacing directly to the application

66 [SOURCE: IEC 60050-811:2017, 811-37-03]

3.1.3**application process**

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

[SOURCE: IEC 60050-811:2017, 811-37-05]

3.1.4**bridge <in a train communication network>**

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

[SOURCE: IEC 60050-811:2017, 811-37-09]

3.1.5**broadcast**

nearly simultaneous transmission of the same information to several destinations

Note 1 to entry: broadcast in the TCN is not considered reliable, i.e., some destinations can receive the information and others not.

[SOURCE: IEC 60050-811:2017, 811-37-10]

3.1.6**bus <in a train communication network>**

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

[SOURCE: IEC 60050-871:2018, 871-05-02]

3.1.7**closed train**

train composed of one or a set of consists, where the train composition does not change during normal operation

EXAMPLE Metro, sub-urban train, or high-speed train unit.

Note 1 to entry: Consists are coupled in a workshop to establish a closed train for operation.

[SOURCE: IEC 60050-811:2017, 811-37-17]

3.1.8**communication device**

device connected to the consist network or train backbone with the ability to transport, source or sink data

[SOURCE: IEC 60050-811:2017, 811-37-18]

3.1.9**consist**

single vehicle or a group of vehicles which are not separated during normal operation

Note 1 to entry: A consist can contain no, one or several consist networks

[SOURCE: IEC 60050-811:2017, 811-37-20]

3.1.10**consist network**

communication network interconnecting communication devices in one consist

Note 1 to entry: Consist networks do not spread beyond consist boundaries.

110 “[SOURCE: IEC 60050-811:2017, 811-37-21, modified – The definition has been replaced with
111 “communication network interconnecting communication devices in one consist”]

112 **3.1.11**

113 **consist network address**

114 network address, which does not change after train inauguration and which is used to address
115 communication device in the own consist network

116 **3.1.12**

117 **consist sequence number**

118 sequence number of the consist in the train as obtained during train inauguration

119 **3.1.13**

120 **consist switch**

121 network component used in consist network based on switched technology

122 [SOURCE: IEC 60050-811:2017]

123 **3.1.14**

124 **cybersecurity <in railway application>**

125 set of activities and measures taken with the objective to prevent, detect, react to unauthorized
126 access or cyberattack which could lead to an accident, an unsafe situation, or railway
127 application performance degradation

128 [SOURCE: EN TS 50701:2017]

129 **3.1.15**

130 **end device**

131 unit connected to one consist network or to one set of consist networks prepared for redundancy
132 reasons

133 [SOURCE: IEC 60050-811:2017, 811-37-33]

134 **3.1.16**

135 **end node**

136 node which terminates the train backbone

137 [SOURCE: IEC 60050-811:2017, 811-37-34]

138 **3.1.17**

139 **essential function**

140 function or capability that is required to maintain health, safety, the environment and availability
141 for the equipment under control

142 Note 1 to entry: Essential functions include, but are not limited to, the safety instrumented function (SIF), the control
143 function and the ability of the operator to view and manipulate the equipment under control. The loss of essential
144 functions is commonly termed loss of protection, loss of control and loss of view respectively. In some industries
145 additional functions such as history may be considered essential.

146 [SOURCE: IEC 62443-4-2:2019, 3.1.20]

147 **3.1.18**

148 **function, <in a train communication network>**

149 application process which exchanges messages with another application process

150 **3.1.19**

151 **gateway, <in a train communication network>**

152 connection between different busses at the application layer requiring application-dependent data
153 analysis and protocol conversion

154 [SOURCE: IEC 60050-811:2017, 811-37-44]

- 155 **3.1.20**
156 **group address**
157 address of a multicast group to which a device belongs
- 158 [SOURCE: IEC 60050-811:2017, 811-37-45]
- 159 **3.1.21**
160 **integrity, <in a train communication network>**
161 property of a system to recognize and to reject wrong data in case of malfunction of its parts
- 162 **3.1.22**
163 **intermediate node**
164 node which establishes continuity between two bus sections connected to it, but does not
165 terminate them
- 166 [SOURCE: IEC 60050-811:2017, 811-37-49]
- 167 **3.1.23**
168 **linear topology**
169 topology where the nodes are connected in series, with two nodes each connected to only one
170 other node and all others each connected to two other nodes (i.e., connected in the shape of a
171 line)
- 172 [SOURCE: IEC 60050-811:2017, 811-37-51]
- 173 **3.1.24**
174 **local area network, <in a train communication network>**
175 part of a network characterized by a common medium access and address space
- 176 [SOURCE: IEC 60050-811:2017, 811-37-60]
- 177 **3.1.25**
178 **medium access control, <in a train communication network>**
179 sublayer of the link layer, which controls the access to the medium (arbitration, mastership
180 transfer, polling)
- 181 **3.1.26**
182 **medium, <in a train communication network>**
183 physical carrier of the signal: electrical wires, optical fibers, etc.
- 184 **3.1.27**
185 **message, <in a train communication network>**
186 information which is transmitted in one or several packets from a sender to one or more
187 receivers
- 188 “[SOURCE: IEC 60050-821:2017, 821-37-29]”
- 189 **3.1.28**
190 **multicast**
191 transmission of the same message to a group of receivers, identified by their group address
- 192 Note 1 to entry: the word "multicast" is used even if the group includes all receivers
193 [SOURCE: IEC 60050-811:2017, 811-37-66]
- 194 **3.1.29**
195 **multimedia data**
196 data used for onboard multimedia and telematic services (OMTS), like video/audio streams or
197 file transfer