

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
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

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

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 It also gives information on projects, replaced and withdrawn publications.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 also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 2 000 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 - www.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

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: 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	ESC 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 (informative).....	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	Efficiency.....	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 Encapsulated (ED) statistics.....	211
D.1	General.....	211
D.2	Structures.....	211
D.2.1	General.....	211
D.2.2	tlc_getSubStatistics.....	213
D.2.3	tlc_getPduStatistics.....	213
D.2.4	tlc_getTcpListStatistics, 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 to 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, orientation 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 – SD-32 Channel.....	162
Figure B.2 – SD-v2 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.