

**Madalpingelised lülitus- ja juhtimisaparaadid. Kontrolleri
ja seadme vahelised liidesed. Osa 7:
Kommunikatsioonisüsteem CompoNet**

Low-voltage switchgear and controlgear - Controller-device
interfaces (CDIs) - Part 7: CompoNet (IEC 62026-7:2010,
modified)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 62026-7:2013 sisaldab Euroopa standardi EN 62026-7:2013 ingliskeelset teksti.	This Estonian standard EVS-EN 62026-7:2013 consists of the English text of the European standard EN 62026-7:2013.
Standard on jõustunud sellekohase teate avaldamisel EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 05.04.2013.	Date of Availability of the European standard is 05.04.2013.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 29.130.20, 33.200

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:
Aru 10, 10317 Tallinn, Eesti; www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:
Aru 10, 10317 Tallinn, Estonia; www.evs.ee; phone 605 5050; e-mail info@evs.ee

**Low-voltage switchgear and controlgear -
Controller-device interfaces (CDIs) -
Part 7: CompoNet
(IEC 62026-7:2010, modified)**

Appareillage à basse tension -
Interfaces appareil de commande-appareil
(CDI) -
Partie 7: CompoNet
(CEI 62026-7:2010, modifiée)

Niederspannungsschaltgeräte -
Steuerung-Geräte-Netzwerke (CDIs) -
Teil 7: CompoNet
(IEC 62026-7:2010, modifiziert)

This European Standard was approved by CENELEC on 2012-12-03. 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

This document (EN 62026-7:2013) consists of the text of IEC 62026-7:2010 prepared by IEC/SC 17B "Low-voltage switchgear and controlgear" of IEC/TC 17 "Switchgear and controlgear", together with the common modifications prepared by CLC/TC 17B "Low-voltage switchgear and controlgear".

The following dates are fixed:

- latest date by which this document has to be implemented (dop) 2013-12-03
at national level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting (dow) 2015-12-03
with this document have to be withdrawn

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 62026-7:2010 are prefixed "Z".

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 2004/108/EC, see informative Annex ZZ, which is an integral part of this document.

This standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

Endorsement notice

The text of the International Standard IEC 62026-7:2010 was approved by CENELEC as a European Standard with agreed common modifications.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61000-4-11	NOTE Harmonised as EN 61000-4-11.
IEC 61158 series	NOTE Harmonised in EN 61158 series.
IEC 62026-3:2008	NOTE Harmonised as EN 62026-3:2009 (not modified).

COMMON MODIFICATIONS

9.2.8.1 General

Add the following note at the end of 9.2.8.1:

NOTE The criteria are those listed in the specifications of 8.7.2 "Immunity".

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 Where 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>
CISPR 11 (mod)	2009	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement	EN 55011	2009
IEC 60512-1	-	Connectors for electronic equipment - Tests and measurements - Part 1: General	EN 60512-1	2001
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May + A1	1991 1993 2000
IEC 61000-4-2	-	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	2009
IEC 61000-4-3	-	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3 + A1 + A2	2006 2008 2010
IEC 61000-4-4	-	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4 + A1	2004 2010
IEC 61000-4-5	-	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	2006
IEC 61000-4-6	-	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	2009
IEC 61076-2-101	-	Connectors for electronic equipment - Product requirements - Part 2-101: Circular connectors - Detail specification for M12 connectors with screw-locking	EN 61076-2-101	2008
IEC 61131-2	-	Programmable controllers - Part 2: Equipment requirements and tests	EN 61131-2	2007

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61158-5-2	2007	Industrial communication networks - Fieldbus specifications - Part 5-2: Application layer service definition - Type 2 elements	EN 61158-5-2 ¹⁾	2008
IEC 61158-6-2	2007	Industrial communication networks - Fieldbus specifications - Part 6-2: Application layer protocol specification - Type 2 elements	EN 61158-6-2 ²⁾	2008
IEC 61918	2010	Industrial communication networks - Installation of communication networks in industrial premises	-	-
IEC 62026-1	-	Low-voltage switchgear and controlgear - Controller-device interfaces (CDIs) - Part 1: General rules	EN 62026-1	2007
ISO/IEC 7498-1	-	Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model	EN ISO/IEC 7498-1	-

1) EN 61158-5-2 is superseded by EN 61158-5-2:2012, which is based on IEC 61158-5-2:2010.

2) EN 61158-6-2 is superseded by EN 61158-6-2:2012, which is based on IEC 61158-6-2:2010.

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 Article 1 of Annex I of Directive 2004/108/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.

CONTENTS

FOREWORD.....	13
INTRODUCTION.....	15
1 Scope	17
2 Normative references	17
3 Terms, definitions, symbols, abbreviated terms and conventions	18
3.1 Terms and definitions	18
3.2 Symbols and abbreviated terms	21
4 Classification.....	22
4.1 General.....	22
4.2 Network specifications	24
4.3 Components	24
4.4 CompoNet communication model	25
4.5 CompoNet and CIP	25
5 Characteristics	26
5.1 Communication cycle.....	26
5.1.1 General	26
5.1.2 Time domains	26
5.1.3 A typical communication cycle	27
5.2 Messaging protocol.....	27
5.2.1 Message frame format	27
5.2.2 Message frame types	29
5.2.3 Explicit messaging	52
5.2.4 Explicit messaging client/server timing requirement	62
5.3 CompoNet communication object classes.....	64
5.3.1 General	64
5.3.2 Identity object class definition (class ID code: 01 _{Hex})	64
5.3.3 Message router object class definition (class ID code: 02 _{Hex}).....	64
5.3.4 Connection object class definition (class ID code: 05 _{Hex})	64
5.3.5 CompoNet Link object class definition (class ID code: F7 _{Hex}).....	74
5.3.6 CompoNet Repeater object (class ID code: F8 _{Hex}).....	80
5.4 Network access state machine	82
5.4.1 General	82
5.4.2 Network access events	82
5.4.3 State transition diagram	84
5.4.4 Data rate auto-detection.....	85
5.4.5 Duplicate MAC ID detection.....	86
5.4.6 Repeater behaviour.....	87
5.5 I/O connection	88
5.6 TDMA.....	88
5.6.1 General	88
5.6.2 Data link timing features.....	89
5.6.3 Calculation of Time Domain.....	92
5.7 Physical layer.....	98
5.7.1 General	98
5.7.2 Physical signalling	98
5.7.3 Master port requirements	98

5.7.4	Slave port requirements	101
5.7.5	Receiving signal requirements for master and slave ports	104
5.7.6	Requirements for digital processing	105
5.7.7	Recommended circuits and component parameters	108
5.7.8	Isolation	113
5.7.9	Transmission medium	114
5.7.10	Topology	115
5.7.11	Link power	121
5.7.12	Repeater implementation	124
6	Product information	125
7	Normal service, mounting and transport conditions	125
7.1	Normal service conditions	125
7.1.1	General	125
7.1.2	Ambient air temperature	126
7.1.3	Altitude	126
7.1.4	Climatic conditions	126
7.2	Conditions during transport and storage	126
7.3	Mounting	126
8	Constructional and performance requirements	126
8.1	Indicators and configuration switches	126
8.1.1	Status indicators	126
8.1.2	Switches	128
8.1.3	CompoNet marking	129
8.2	CompoNet cable	130
8.2.1	Overview	130
8.2.2	Cable profile template	131
8.2.3	Round cable I profile	132
8.2.4	Round cable II profile	134
8.2.5	Flat cable I profile	136
8.2.6	Flat cable II profile	139
8.3	Terminator	141
8.3.1	General	141
8.3.2	Terminating resistor	141
8.3.3	Terminating capacitor	141
8.4	Connectors	141
8.4.1	General	141
8.4.2	Template	141
8.4.3	Engaging specification for connector profiles: open, flat I, flat II	143
8.4.4	Specifications of hooks for connector profiles: open, flat I, flat II	145
8.4.5	Open connector profile	146
8.4.6	Profile of flat connector I	150
8.4.7	Profile of flat connector II	155
8.4.8	Profile of sealed M12 connector	158
8.5	Node power supply implementation	159
8.5.1	General	159
8.5.2	Requirement for node power supply connection	159
8.5.3	The requirements for nodes powered by network power supplies:	160
8.6	Miswiring protection	161
8.7	Electromagnetic compatibility (EMC)	161

8.7.1	General	161
8.7.2	Immunity.....	161
8.7.3	Emissions	162
9	Tests.....	162
9.1	General	162
9.2	Electrical testing.....	163
9.2.1	Slave port operation voltage test	163
9.2.2	Reverse connected power supply line.....	163
9.2.3	Momentary power interruption	164
9.2.4	Isolation.....	164
9.2.5	Input impedance	165
9.2.6	Output waveform.....	166
9.2.7	Minimum input waveform.....	166
9.2.8	Electromagnetic compatibility testing	167
9.3	Mechanical test	168
9.4	Logical test.....	168
9.4.1	General	168
9.4.2	Test of slaves and repeaters	168
9.4.3	Test of master.....	171
Annex A	(normative) CompoNet common services	174
Annex B	(normative) CompoNet error codes.....	175
Annex C	(normative) Connection path attribute definition	176
Annex D	(normative) Data type specification and encoding	177
Annex E	(normative) Communication objects library	181
Annex F	(normative) Value ranges	182
Annex G	(normative) CN default time domain	183
Bibliography		187
Figure 1	– Segment layer	23
Figure 2	– CompoNet components	25
Figure 3	– Time domains.....	26
Figure 4	– A typical communication cycle	27
Figure 5	– A general frame.....	27
Figure 6	– Preamble of frames	28
Figure 7	– Transmission direction.....	28
Figure 8	– Transmission direction.....	29
Figure 9	– OUT frame format	30
Figure 10	– OUT command code	30
Figure 11	– TRG frame format.....	32
Figure 12	– TRG command code.....	32
Figure 13	– CN frame format.....	32
Figure 14	– CN command code	33
Figure 15	– IN frame format	34
Figure 16	– IN command code.....	35
Figure 17	– A_EVENT frame format	35

Figure 18 – A_EVENT command code.....	36
Figure 19 – B_EVENT frame format	37
Figure 20 – B_EVENT command code meanings	38
Figure 21 – B_EVENT message format	39
Figure 22 – E_CMD block	39
Figure 23 – Group block.....	40
Figure 24 – Item block	40
Figure 25 – Status Read (STR Response) event data	43
Figure 26 – Configuration event data (STW Request)	45
Figure 27 – Poll data.....	46
Figure 28 – B_EVENT general decoding phase	47
Figure 29 – Flow chart for processing a matched STW request	49
Figure 30 – BEACON frame format.....	50
Figure 31 – BEACON command code.....	50
Figure 32 – Object diagram of A_Event message flow	52
Figure 33 – A_EVENT message format	52
Figure 34 – Compact message type request format (non-fragmented frame/first fragment frame).....	53
Figure 35 – Expanded message type request format (non-fragmented frame/first fragment frame).....	54
Figure 36 – Compact/Expanded message successful response format (unfragmented frame/first fragment frame).....	54
Figure 37 – Compact/Expanded message unsuccessful response format (unfragmented frame/first fragment frame).....	55
Figure 38 – Compact/Expanded message request format for fragments	55
Figure 39 – Compact/Expanded message response format for fragments	55
Figure 40 – Service data format	56
Figure 41 – Predefined master/slave I/O connection state transition diagram	70
Figure 42 – Predefined master/slave I/O connection state transition diagram	72
Figure 43 – Connection flow.....	73
Figure 44 – Allocate request service data	78
Figure 45 – Allocate response service data	79
Figure 46 – Release request service data.....	79
Figure 47 – Reset service parameter.....	82
Figure 48 – State transition diagram.....	84
Figure 49 – Sub-state of non-participated state	85
Figure 50 – Sub-state of participated state	85
Figure 51 – Data rate detection diagram.....	86
Figure 52 – BEACON changed by repeaters	88
Figure 53 – Multicast I/O connections.....	88
Figure 54 – Master MAC and Phy. circuit diagram	89
Figure 55 – Slave MAC and Phy. circuit diagram	90
Figure 56 – Repeater MAC and Phy. circuit diagram.....	91
Figure 57 – Transmission process.....	92

Figure 58 – Transmission cycle model.....	93
Figure 59 – CnDefaultTimeDomain cycle model.....	95
Figure 60 – Master event communication model	96
Figure 61 – Slave event communication model	97
Figure 62 – Manchester encoding (inverted)	98
Figure 63 – Master port transmit mask	100
Figure 64 – Output waveform test circuit for master or slave port	101
Figure 65 – Slave port transmit mask	103
Figure 66 – Receive mask 1	104
Figure 67 – Receive mask 2	105
Figure 68 – Receive mask 3	105
Figure 69 – PHY/MAC interface diagram	106
Figure 70 – Digital receive mask 1	106
Figure 71 – Digital receive mask 2	107
Figure 72 – Digital receive mask 3	107
Figure 73 – Logical transmit mask	108
Figure 74 – Recommended circuit for a master port	109
Figure 75 – Recommended circuit for a slave port	110
Figure 76 – Transformer symbol	110
Figure 77 – Driver voltage measurement circuit	112
Figure 78 – Propagation delay test circuit	112
Figure 79 – An isolation example of a master port	113
Figure 80 – An isolation example of an I/O module with connectivity to other power sources	114
Figure 81 – An isolation example of a simple slave that requires connection to devices with ungrounded signal wiring	114
Figure 82 – An isolation example of a non-network powered slave	114
Figure 83 – Media topology	116
Figure 84 – Position of a terminator	117
Figure 85 – Number of devices per segment	117
Figure 86 – Cable length limitation Illustration	118
Figure 87 – Branch restriction	118
Figure 88 – Wiring selection	119
Figure 89 – General wiring method	120
Figure 90 – Flexible wiring method	121
Figure 91 – Power dispatching method	123
Figure 92 – Network segment powered by the master	123
Figure 93 – Connection with power supply	123
Figure 94 – Network segments powered by repeaters	124
Figure 95 – A simplified diagram for a repeater	125
Figure 96 – Outline of round cable II	136
Figure 97 – Outline of flat cable I	138
Figure 98 – Dimension of flat cable I	139
Figure 99 – Outline of flat cable II	140

Figure 100 – Dimension of flat cable II	141
Figure 101 – Engaging dimensions of plug connector	143
Figure 102 – Contact space for plug connector.....	144
Figure 103 – Engaging dimensions of jack connector.....	145
Figure 104 – Connector hook	146
Figure 105 – Open connector plug (informative)	148
Figure 106 – Open connector jack (informative).....	149
Figure 107 – Method to measure contact resistance (open connectors).....	150
Figure 108 – De-rating current for connectors.....	150
Figure 109 – Flat connector I plug	153
Figure 110 – Flat connector I jack (informative)	154
Figure 111 – Method to measure contact resistance (flat I, II connectors).....	155
Figure 112 – Flat connector II plug (informative).....	157
Figure 113 – Flat connector II jack (informative)	157
Figure 114 – Marking connector for trunk lines	158
Figure 115 – M12 connector pinout	159
Figure 116 – Link power circuits.....	160
Figure 117 – Power-drop along a cable	160
Figure 118 – Power design for a node (informative)	161
Figure 119 – Operating voltage test circuit	163
Figure 120 – Reverse connected power supply line	164
Figure 121 – Isolation	165
Figure 122 – Input impedance	165
Figure 123 – Output slave test circuit for slave port	166
Figure 124 – Minimum input waveform test circuit.....	167
Figure 125 – Minimum input waveform test system	167
Figure 126 – Data link test for slave and repeater DUT	169
Figure 127 – Test configuration for minimum traffic of master DUT	172
Figure 128 – Test configuration for proxy of master DUT	173
Figure D.1 – An example to generate CRC	180
Table 1 – Network specifications	24
Table 2 – OSI reference model and CompoNet.....	26
Table 3 – Command codes.....	28
Table 4 – Command restrictions for slave MAC	29
Table 5 – Block name description.....	30
Table 6 – CN target	30
Table 7 – I/O refresh.....	31
Table 8 – Block name description.....	32
Table 9 – Block name description.....	33
Table 10 – Duplication checking function status.....	33
Table 11 – A_EVENT sending request.....	33
Table 12 – Status of CN frames	34

Table 13 – Warning bit of CN frames	34
Table 14 – Alarm bit of CN frames	34
Table 15 – Block name description	34
Table 16 – Encoded length	35
Table 17 – Block name description	36
Table 18 – Acknowledgement bit of A_EVENT	36
Table 19 – Command type of A_EVENT	36
Table 20 – Block name description	37
Table 21 – Acknowledgement bit of B_EVENT	38
Table 22 – Command type of B_EVENT	38
Table 23 – E_CMD block meanings	39
Table 24 – Group block meanings	40
Table 25 – Item block meanings	40
Table 26 – Processing rules for a STR request	48
Table 27 – Processing rules for an A_EVENT poll request	48
Table 28 – Processing rules for a STW request	48
Table 29 – STW request commands	50
Table 30 – Block name description	50
Table 31 – Control code of BEACON frames	51
Table 32 – Speed Code of BEACON frames	51
Table 33 – Control code format	56
Table 34 – A Data encoding example	58
Table 35 – Fragment type values	59
Table 36 – Fragmented transmission	60
Table 37 – Fragmented reception	61
Table 38 – Explicit message timeout values	63
Table 39 – Maximum value of expected packet rate	65
Table 40 – CompoNet connection object attribute access rules	65
Table 41 – CompoNet Link object specific additional error codes	68
Table 42 – Connection instance ID for predefined master/slave connections	69
Table 43 – Default multicast poll connection object attribute values	69
Table 44 – Predefined master/slave I/O connection state event matrix	70
Table 45 – CompoNet Link class attributes	74
Table 46 – CompoNet Link class services	74
Table 47 – CompoNet Link instance attributes	74
Table 48 – MAC ID range	75
Table 49 – Data rate	76
Table 50 – Allocation choice	76
Table 51 – Data rate switch value	76
Table 52 – Bit definitions for node state octet	77
Table 53 – Bit definitions for node network state	77
Table 54 – CompoNet Link object common services	77
Table 55 – CompoNet Link Object class specific services	78

Table 56 – Allocation choice octet contents	78
Table 57 – EPR value	79
Table 58 – Explicit message timer	79
Table 59 – Release master/slave connection set request parameters	79
Table 60 – Release choice octet contents	80
Table 61 – Repeater class attribute	80
Table 62 – Repeater class services	80
Table 63 – Instance attributes of repeater class	81
Table 64 – Repeater common service	82
Table 65 – Reset attributes	82
Table 66 – Data rate and network watchdog time periods	83
Table 67 – Description of the state machine	84
Table 68 – Duplicate MAC ID detection mechanism	87
Table 69 – Repeating directions of frames	87
Table 70 – Master timing features	89
Table 71 – Slave timing features	90
Table 72 – Repeater timing features	91
Table 73 – Cable propagation delay	91
Table 74 – Maximum cable length	92
Table 75 – Parameters in TimeDomain calculation	92
Table 76 – Frame marks	93
Table 77 – TimeDomain settings for nodes at first segment layer	94
Table 78 – TimeDomain settings for nodes at 2 nd and 3 rd segment layers	94
Table 79 – Repeater delay for CnDefaultTimeDomain calculation	95
Table 80 – Parameters for CnDefaultTimeDomain calculation	95
Table 81 – First segment layer settings	96
Table 82 – Settings for 2 nd and 3 rd segment layers	96
Table 83 – Parameters for Event Time Domain calculations	97
Table 84 – CompoNet Manchester encoding	98
Table 85 – Allowable connectors for the master port	98
Table 86 – Master port impedance during receive	99
Table 87 – Master port impedance during transmit	99
Table 88 – Master port transmit specifications for data rate of 4 Mbit/s; 3 Mbit/s and 1,5 Mbit/s	100
Table 89 – Master port transmit specifications for data rate of 93,75 kbit/s	100
Table 90 – Allowable connectors for permanently attached cables	101
Table 91 – Allowable connectors for the slave port	101
Table 92 – Slave port impedance during receive	102
Table 93 – Slave port impedance during transmit	102
Table 94 – Slave port transmit specifications for data rate of 4 Mbit/s; 3 Mbit/s and 1,5 Mbit/s	103
Table 95 – Slave port transmit specifications for data rate of 93,75 kbit/s	103
Table 96 – Specifications for digital receive mask 1	106
Table 97 – Specifications for digital receive mask 2	107

Table 98 – Specifications for digital receive mask 3	107
Table 99 – Specifications for logical transmit	108
Table 100 – Specification for pulse transformer	111
Table 101 – Specifications for transformer core	111
Table 102 – Specifications for transceiver	112
Table 103 – Sending	113
Table 104 – Receiving	113
Table 105 – Cable types	115
Table 106 – Cable conductor colours	115
Table 107 – CompoNet round cable I: network limitations	117
Table 108 – CompoNet 4-conductor cables: network limitations	118
Table 109 – Resistance characteristics	121
Table 110 – Network power supply specifications	121
Table 111 – Local power supply specifications	122
Table 112 – Node external power supply specifications	122
Table 113 – Module status indicator	127
Table 114 – CDI status indicator	127
Table 115 – Data rate switch encoding	128
Table 116 – Addresses switches	128
Table 117 – Indicator marking	129
Table 118 – Node address switch and device type marking	129
Table 119 – Connector marking	130
Table 120 – Cable profile: data pair specification	131
Table 121 – Cable profile: d.c. power pair specification	131
Table 122 – Cable profile: general specification	132
Table 123 – Round cable I: data pair specification	133
Table 124 – Round cable I: d.c. power pair specification	133
Table 125 – Round cable I: general specification	134
Table 126 – Round cable II: data pair specification	135
Table 127 – Round cable II: d.c. power pair specification	135
Table 128 – Round cable II: general specification	136
Table 129 – Flat cable I: data pair specification	137
Table 130 – Flat cable I: d.c. power pair specification	137
Table 131 – Flat cable I: general specification	138
Table 132 – Flat cable II: data pair specification	139
Table 133 – Flat cable II: d.c. power pair specification	140
Table 134 – Flat cable II: general specification	140
Table 135 – Connector profile template	142
Table 136 – Specification of open connector	147
Table 137 – Specification of flat connector I	151
Table 138 – Specification of flat connector II	155
Table 139 – Specification of sealed M12 connector	158
Table 140 – Input impedance for master	166

Table 141 – Input impedance for slave	166
Table B.1 – Newly defined CompoNet error codes	175
Table F.1 – MAC ID and node address ranges.....	182
Table G.1 – CN default time domain table for 4 Mbit/s data rate.....	183
Table G.2 – CN default time domain table for 3 Mbit/s data rate.....	184
Table G.3 – CN default time domain table for 1,5 Mbit/s data rate.....	185
Table G.4 – CN default time domain table for 93,75 kbit/s data rate	186

This document is a preview generated by EVS

NOTE This page was inserted to preserve the even/odd alignment of the following pages.

This document is a preview generated by EVS

INTRODUCTION

CompoNet™ is intended for use in, but is not limited to, industrial automation applications. These applications may include devices such as limit switches, proximity sensors, electro-pneumatic valves, relays, motor starters, operator interface panels, analogue inputs, analogue outputs and controllers.

Patent declaration

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of the following patents owned by OMRON Corporation:

JP Patent Number 4023342	DUPLICATE MAC. ADDRESS DETECTING METHOD, SLAVE AND MASTER IN FIELD BUS SYSTEM, AND FIELD BUS
JP Patent Number 4107110	FIELD BUS SYSTEM, CONNECTION CONFIRMING METHOD AND MASTER
JP Patent Number 3293089	REMOTE I/O SYSTEM FOR PLC AND EXECUTION METHOD THEREOF
JP Patent Number 3925660 and its counterpart patents in other countries	STARTING CONTROL METHOD OF COMMUNICATION MASTER
JP Patent Number 4006605 and its counterpart patents in other countries	COMMUNICATION SYSTEM REDUCED IN INFLUENCE OF REPEATER DELAY
JP Application Number 2004-059864	COMMUNICATION DEVICE AND NETWORK SYSTEM
JP Application Number 2004-022243	CONNECTOR FOR CONNECTION CABLE
JP Application Number 2007-167281	COMMUNICATION SYSTEM REDUCED IN INFLUENCE OF REPEATER DELAY
JP Application Number 2005-252414	NETWORK REPEATING WITH FILTERING FUNCTION
JP Application Number 2005-252758	A EVENT COMMUNICATION METHOD FOR PROGRAMABLE CONTROLLER SYSTEMS
JP Application Number 2005-203496	GETTING NETWORK CONFIGURATION INFORMATION IN PLC SYSTEMS
JP Application Number 2002-334265	A I/O MAPPING METHOD FOR NETWORK SYSTEMS AND CONTROLLERS
JP Application Number 2005-252682	A SCHEDULING METHOD FOR EVENT COMMUNICATIONS
JP Application Number 2005-105543 and its counterpart patents in other countries	RECEIVED DATA COMPENSATION DEVICE

IEC takes no position concerning the evidence, validity and scope of these patent rights.

The holder of this patent right has assured the IEC that he/she is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the

world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from:

ODVA, Inc.
2370 E. Stadium Boulevard #1000
Ann Arbor, Michigan U.S.A. 48104

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ISO (www.iso.org/patents) and IEC (http://www.iec.ch/tctools/patent_decl.htm) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR – CONTROLLER-DEVICE INTERFACES (CDIs) –

Part 7: CompoNet

1 Scope

This part of IEC 62026 specifies an interface system providing bit-level and word-level communication between a controller and control circuit devices such as sensors, actuators, and switching elements. The interface system uses cabling with round or flat profiles containing a two conductor signalling pair and optionally a two conductor power supply pair. This part establishes requirements for the interchangeability of components with such interfaces.

This part of IEC 62026 specifies the following particular requirements for CompoNet™ 1):

- requirements for interfaces between a controller and control circuit devices;
- normal service conditions for devices;
- constructional and performance requirements;
- tests to verify conformance to requirements.

These particular requirements apply in addition to the general requirements of IEC 62026-1.

2 Normative references

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

IEC 60512-1, *Connectors for electronic equipment – Tests and measurements – Part 1: General*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

1) CompoNet™ is a trade name of Open DeviceNet Vendor Association, Inc. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this standard does not require use of the trade name CompoNet™. Use of the trade name CompoNet™ requires permission of Open DeviceNet Vendor Association, Inc.

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61076-2-101, *Connectors for electronic equipment – Product requirements – Part 2-101: Circular connectors – Detail specification for M12 connectors with screw-locking*

IEC 61131-2, *Programmable controllers – Part 2: Equipment requirements and tests*

IEC 61158-5-2:2007, *Industrial communication networks – Fieldbus specifications – Part 5-2: Application layer service definition – Type 2 elements*

IEC 61158-6-2:2007, *Industrial communication networks – Fieldbus specifications – Part 6-2: Application layer protocol specification – Type 2 elements*

IEC 61918:2010, *Industrial communication networks – Installation of communication networks in industrial premises*

IEC 62026-1, *Low-voltage switchgear and controlgear – Controller-device interfaces (CDIs) – Part 1: General rules*

CISPR 11:2009, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

ISO/IEC 7498-1, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

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

3.1.1

BEACON

frame generated by the master to notify slaves and repeaters of the present transmission speed and network connection information

3.1.2

bit slave

I/O device working with data lengths not more than 4 bits

3.1.3

branch

a piece of cable making a T connection to a trunk or sub-trunk

3.1.4

CDI status indicator

visual indication reporting the status of the communication link at a CompoNet device

3.1.5

circuit speed

baud rate

communication rate in signalling symbols or marks/s on the transmission medium

NOTE Each CompoNet bit is Manchester encoded using two marks so a circuit speed of 6 Mmarks/s gives a transmission speed or data rate of 3 Mbits/s.