

<b>STN</b>	<b>Elektronické železničné zariadenia. Vlaková komunikačná sieť (TCN). Časť 2-3: Komunikačný profil TCN.</b>	<b>STN EN 61375-2-3</b>  34 2675
------------	--	--

Electronic railway equipment - Train communication network (TCN) - Part 2-3: TCN communication profile

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. 02/16

Obsahuje: EN 61375-2-3:2015, IEC 61375-2-3:2015

**122355**

---

Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, 2016  
Podľa zákona č. 264/1999 Z. z. v znení neskorších predpisov sa môžu slovenské technické normy rozmnožovať a rozširovať iba so súhlasom Úradu pre normalizáciu, metrológiu a skúšobníctvo SR.



EUROPEAN STANDARD

**EN 61375-2-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2015

---

ICS 45.060

English Version

**Electronic railway equipment - Train communication network  
(TCN) - Part 2-3: TCN communication profile  
(IEC 61375-2-3:2015)**

Matériel électronique ferroviaire - Réseau embarqué de  
train (TCN) - Partie 2-3: Profil de communication TCN  
(IEC 61375-2-3:2015)

Elektronische Betriebsmittel für Bahnen - Zug-  
Kommunikations-Netzwerk (TCN) - Teil 2-3: TCN  
Kommunikationsprofil  
(IEC 61375-2-3:2015)

This European Standard was approved by CENELEC on 2015-08-13. 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

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

## European foreword

The text of document 9/2029/FDIS, future edition 1 of IEC 61375-2-3, 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 61375-2-3:2015.

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) 2016-05-13
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-08-13

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.

## Endorsement notice

The text of the International Standard IEC 61375-2-3:2015 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 61131-3:2013	NOTE	Harmonized as EN 61131-3:2013 (not modified).
IEC 61375-3-4	NOTE	Harmonized as EN 61375-3-4.
IEC 61508-1:2010	NOTE	Harmonized as EN 61508-1:2010 (not modified).
IEC 61784-3-3:2010	NOTE	Harmonized as EN 61784-3-3:2010 (not modified).
IEC 62580	NOTE	Harmonized in EN 62580 series.
ISO/IEC 7498-1	NOTE	Harmonized as EN ISO/IEC 7498-1.

## 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 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61375-1	-	Electronic railway equipment - Train communication network (TCN) - Part 1: General architecture	EN 61375-1	-
IEC 61375-2-1	-	Electronic railway equipment - Train communication network (TCN) - Part 2-1: Wire Train Bus (WTB)	EN 61375-2-1	-
IEC 61375-2-4	- <sup>1)</sup>	Electronic railway equipment - Train communication network (TCN) - Part 2-4: TCN Application profile	-	-
IEC 61375-2-5	-	Electronic railway equipment - Train communication network (TCN) - Part 2-5: Ethernet train backbone	EN 61375-2-5	-
IEC 62280	-	Railway applications - Communication, signalling and processing systems - Safety related communication in transmission systems	-	-
ISO/IEC 9646-6	1994	Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 6: Protocol profile test specification	-	-
ISO/IEC 9646-7	1995	Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements	-	-

---

1) At draft stage.

**EN 61375-2-3:2015**

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO/IEC 17011	2004	Conformity assessment - General requirements for accreditation bodies accrediting conformity assessment bodies	EN ISO/IEC 17011	2004
ISO/IEC 17025	2005	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	2005



# INTERNATIONAL STANDARD



---

**Electronic railway equipment – Train communication network (TCN) –  
Part 2-3: TCN communication profile**





**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2015 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 Central Office  
 3, rue de Varembe  
 CH-1211 Geneva 20  
 Switzerland

Tel.: +41 22 919 02 11  
 Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://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 corrigenda or an amendment might have been published.

**IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)**

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

**IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)**

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](http://webstore.iec.ch/justpublished)**

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

**Electropedia - [www.electropedia.org](http://www.electropedia.org)**

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

**IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)**

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

**IEC Customer Service Centre - [webstore.iec.ch/csc](http://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: [csc@iec.ch](mailto:csc@iec.ch).





# INTERNATIONAL STANDARD



---

## Electronic railway equipment – Train communication network (TCN) – Part 2-3: TCN communication profile

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

ICS 45.060

ISBN 978-2-8322-2775-6

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

## CONTENTS

FOREWORD.....	13
INTRODUCTION.....	15
1 Scope.....	16
2 Normative references.....	17
3 Terms, definitions, abbreviations, acronyms, and conventions.....	18
3.1 Terms and definitions.....	18
3.2 Abbreviations and acronyms.....	26
3.3 Conventions.....	28
3.3.1 Base of numeric values.....	28
3.3.2 Character strings and citations.....	28
3.3.3 Naming conventions.....	29
3.3.4 Diagram conventions.....	29
3.3.5 Annotation of data structures.....	29
4 Architecture.....	30
4.1 General.....	30
4.2 Physical train architecture (system breakdown).....	31
4.2.1 General.....	31
4.2.2 Train network architectures.....	31
4.2.3 Closed Trains.....	34
4.2.4 Directions.....	36
4.2.5 Consist and vehicle basic properties.....	37
4.3 Logical Train Architecture (Functional Breakdown).....	38
4.3.1 General.....	38
4.3.2 Service classification.....	38
4.3.3 Operational Services Overview.....	39
4.3.4 Service Provider.....	39
5 Common ETB framework.....	39
5.1 General.....	39
5.1.1 Overview.....	39
5.1.2 Interoperability.....	40
5.2 CSTINFO telegram.....	40
5.2.1 General.....	40
5.2.2 Closed train support (Option).....	40
5.2.3 Protocol.....	40
5.2.4 CSTINFO classes.....	40
5.2.5 CSTINFO Notification Message.....	41
5.2.6 CSTINFO Request.....	42
5.3 Train topology database.....	44
5.3.1 General.....	44
5.3.2 Computation of the TTDB.....	46
5.3.3 Data structure.....	50
5.3.4 Train Topology Database for multiple ETBs (Option).....	59
5.4 Service Addressing.....	61
5.4.1 General.....	61
5.4.2 TCN Domain Name System (TCN-DNS).....	61
5.4.3 TCN Domain Names.....	62

5.4.4	TCN-URI Scheme .....	63
5.4.5	Mapping TCN-URI to IP address .....	69
5.4.6	Support of other URI schemas .....	73
5.5	TCN-DNS Server.....	73
5.5.1	General .....	73
5.5.2	Architecture .....	73
5.5.3	Functional address resolution.....	73
5.5.4	Protocol .....	76
5.5.5	Multiple ETBs .....	77
5.6	Data exchange.....	77
5.6.1	General .....	77
5.6.2	Operational network communication.....	77
5.6.3	OMTS network communication.....	78
5.6.4	Quality of Service (QoS).....	78
5.7	Service discovery .....	78
5.8	Train Info Service.....	78
6	Services of the communication profile – ETB Control Service .....	78
6.1	General.....	78
6.2	Communication model.....	79
6.3	ECSP Supervision.....	79
6.4	ECSP Interconnection .....	79
6.4.1	General .....	79
6.4.2	ETBCTRL telegram exchange selection .....	80
6.4.3	ETBCTRL telegram transmission .....	80
6.4.4	Structure of the ETBCTRL telegram .....	80
6.4.5	Operational train directory computation process .....	83
6.5	Function “Leading” .....	86
6.5.1	General .....	86
6.5.2	Function primitives.....	86
6.5.3	ECSP to ECSP protocol .....	88
6.6	Function Confirmation/Correction .....	92
6.6.1	General .....	92
6.6.2	Function primitives.....	92
6.6.3	ECSP to ECSP protocol .....	94
6.6.4	State diagram .....	97
6.6.5	ECSC Failure.....	99
6.7	Computation of the operational train directory.....	99
6.7.1	General .....	99
6.7.2	Action setCorrInfo.....	100
6.7.3	Action computeOpTrnDir.....	103
6.8	Function Sleep Mode (Option) .....	106
6.8.1	General .....	106
6.8.2	Sleep Mode Use Case (informal).....	106
6.8.3	Exclusivity.....	108
6.8.4	Function primitives.....	108
6.8.5	ECSP to ECSP protocol .....	110
Annex A (normative)	Train Real-Time Data Protocol (TRDP) .....	114
A.1	General.....	114
A.2	Lower Layers .....	114

A.2.1	Data link layer.....	114
A.2.2	Network Layer.....	114
A.2.3	Transport Layer .....	115
A.3	TRDP FCS Computation.....	116
A.4	Interaction between TRDP user and TRDP Layer.....	118
A.5	Communication Identifier (ComId) .....	118
A.6	Process Data .....	120
A.6.1	Communication model.....	120
A.6.2	Roles .....	120
A.6.3	Communication pattern .....	120
A.6.4	Addressing.....	125
A.6.5	PD-PDU.....	125
A.6.6	Interaction between application and TRDP protocol layer.....	128
A.6.7	Topography counter check .....	135
A.6.8	State Machine.....	136
A.7	Message Data .....	140
A.7.1	Communication model.....	140
A.7.2	Roles .....	141
A.7.3	Communication pattern .....	141
A.7.4	Addressing.....	142
A.7.5	MD-PDU .....	142
A.7.6	Interaction between application and TRDP layer .....	145
A.7.7	Topography counter check .....	150
A.7.8	MD protocol state machine.....	151
A.7.9	TCP Connection Handling .....	160
A.8	Message data echo server (option).....	161
Annex B (normative)	Safe Data Transmission (SDTv2).....	162
B.1	General.....	162
B.2	Overview of SDTv2 (informal).....	162
B.3	Safety functional requirements .....	163
B.4	Safety measures .....	163
B.5	Operational states of the SDTv2 channel .....	164
B.6	Data presentation.....	165
B.7	SC-32 .....	165
B.8	SID .....	168
B.9	Vital Data Packet .....	169
B.10	Exclusivity.....	170
B.11	Configuration time parameters.....	170
B.12	Safe data source (SDSRC).....	170
B.12.1	General .....	170
B.12.2	Safe Data Preparation (Application) .....	170
B.12.3	Safe data sending .....	171
B.13	Safe data sink (SDSINK) .....	172
B.13.1	General .....	172
B.13.2	Definitions .....	173
B.13.3	SDSINK States .....	174
B.13.4	VDP Sampling.....	175
B.13.5	VDP Integrity Check.....	176
B.13.6	Sink time supervision .....	177

B.13.7	Guard time check.....	177
B.13.8	Latency monitoring.....	178
B.13.9	Channel monitoring.....	180
B.13.10	SDTV2 Application Interface.....	182
B.13.11	Change of operational train composition.....	182
B.14	Diagnosis and statistics.....	182
B.15	Safe data transmission over MVB (informative).....	183
B.15.1	General.....	183
B.15.2	MVB-VDP.....	183
B.15.3	SDTV2 protocol deviations for MVB.....	184
B.16	SDTV2 with TRDP message data.....	184
Annex C (informative)	Train Real-Time Data Protocol Configuration (TRDP).....	185
C.1	General.....	185
C.2	Device Parameters.....	186
C.3	Device Configuration Parameters.....	187
C.4	Bus Interface List.....	187
C.4.1	General.....	187
C.4.2	Bus Interface Configuration.....	188
C.5	Mapped Device Parameters.....	199
C.5.1	General.....	199
C.5.2	Mapped Bus Interface Parameters.....	200
C.6	Communication Parameters (ComPar).....	202
C.6.1	General.....	202
C.6.2	Default Communication Parameters.....	203
C.7	DataSet Parameters.....	203
C.7.1	General.....	203
C.7.2	DataSet Element.....	205
C.7.3	Examples of DataSets.....	207
Annex D (informative)	Access to End Device (ED) statistics.....	211
D.1	General.....	211
D.2	Structures.....	211
D.2.1	General.....	211
D.2.2	tlc_getSubsStatistics.....	213
D.2.3	tlc_getPubStatistics.....	213
D.2.4	tlc_getUdpListStatistics, tlc_getTcpListStatistics.....	213
D.2.5	tlc_getRedStatistics.....	214
D.3	ED interface for statistic data access.....	214
D.3.1	General.....	214
D.3.2	TRDP interface.....	214
Annex E (informative)	Service interface.....	216
E.1	General.....	216
E.2	Service provider.....	217
E.2.1	Proxies.....	217
E.2.2	Performance.....	217
E.3	ECSP interface.....	217
E.3.1	General.....	217
E.3.2	ECSP control telegram.....	217
E.3.3	ECSP status telegram.....	219
E.3.4	ECSP Confirmation/Correction Request.....	221

E.4	TTDB manager interface .....	224
E.4.1	General .....	224
E.4.2	TTDB status information .....	224
E.4.3	TTDB notification .....	225
E.4.4	TTDB information – train directory.....	225
E.4.5	TTDB information – static consist information.....	226
E.4.6	TTDB information – train network directory information.....	227
E.4.7	Operational train directory information.....	228
E.4.8	Read TTDB.....	229
E.5	DNS server interface .....	230
E.5.1	DNS standard interface.....	230
E.5.2	DNS TCN interface .....	230
E.6	ETBN control interface .....	234
E.6.1	General .....	234
E.6.2	ETBN control and status data.....	235
E.6.3	ETBN train network directory.....	238
Annex F (normative)	Communication profile conformance test guideline .....	240
F.1	General.....	240
F.2	Scope of conformance test.....	240
F.3	Conformance test overview .....	241
F.4	Test laboratory .....	241
F.4.1	General .....	241
F.4.2	Tasks .....	241
F.5	Guideline for writing conformance test specifications .....	242
F.5.1	Overview of the main components.....	242
F.5.2	Protocol Implementation Conformance Statement (PICS) .....	242
F.5.3	Abstract test architecture .....	243
F.5.4	Protocol Implementation eXtra Information for Testing (PIXIT).....	243
F.5.5	Test suite structure .....	243
F.6	Abstract test architecture (option).....	243
F.6.1	General .....	243
F.6.2	Test architecture with one ETB.....	244
F.6.3	Test architecture for multiple ETB .....	244
F.6.4	Set-up for automatic test.....	244
F.7	Test of conformity to the common ETB framework .....	245
F.7.1	General .....	245
F.7.2	Test of CSTINFO telegram.....	245
F.7.3	Test of TTDB .....	245
F.7.4	Test of service addressing and TCN-DNS server.....	245
F.7.5	Test of data exchange.....	246
F.7.6	Test of service discovery.....	247
F.7.7	Test of train info service.....	247
F.8	ETB Control Service conformity test .....	247
F.8.1	General .....	247
F.8.2	Test control interface for the test of ETB control services .....	247
F.9	Echo function .....	255
F.9.1	General .....	255
F.9.2	TRDP echo test .....	255
F.9.3	Reverse-Echo test .....	256

F.10	Statement of conformity .....	257
Annex G (informative)	SNMP Management Information Base (MIB) .....	259
G.1	General.....	259
G.2	TTDB-MIB.....	259
G.3	TRDP-MIB.....	264
Bibliography	.....	275

Figure 1	– IEC 61375-2-3 as connecting element between train backbone and application .....	17
Figure 2	– Train structure in accordance to IEC 61375-1 (example) .....	31
Figure 3	– Train structure seen from viewpoint of the communication profile (example).....	31
Figure 4	– Train network (example) .....	32
Figure 5	– Possible couplings of operational network and multimedia network.....	33
Figure 6	– Gateway between operational network and multimedia network (example).....	34
Figure 7	– Example: three coupled Consists .....	35
Figure 8	– Example: Closed Train.....	35
Figure 9	– Service classification .....	38
Figure 10	– CSTINFO notification data .....	42
Figure 11	– CSTINFOCTRL telegram .....	44
Figure 12	– TTDB management block diagram .....	44
Figure 13	– TTDB Content.....	45
Figure 14	– TTDB computation block diagram .....	46
Figure 15	– Train directory computation state diagram.....	47
Figure 16	– TTDB class diagram (example).....	51
Figure 17	– TTDB adoption (in this example shown for the first consist).....	60
Figure 18	– TCN-DNS name space with division into zones .....	62
Figure 19	– TCN-URI Schema.....	64
Figure 20	– Directions, orientations and numbers in train.....	65
Figure 21	– TCN-URI resolving in a train .....	74
Figure 22	– DNS protocol (case a without, case b with TTDB interrogation) .....	76
Figure 23	– ETB control service model .....	79
Figure 24	– ETBCTRL telegram exchange.....	80
Figure 25	– ETBCTRL telegram.....	81
Figure 26	– Operational train directory computation block diagram.....	84
Figure 27	– ETBCTRL processing state diagram.....	85
Figure 28	– Leading sequence diagram .....	87
Figure 29	– Leading vehicle function state machine block diagram.....	89
Figure 30	– State diagram of leading function.....	90
Figure 31	– Confirmation sequence diagram.....	93
Figure 32	– Confirmation/correction function state machine block diagram.....	94
Figure 33	– Correction/confirmation protocol sequence chart (example).....	96
Figure 34	– Unconfirm protocol sequence chart (example).....	97
Figure 35	– Confirmation/correction state diagram .....	98
Figure 36	– Action “setCorrInfo” block diagram .....	100

Figure 37 – Train composition consistency check examples.....	103
Figure 38 – Computation of the operational train directory .....	104
Figure 39 – computeOpTrnDir state chart .....	105
Figure 40 – Use case “sleep mode” state diagram .....	108
Figure 41 – Sleep control sequence diagram .....	109
Figure 42 – Sleep control function state machine block diagram .....	110
Figure 43 – Sleep request protocol sequence chart (example) .....	111
Figure 44 – Sleep control state diagram .....	112
Figure A.1 – Overview of the protocol stack .....	114
Figure A.2 – FCS Computation .....	116
Figure A.3 – FCS Table.....	117
Figure A.4 – TRDP service model.....	118
Figure A.5 – PD push pattern (point to point) .....	121
Figure A.6 – PD push pattern (point to multipoint).....	121
Figure A.7 – PD pull pattern (point to point, sink knows source) .....	122
Figure A.8 – PD pull pattern (multipoint to point, sink does not know source) .....	123
Figure A.9 – PD pull pattern (point to multipoint, sink knows source).....	124
Figure A.10 – PD pull pattern (multipoint to multipoint, sink does not know source) .....	125
Figure A.11 – PD-PDU .....	126
Figure A.12 – Interaction sequence chart for PD pull pattern.....	133
Figure A.13 – Interaction sequence chart for PD push pattern.....	134
Figure A.14 – Interaction sequence chart for redundant PD handling.....	135
Figure A.15 – PD State diagram publisher .....	136
Figure A.16 – PD State diagram requester.....	138
Figure A.17 – PD State diagram subscriber .....	139
Figure A.18 – Message data transfer options .....	141
Figure A.19 – MD-PDU .....	142
Figure A.20 – Interaction sequence chart.....	149
Figure A.21 – TRDP layer MD caller state chart .....	153
Figure A.22 – TRDP layer MD replier state chart.....	156
Figure A.23 – TRDP Layer MD telegram reception.....	159
Figure B.1 – SDTV2 Channel.....	162
Figure B.2 – SDTV2 Channel States .....	165
Figure B.3 – SC-32 Computation .....	166
Figure B.4 – SC-32 Table .....	167
Figure B.5 – SID Computation .....	168
Figure B.6 – ETB-VDP .....	169
Figure B.7 – Format of ETB-VDP.....	170
Figure B.8 – Redundancy Group (Example with 2 SDSRC) .....	172
Figure B.9 – SDSINK state diagram.....	174
Figure B.10 – Window of expected SSC (example) .....	176
Figure B.11 – Guard time violation (example) .....	178
Figure B.12 – Latency violation sequence chart (example).....	179



Figure B.13 – MVB-VDP .....	183
Figure B.14 – Format of MVB-VDP .....	184
Figure C.1 – TRDP configuration block diagram .....	185
Figure C.2 – Exchange Parameters with the central key ComId.....	193
Figure C.3 – DataSet structure .....	204
Figure D.1 – TRDP statistics data telegrams.....	214
Figure E.1 – Service interfaces block diagram .....	216
Figure E.2 – ECSP interface telegrams.....	217
Figure E.3 – ECSP control data .....	218
Figure E.4 – ECSP status data .....	219
Figure E.5 – ECSP confirm/correction request data .....	222
Figure E.6 – ECSP confirm/correction reply data .....	223
Figure E.7 – TTDB manager interface telegrams .....	224
Figure E.8 – TCN-URI resolving .....	230
Figure E.9 – DNS resolving request data .....	232
Figure E.10 – DNS resolving reply data .....	233
Figure E.11 – ETBN control interface telegrams .....	234
Figure E.12 – ETBN control request data.....	235
Figure E.13 – ETBN status reply data .....	236
Figure F.1 – Consist interface on ETB level.....	240
Figure F.2 – Scope of conformance test .....	241
Figure F.3 – Abstract test architecture (1 ETB).....	244
Figure F.4 – Abstract test architecture (2 ETBs) .....	244
Figure F.5 – Unit under test abstract architecture .....	245
Figure F.6 – Conformance test control telegram .....	248
Figure F.7 – Conformance test control telegram data.....	248
Figure F.8 – Conformance test status telegram .....	249
Figure F.9 – Conformance test status telegram data.....	250
Figure F.10 – (Un-)confirmation request .....	250
Figure F.11 – Conformance test confirmation/correction request data .....	251
Figure F.12 – Conformance test confirmation/correction reply data .....	252
Figure F.13 – Conformance test operational train directory request.....	253
Figure F.14 – Conformance test operational train directory request data .....	253
Figure F.15 – Conformance test operational train directory reply data .....	254
Figure F.16 – Echo test.....	255
Figure F.17 – Reverse-Echo test .....	256
Figure F.18 – Conformance test message data telegram data.....	257
Table 1 – Data type keywords and notations .....	30
Table 2 – ETB control service.....	39
Table 3 – Train directory computation – triggers .....	48
Table 4 – Train directory computation – guards .....	48
Table 5 – Train directory computation – actions .....	48

Table 6 – TCN URI basic syntax.....	63
Table 7 – General schema syntax.....	63
Table 8 – Device label syntax.....	65
Table 9 – Device label definition.....	65
Table 10 – vehicle label syntax.....	66
Table 11 – Veh (vehicle) label definition.....	66
Table 12 – Consist label syntax.....	67
Table 13 – Consist label definition.....	67
Table 14 – Closed train label syntax.....	68
Table 15 – Closed train label definition.....	68
Table 16 – Train label syntax.....	69
Table 17 – Train label definition.....	69
Table 18 – General decomposition of IP MC groups addresses.....	70
Table 19 – Decomposition of all-train groups.....	70
Table 20 – Decomposition of ETB-related groups.....	71
Table 21 – Decomposition of consist-limited groups.....	71
Table 22 – Well-known TCN-URI.....	72
Table 23 – TCN-URI resolving – Example 1.....	74
Table 24 – TCN-URI resolving – Example 2.....	75
Table 25 – TCN-URI resolving – Example 3.....	75
Table 26 – TCN-URI resolving – Example 4.....	76
Table 27 – Data class priorities.....	78
Table 28 – ETBCTRL processing – triggers.....	85
Table 29 – ETBCTRL processing – guards.....	85
Table 30 – ETBCTRL processing – actions.....	85
Table 31 – Leading function primitives – F_leadingStatusRequest.....	87
Table 32 – Leading function primitives – F_leadingSetRequest.....	87
Table 33 – Leading function primitives – F_leadingResetRequest.....	87
Table 34 – Leading function control flags.....	88
Table 35 – Leading function – triggers.....	91
Table 36 – Leading function – guards.....	91
Table 37 – Leading function – actions.....	91
Table 38 – Confirmation function primitives – F_confirmStatusRequest.....	93
Table 39 – Confirmation function primitives – F_confirmRequest.....	93
Table 40 – Confirmation function primitives – F_unconfirmRequest.....	93
Table 41 – Confirmation function control flags.....	94
Table 42 – Confirmation/correction state diagram – Trigger.....	98
Table 43 – Confirmation/correction state diagram – Guard.....	98
Table 44 – Confirmation/correction state diagram – Action.....	99
Table 45 – Confirmation/Correction rules.....	100
Table 46 – Operation Train Directory computation state diagram – Trigger.....	105
Table 47 – Operation Train Directory computation state diagram – Guards.....	105
Table 48 – Operation Train Directory computation state diagram – Action.....	105

Table 49 – Example of operational train directory .....	106
Table 50 – ETBN operating conditions .....	107
Table 51 – Sleep mode function primitives – F_sleepStatus .....	109
Table 52 – Sleep mode function primitives – F_sleepRequest .....	109
Table 53 – Sleep mode function primitives – F_sleepCancel .....	109
Table 54 – Sleep mode function primitives – F_nodeAwake .....	110
Table 55 – Sleep control function control flags .....	110
Table 56 – Sleep control state diagram – trigger .....	112
Table 57 – Sleep control state diagram – guards .....	112
Table 58 – Sleep control state diagram – action .....	113
Table A.1 – UDP/TCP port assignments .....	115
Table A.2 – Reserved ComIds .....	119
Table A.3 – PD-PDU parameters .....	127
Table A.4 – TRDP service primitives .....	128
Table A.5 – Topography counter check .....	135
Table A.6 – PD publisher state diagram – guards .....	136
Table A.7 – PD publisher state diagram – triggers .....	137
Table A.8 – PD publisher state diagram – actions .....	137
Table A.9 – PD publisher state diagram – states .....	137
Table A.10 – PD publisher state diagram – guards .....	138
Table A.11 – PD requester state diagram – triggers .....	138
Table A.12 – PD requester state diagram – actions .....	138
Table A.13 – PD requester state diagram – states .....	138
Table A.14 – PD subscriber state diagram – triggers .....	139
Table A.15 – PD subscriber state diagram – guards .....	139
Table A.16 – PD subscriber state diagram – actions .....	140
Table A.17 – PD subscriber state diagram – states .....	140
Table A.18 – MD-PDU parameters .....	143
Table A.19 – TRDP service primitives – Caller .....	145
Table A.20 – TRDP service primitives – Replier .....	147
Table A.21 – Topography counter check .....	150
Table A.22 – MD caller state diagram – triggers .....	153
Table A.23 – MD caller state diagram – guards .....	153
Table A.24 – MD caller state diagram – actions .....	154
Table A.25 – MD caller state diagram – states .....	154
Table A.26 – MD replier state diagram – triggers .....	157
Table A.27 – MD replier state diagram – guards .....	157
Table A.28 – MD replier state diagram – actions .....	157
Table A.29 – MD replier state diagram – states .....	158
Table A.30 – MD receiver state diagram – triggers .....	159
Table A.31 – MD receiver state diagram – guards .....	159
Table A.32 – MD receiver state diagram – actions .....	160
Table A.33 – MD receiver state diagram – states .....	160

Table B.1 – Deployed measures to communication errors .....	164
Table B.2 – SDSINK state diagram – triggers .....	175
Table B.3 – SDSINK state diagram – guards .....	175
Table B.4 – SDSINK state diagram – operations .....	175
Table B.5 – SDTV2 statistic counters .....	182
Table C.1 – Attributes for device tag .....	187
Table C.2 – Attributes for device-configuration tag .....	187
Table C.3 – Attributes for bus-interface tag .....	189
Table C.4 – Attributes for trdp-process tag .....	189
Table C.5 – Default values for thread/task .....	190
Table C.6 – Attributes for pd-com-parameter tag .....	190
Table C.7 – Default values for pd-com-parameter .....	191
Table C.8 – Attributes for md-com-parameter tag .....	192
Table C.9 – Default values for md-com-parameter .....	193
Table C.10 – Attributes for telegram tag .....	194
Table C.11 – Attributes for md-parameter tag .....	195
Table C.12 – Attributes for pd-parameter tag .....	196
Table C.13 – Attributes for source tag .....	197
Table C.14 – Attributes for destination tag .....	198
Table C.15 – Attributes for sdt-parameter tag .....	198
Table C.16 – Default values for sdt-parameter tag .....	199
Table C.17 – Attributes for mapped-device tag .....	200
Table C.18 – Attributes for mapped-bus-interface tag .....	201
Table C.19 – Attributes for mapped-telegram tag .....	201
Table C.20 – Attributes for mapped-pd-parameter tag .....	201
Table C.21 – Attributes for mapped-source tag .....	201
Table C.22 – Attributes for mapped-destination tag .....	202
Table C.23 – Attributes for mapped-SDTV2-parameter tag .....	202
Table C.24 – Attributes for com-parameter tag .....	203
Table C.25 – Default communication parameters .....	203
Table C.26 – Basic data types .....	204
Table C.27 – Attributes for data-set tag .....	205
Table C.28 – Attributes for element tag .....	206
Table C.29 – Use of element array size .....	207
Table F.1 – Conformance testing summary .....	258

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRONIC RAILWAY EQUIPMENT –  
TRAIN COMMUNICATION NETWORK (TCN) –****Part 2-3: TCN communication profile**

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

International Standard IEC 61375-2-3 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

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

FDIS	Report on voting
9/2029/FDIS	9/2048/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 in the IEC 61375 series, published 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 website 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

The IEC 61375 standard series specifies a Train Communication Network for usage in railway vehicles (trains) mainly intended for the exchange of TCMS related information, but not restricted to it. The specification starts from the physical layer up to the application layer and it involves different communication technologies.

This part of IEC 61375 (IEC 61375-2-3) defines the communication profile of the Train Communication Network so as to achieve interoperability between Consists connected by Ethernet Train Backbones as defined in IEC 61375-2-5.

The reasons for prompting the preparation of this part of IEC 61375 are:

- definition of the requirements necessary for communication interoperability on Ethernet Train Backbone level
- full documentation of the requirements of all users, aligning them and setting them out in standard form
- providing guidelines for the technical solution adopted for the train backbone interoperable communication
- defining a conformance test guideline (Annex F) which gives guidance for checking the conformity of consists to the communication profile

Concrete train applications for certain functionalities are not dealt with in this part of IEC 61375. They are contained in IEC 61375-2-4.

# **ELECTRONIC RAILWAY EQUIPMENT – TRAIN COMMUNICATION NETWORK (TCN) –**

## **Part 2-3: TCN communication profile**

### **1 Scope**

This part of IEC 61375 specifies rules for the data exchange between consists in trains. The aggregation of these rules defines the TCN communication profile.

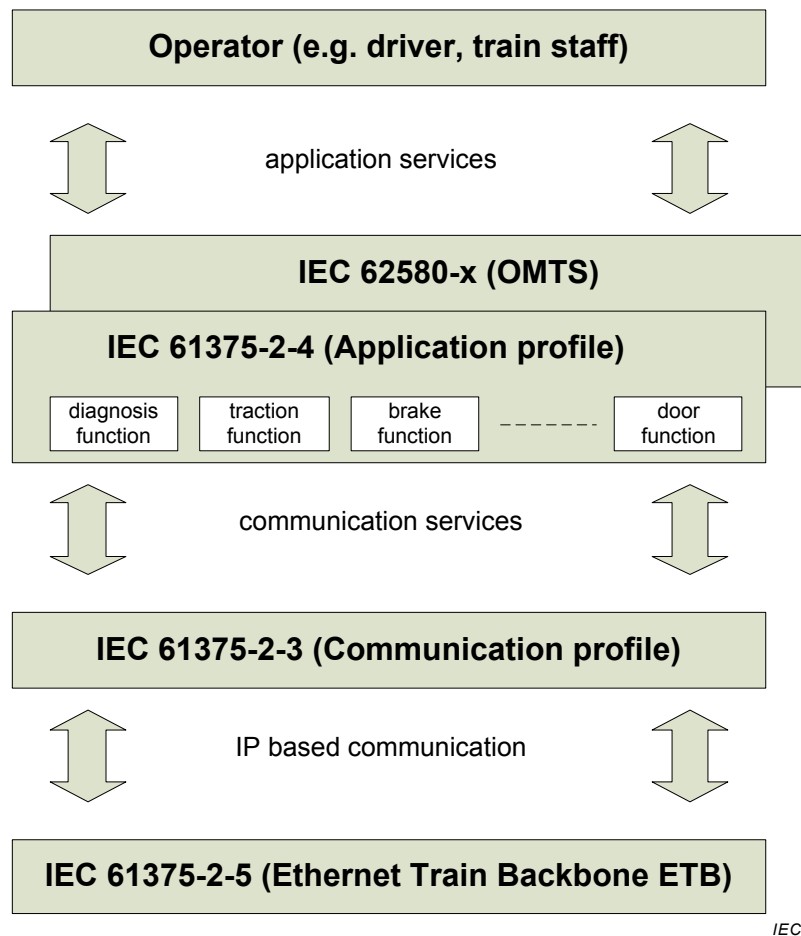
The objective of the communication profile is to ensure interoperability between consists of the said trains with respect to the exchange of information. For this it defines all those items which are necessary for communication interoperability:

- an architecture with defined train directions related to different train views
- a common functional addressing concept
- common communication protocol for data exchange between functions
- a set of services for train communication control.

As a restriction, this communication profile is adhered to the Ethernet Train Backbone (ETB) technology as defined in IEC 61375-2-5. Towards the consist networks, a more abstract interface is defined which does not restrict the appliance of any consist network technology as for instance MVB (IEC 61375-3-1), CANOpen (IEC 61375-3-3) or ECN (IEC 61375-3-4).

It is not within the scope of the communication profile to define application data content and its meaning (e.g. syntax and semantics). This is within the responsibility of the application profiles. Namely two application profiles are explicitly supported as shown in Figure 1: the TCMS application profile as defined in IEC 61375-2-4, and the onboard multimedia and telematic services (OMTS) related profiles as defined in the IEC 62580 series.





**Figure 1 – IEC 61375-2-3 as connecting element between train backbone and application**

## 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.

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

IEC 61375-2-1, *Electronic railway equipment – Train communication network (TCN) – Part 2-1: Wire Train Bus (WTB)*

IEC 61375-2-4, *Electronic railway equipment – Train communication network (TCN) – Part 2-4: Application Profile (to be published)*

IEC 61375-2-5, *Electronic railway equipment – Train communication network (TCN) – Part 2-5: Ethernet train backbone*

IEC 62280, *Railway applications – Communication, signalling and processing systems – Safety related communication in transmission systems*

ISO/IEC 9646-6:1994, *Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 6: Protocol profile test specification*

ISO/IEC 9646-7:1995, *Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 7: Implementation Conformance Statements*

ISO/IEC 17011:2004, *Conformity assessment – General requirements for accreditation bodies accrediting conformity assessment bodies*

ISO/IEC 17025:2005, *General requirements for the competence of testing and calibration laboratories*

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**