



SLOVENSKI STANDARD
SIST EN 61375-3-3:2012

01-oktober-2012

Železniške elektronske naprave - Komunikacijsko omrežje vlaka - 3-3. del: CCN - CAN odprto skladno omrežno podatkovno vodilo (IEC 61375-3-3:2012)

Electronic railway equipment - Train communication network - Part 3-3: CCN - CANopen Consist Network bus (IEC 61375-3-3:2012)

Elektronische Betriebsmittel für Bahnen - Zug-Kommunikations-Netzwerk (TCN) - Teil 3-3: CANopen Consist Network (CCN) (IEC 61375-3-3:2012)

Matériel électronique ferroviaire - Réseau embarqué de train (TCN) - Partie 3-3: Réseau de rame CANopen (CCN) (CEI 61375-3-3:2012)

<https://standards.iteh.ai/catalog/standards/sist/968cf594-0b9a-434d-9a0f-d8d778580127/sist-en-61375-3-3-2012>

Ta slovenski standard je istoveten z: EN 61375-3-3:2012

ICS:

45.020

Železniška tehnika na splošno

Railway engineering in general

SIST EN 61375-3-3:2012

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 61375-3-3:2012](https://standards.iteh.ai/catalog/standards/sist/968cf594-0b9a-434d-9a0f-d8d778580127/sist-en-61375-3-3-2012)

<https://standards.iteh.ai/catalog/standards/sist/968cf594-0b9a-434d-9a0f-d8d778580127/sist-en-61375-3-3-2012>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 61375-3-3

August 2012

ICS 45.060

English version

**Electronic railway equipment -
Train communication network (TCN) -
Part 3-3: CANopen Consist Network (CCN)
(IEC 61375-3-3:2012)**

Matériel électronique ferroviaire -
Réseau embarqué de train (TCN) -
Partie 3-3: Réseau de rame CANopen
(CCN)
(CEI 61375-3-3:2012)

Elektronische Betriebsmittel für Bahnen -
Zug-Kommunikations-Netzwerk (TCN) -
Teil 3-3: CCN-CANopen Consist Network
Bus
(IEC 61375-3-3:2012)

**iTeh STANDARD PREVIEW
(standards.iteh.ai)**

This European Standard was approved by CENELEC on 2012-07-26. 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.

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 9/1646/FDIS, future edition 1 of IEC 61375-3-3, 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 61375-3-3:2012.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2013-04-26
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-07-26

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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

iTeH STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 61375-3-3:2012
Endorsement notice
<https://standards.iteh.ai/catalog/standards/sist/968c1594-0b9a-434d-9a0f-d8d778580127/sist-en-61375-3-3-2012>

The text of the International Standard IEC 61375-3-3:2012 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
-	-	Industrial communications subsystem based on ISO 11898 (CAN) for controller-device interfaces - Part 4: CANopen	EN 50325-4	2002
IEC 61131	Series	Programmable controllers	EN 61131	Series
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 61375-2-2	-	Electronic railway equipment - Train communication network (TCN) - Part 2-2: Wire Train Bus conformance testing	EN 61375-2-2	-
ISO/IEC 646	1991	Information technology - ISO 7-bit coded character set for information interchange	-	-
ISO/IEC 9899	1999	Programming languages - C	-	-
ISO 11898-1	2003	Road vehicles - Controller area network (CAN) - Part 1: Data link layer and physical signalling	-	-
ISO 11898-2	2003	Road vehicles - Controller area network (CAN) - Part 2: High-speed medium access unit	-	-

Annex ZZ
(informative)

Coverage of Essential Requirements of EU Directives

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

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

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 61375-3-3:2012](https://standards.iteh.ai/catalog/standards/sist/968cf594-0b9a-434d-9a0f-d8d778580127/sist-en-61375-3-3-2012)

<https://standards.iteh.ai/catalog/standards/sist/968cf594-0b9a-434d-9a0f-d8d778580127/sist-en-61375-3-3-2012>



IEC 61375-3-3

Edition 1.0 2012-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electronic railway equipment – Train communication network (TCN) –
Part 3-3: CANopen Consist Network (CCN)**

**Matériel électronique ferroviaire – Réseau embarqué de train (TCN) –
Partie 3-3: Réseau de rame CANopen (CCN)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

XE

ICS 45.060

ISBN 978-2-88912-072-7

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	10
INTRODUCTION.....	12
1 Scope.....	13
2 Normative references	13
3 Terms, definitions and abbreviations	14
3.1 Terms and definitions	14
3.2 Abbreviations	15
3.3 Conventions	15
4 Architecture.....	15
4.1 Content	15
4.2 Logical CANopen-based consist network.....	15
4.3 Network topology.....	16
4.4 Addressing	16
4.5 Data classes	17
5 Physical layer.....	17
5.1 Content	17
5.2 Cabling.....	17
5.3 Connector	17
5.4 Physical medium attachment.....	19
5.5 Physical signaling.....	19
6 Data Link layer.....	19
6.1 Content	19
6.2 CANopen data link layer.....	20
7 CANopen application layer	20
7.1 Content	20
7.2 Reference model.....	20
7.3 Field device model	20
7.4 CANopen communication objects	22
7.5 CANopen object dictionary	22
7.6 Predefined CANopen communication objects	24
7.6.1 Content	24
7.6.2 Object 1000 _h : Device type	24
7.6.3 Object 1001 _h : Error register.....	24
7.6.4 Object 1014 _h : COB-ID emergency object.....	24
7.6.5 Object 1017 _h : Heartbeat producer	24
7.6.6 Object 1018 _h : Identity object.....	24
7.6.7 Object 1029 _h : Error behavior	24
7.6.8 Object 67FF _h : Device type.....	25
7.6.9 Service data objects (SDOs).....	25
7.6.10 Process data objects (PDOs).....	25
8 Application data.....	25
8.1 Content	25
8.2 CANopen application data representation.....	25
8.3 Recommended representation principle of application data	25
8.3.1 Content	25

8.3.2	Application data for door control	25
8.3.3	Consumed door control application objects	26
8.3.4	Produced door control application objects	27
9	CANopen network management	29
9.1	Content	29
9.2	CANopen NMT slave functionality	30
9.3	CANopen manager functionality	30
9.3.1	General	30
9.3.2	Object dictionary usage	31
9.3.3	Redundant networks	31
9.4	CANopen NMT start-up	32
9.4.1	NMT startup	32
9.4.2	NMT startup simple	35
9.4.3	Start process boot NMT slave	36
9.5	Boot NMT slave	37
9.5.1	Check configuration	42
9.5.2	Check NMT state	43
9.5.3	NMT flying master start up	43
9.5.4	Error status	44
9.6	Error control	45
9.6.1	Start error control	45
9.6.2	Error handler	46
9.6.3	Startup handler	47
9.7	Additional NMT master services and protocols	47
9.8	Object dictionary entries	47
9.8.1	Object 1020 _h : Verify configuration	47
9.8.2	Object 102A _h : NMT inhibit time	48
9.8.3	Object 1F20 _h : Store DCF	49
9.8.4	Object 1F22 _h : Concise DCF	50
9.8.5	Object 1F26 _h : Expected configuration date	52
9.8.6	Object 1F27 _h : Expected configuration time	53
9.8.7	Object 1F80 _h : NMT startup	54
9.8.8	Object 1F81 _h : NMT slave assignment	56
9.8.9	Object 1F82 _h : Request NMT	58
9.8.10	Object 1F83 _h : Request node guarding	61
9.8.11	Object 1F84 _h : Device type identification	63
9.8.12	Object 1F85 _h : Vendor identification	64
9.8.13	Object 1F86 _h : Product code	65
9.8.14	Object 1F87 _h : Revision number	66
9.8.15	Object 1F88 _h : Serial number	67
9.8.16	Object 1F89 _h : Boot time	68
9.8.17	Object 1F8A _h : Restore configuration	69
9.8.18	Object 1F91 _h : Self starting nodes timing parameters	70
10	Gateway functions	71
10.1	Content	71
10.2	Gateway architecture	72
10.3	General principles and services	73
10.3.1	Content	73
10.3.2	Gateway class definitions	73

10.3.3	Service primitives definitions	73
10.4	Network access service specification.....	73
10.4.1	SDO access services.....	73
10.4.2	PDO access services.....	75
10.4.3	CANopen NMT services.....	78
10.4.4	Device failure management services	81
10.4.5	CANopen interface configuration services	82
10.4.6	Gateway management services	84
10.4.7	Manufacturer-specific services	85
10.5	ASCII mapping of network access services	85
10.5.1	Content	85
10.5.2	Definitions	86
10.5.3	Network access command specification.....	89
11	Train network management	97
11.1	Content	97
11.2	Manager, Agents and interfaces (informative).....	98
11.3	Management message protocol (informative)	98
11.4	Object interfaces (informative).....	98
11.5	CANopen-specific management services	98
11.5.1	General	98
11.5.2	Agent interfaces on a Station connected to CANopen consist network	98
11.5.3	Management message structure for CANopen consist networks	99
11.5.4	Notation for the CANopen specific SIF_codes	99
11.5.5	Notation for a call CANopen management message	100
11.5.6	Notation for a reply CANopen management message	100
11.5.7	Notation for the TNM CANopen services command codes	100
11.6	TNM CANopen services	101
11.6.1	Content	101
11.6.2	Call_Write_CANopen_Command (with reservation)	101
11.6.3	Reply_Write_CANopen_Command (with reservation)	102
11.6.4	Call_Read_CANopen_Command (without reservation)	102
11.6.5	Reply_Read_CANopen_Command (without reservation).....	103
12	CANopen management message data handling.....	103
12.1	General.....	103
12.2	Message data format.....	105
12.3	Requirements for message data communication within CANopen networks	105
12.4	Object 1F78 _h : CANopen message data reception	106
13	Conformance testing	107
	Bibliography.....	108
	Figure 1 – Logical network architecture of the consist network.....	16
	Figure 2 – Network topology of CANopen-based consist network.....	16
	Figure 3 – 9-pin D-sub connector.....	18
	Figure 4 – 5-pin micro style connector	18
	Figure 5 – Field device model	20
	Figure 6 – Minimum field device.....	21
	Figure 7 – CANopen device structure.....	22

Figure 8 – Structure of the device type object	24
Figure 9 – Object structure	26
Figure 10 – Object structure	27
Figure 11 – Object structure	28
Figure 12 – NMT startup, part 1	32
Figure 13 – NMT startup, part 2	34
Figure 14 – NMT startup simple	35
Figure 15 – Start process boot NMT slave	36
Figure 16 – Boot NMT slave, part 1	37
Figure 17 – Boot NMT slave, part 2	39
Figure 18 – Boot NMT slave, part 3	40
Figure 19 – Check configuration	42
Figure 20 – Check NMT state	43
Figure 21 – Start error control	45
Figure 22 – Error handler	46
Figure 23 – Bootup handler	47
Figure 24 – Data stream definition of concise DCF	51
Figure 25 – Object structure	54
Figure 26 – Bit structure of the configuration value	54
Figure 27 – Object structure of the value	56
Figure 28 – Bit structure of the configuration value	57
Figure 29 – Gateway between Train backbone and CANopen consist network	72
Figure 30 – Management messages (informative)	97
Figure 31 – Agent interface on a CANopen (gateway) station for message data	99
Figure 32 – Call_Write_CANopen_Command	102
Figure 33 – Reply_Write_CANopen_Command	102
Figure 34 – Call_Read_CANopen_Command (without reservation)	103
Figure 35 – Reply_Read_CANopen_command (without reservation)	103
Figure 36 – CANopen device capable to handle TNM management messages	104
Figure 37 – Message data format comparison	105
Table 1 – Pinning for 9-pin D-sub connector	18
Table 2 – Pinning for 5-pin micro style connector	19
Table 3 – Bit timing	19
Table 4 – CANopen object dictionary structure	23
Table 5 – Value definition	26
Table 6 – Object description	26
Table 7 – Entry description	27
Table 8 – Value definition	27
Table 9 – Object description	27
Table 10 – Entry description	28
Table 11 – Value definition	29
Table 12 – Object description	29

Table 13 – Entry description	29
Table 14 – Error status	44
Table 15 – Object description	48
Table 16 – Entry description	48
Table 17 – Object description	49
Table 18 – Entry description	49
Table 19 – Object description	49
Table 20 – Entry description	50
Table 21 – Object description	51
Table 22 – Entry description	52
Table 23 – Object description	52
Table 24 – Entry description	53
Table 25 – Object description	53
Table 26 – Entry description	54
Table 27 – Value NMT master (bit: 0)	55
Table 28 – Value Start all nodes (bit: 1)	55
Table 29 – Value NMT master start (bit: 2)	55
Table 30 – Value Start node (bit: 3)	55
Table 31 – Reset all nodes (bit: 4)	55
Table 32 – Flying master (bit: 5)	55
Table 33 – Stop all nodes (bit: 6)	55
Table 34 – Exceptions for NMT start-up capable devices	56
Table 35 – Object description	56
Table 36 – Entry description	56
Table 37 – NMT slave (bit: 0)	57
Table 38 – NMT boot slave (bit: 2)	57
Table 39 – Mandatory (bit: 3)	57
Table 40 – Reset communication (bit: 4)	57
Table 41 – Software version (bit: 5)	57
Table 42 – Software update (bit: 6)	57
Table 43 – Restore (bit: 7)	58
Table 44 – Object description	58
Table 45 – Entry description	58
Table 46 – Value definition	60
Table 47 – Object description	60
Table 48 – Entry description	61
Table 49 – Value definition	62
Table 50 – Object description	62
Table 51 – Entry description	63
Table 52 – Object description	64
Table 53 – Entry description	64
Table 54 – Object description	65
Table 55 – Entry description	65

Table 56 – Object description	66
Table 57 – Entry description	66
Table 58 – Object description	67
Table 59 – Entry description	67
Table 60 – Object description	68
Table 61 – Entry description	68
Table 62 – Object description	69
Table 63 – Entry description	69
Table 64 – Object description	69
Table 65 – Entry description	70
Table 66 – Object description	70
Table 67 – Entry description	71
Table 68 – Upload SDO service	74
Table 69 – Download SDO parameters	75
Table 70 – Configure SDO timeout parameters	75
Table 71 – Configure RPDO service parameters	76
Table 72 – Configure TPDO service parameters	77
Table 73 – Read PDO data service parameters	77
Table 74 – Write PDO data service parameters	78
Table 75 – RPDO received service parameters	78
Table 76 – Start node service parameters	78
Table 77 – Stop node service parameters	79
Table 78 – Set node to pre-operational service parameters	79
Table 79 – Reset node service parameters	79
Table 80 – Reset communication service parameters	80
Table 81 – Enable node guarding service parameters	80
Table 82 – Disable node guarding service parameters	80
Table 83 – Start heartbeat consumer service parameters	81
Table 84 – Disable heartbeat consumer service parameters	81
Table 85 – Error control event received parameters	81
Table 86 – Read device error service parameters	82
Table 87 – Emergency event received service parameters	82
Table 88 – Initialize gateway service parameters	82
Table 89 – Store configuration service parameters	83
Table 90 – Restore configuration service parameters	83
Table 91 – Set heartbeat producer service parameters	83
Table 92 – Set node-ID service parameters	84
Table 93 – Start emergency consumer service parameters	84
Table 94 – Stop emergency consumer service parameters	84
Table 95 – Set default network service parameters	85
Table 96 – Start default node-ID service parameters	85
Table 97 – Get version service parameters	85
Table 98 – Syntax and CANopen data types	86

Table 99 – Command notation in BNF.....	87
Table 100 – Response notation.....	88
Table 101 – Internal error code (InEC).....	88
Table 102 – Notation for event triggered messages	88
Table 103 – Syntax for upload SDO command	89
Table 104 – Examples for upload SDO command	89
Table 105 – Syntax for Download SDO command	89
Table 106 – Examples for download SDO command	89
Table 107 – Syntax for configure SDO timeout command.....	89
Table 108 – Syntax for configure RPDO command.....	90
Table 109 – Examples for configure RPDO command	90
Table 110 – Syntax for configure TPDO command	90
Table 111 – Examples for configure TPDO command.....	90
Table 112 – Syntax for read PDO data command.....	91
Table 113 – Response syntax for read PDO data command.....	91
Table 114 – Syntax for write PDO data command	91
Table 115 – Syntax for RPDO receive command.....	91
Table 116 – Examples RPDO received command	91
Table 117 – Syntax for start node command	91
Table 118 – Syntax for stop node command	92
Table 119 – Syntax set node to pre-operational command	92
Table 120 – Syntax reset node command	92
Table 121 – Syntax reset communication command	92
Table 122 – Syntax enable node guarding command	92
Table 123 – Syntax disable node guarding command.....	93
Table 124 – Syntax start heartbeat consumer command	93
Table 125 – Syntax disable heartbeat consumer command	93
Table 126 – Syntax for error control event received command	93
Table 127 – Syntax for read device error command	94
Table 128 – Syntax for emergency event received command	94
Table 129 – Syntax for initialize gateway command	94
Table 130 – Bit rate indices	94
Table 131 – Syntax for store configuration command	95
Table 132 – Storage specifier	95
Table 133 – Syntax restore configuration command	95
Table 134 – Syntax set heartbeat producer command.....	95
Table 135 – Syntax set node-ID command.....	95
Table 136 – Syntax set default network command.....	96
Table 137 – Syntax set default node-ID command	96
Table 138 – Syntax for get version command.....	96
Table 139 – Response syntax for get version command.....	96
Table 140 – Example for get version response.....	97
Table 141 – Management message structure.....	99

Table 142 – CANopen specific SIF_codes	100
Table 143 – Notation for a call CANopen management message	100
Table 144 – Notation for a reply CANopen management message	100
Table 145 – TNM CANopen services command codes (reservation required).....	101
Table 146 – TNM CANopen services command codes (reservation not required)	101
Table 147 – Value definition for Call_Write_CANopen_Command	102
Table 148 – Value definition Reply_Write_CANopen_Command	102
Table 149 – Value definition for Call_Read_CANopen_Command (without reservation)	103
Table 150 – Value definition for Reply_Read_CANopen_Command (without reservation)	103
Table 151 – Object description	106
Table 152 – Entry description	106

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[SIST EN 61375-3-3:2012](https://standards.iteh.ai/catalog/standards/sist/968cf594-0b9a-434d-9a0f-d8d778580127/sist-en-61375-3-3-2012)

<https://standards.iteh.ai/catalog/standards/sist/968cf594-0b9a-434d-9a0f-d8d778580127/sist-en-61375-3-3-2012>