IEC 61784-3-13

Edition 1.0 2010-06

INTERNATIONAL STANDARD

colour inside

Withdrawn
iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/iec/a7a0c38-48a2-42c6-a726-8a8809dd5dc5/iec-61784-3-13-2010

Industrial communication networks – Profiles – Part 3-13: Functional safety fieldbuses – Additional specifications for CPF 13

IEC 61784-3-13:2010(E)

THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2010 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 Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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.

- Catalogue of IEC publications: www.iec.ch/searchpub
The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub
Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv
If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

Withdrawn
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/iec/a72a0c38-48a2-42c6-a726-8a8809dd5dc5/iec-61784-3-13-2010

IEC 61784-3-13

Edition 1.0 2010-06

INTERNATIONAL STANDARD

Industrial communication networks – Profiles – Part 3-13: Functional safety fieldbuses – Additional specifications for CPF 13

iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/iec/a7a0c38-48a2-42c6-a726-8a8809dd5dc5/iec-61784-3-13-2010
Withdrawn

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE XH

ICS 25.040.40; 35.100.05

ISBN 978-2-88910-982-1

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 13
0 Introduction 15
0.1 General 15
0.2 Patent declaration 17
1 Scope 19
2 Normative references 19
3 Terms, definitions, symbols, abbreviated terms and conventions 20
3.1 Terms and definitions 20
3.1.1 Common terms and definitions 20
3.1.2 CPF 13: Additional terms and definitions 24
3.2 Symbols and abbreviated terms 25
3.2.1 Common symbols and abbreviated terms 25
3.2.2 CPF 13: Additional symbols and abbreviated terms 26
3.3 Conventions 27
3.3.1 Hexadecimal values 27
3.3.2 Binary values 27
3.3.3 Wildcard digits 27
3.3.4 Diagrams 27
4 Overview of FSCP 13/1 (Ethernet POWERLINK safety) 27
4.1 Functional Safety Communication Profile 13/1 27
4.2 Technical overview 28
5 General 28
5.1 External documents providing specifications for the profile 28
5.2 Safety functional requirements 29
5.3 Safety measures 29
5.4 Safety communication layer structure 31
5.5 Relationships with FAL (and DLL, PhL) 32
5.5.1 General 32
5.5.2 Data types 32
6 Safety communication layer services 32
6.1 Modelling 32
6.1.1 Reference model 32
6.1.2 Communication model 33
6.1.3 Device roles and topology 34
6.2 Life cycle model 38
6.2.1 General 38
6.2.2 Concept, planning and implementation 38
6.2.3 Commissioning 39
6.2.4 Operation terms 40
6.2.5 Maintenance terms 42
6.3 Non safety communication layer 42
6.3.1 General 42
6.3.2 Requirements for data transport 42
6.3.3 Domain protection and separation 46
7 Safety communication layer protocol 46
7.1 Safety PDU format 46

Withdrawn
iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/iec/61784-3-13-2010

7.1.1 General 46
7.1.2 Address field (ADR) 48
7.1.3 PDU identification field (ID) 49
7.1.4 Length field (LE) 50
7.1.5 Consecutive Time field (CT) 50
7.1.6 Payload data field (DB0 to DBn) 50
7.1.7 Cyclic Redundancy Check field (CRC-8 / CRC-16) 50
7.1.8 Time Request Address field (TADR) 50
7.1.9 Time Request Distinctive Number field (TR) 51
7.1.10 UDID of SCM coding (UDID of SCM) 51
7.2 Safety Process Data Objects (SPDO) 51
7.2.1 General 51
7.2.2 SPDO telegram types 51
7.2.3 Data Only telegram 51
7.2.4 Data with Time Request telegram 52
7.2.5 Data with Time Response telegram 53
7.3 Safety Service Data Object (SSDO) 54
7.3.1 General 54
7.3.2 SSDO telegram types 54
7.3.3 SSDO services and protocols 55
7.3.4 SSDO Initiate Download 56
7.3.5 SSDO Segmented Download 57
7.3.6 SSDO Initiate Upload 58
7.3.7 SSDO Segmented Upload 59
7.3.8 SSDO Abort 60
7.4 Safety Network Management (SNMT) 62
7.4.1 General 62
7.4.2 SNMT telegram types 62
7.4.3 SNMT services and protocols 62
7.5 Safety Object dictionary (SOD) 75
7.5.1 General 75
7.5.2 Object dictionary entry definition 75
7.5.3 Data type entry specification 81
7.5.4 Object description 82
7.6 Safety related PDO mapping 117
7.6.1 General 117
7.6.2 Transmit SPDOs 118
7.6.3 Receive SPDOs 118
7.6.4 SPDO mapping parameter 118
7.6.5 SPDO mapping example 119
7.6.6 SPDO error handling 121
7.7 State and sequence diagrams 121
7.7.1 Safety Process Data Object (SPDO) 121
7.7.2 Time synchronization and validation 125
7.7.3 Safety Service Data Object (SSDO) 134
7.7.4 SOD access 136
7.7.5 Safety Network Management Object (SNMT) 141
7.7.6 SN power up 143
7.7.7 SN power down 147

iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/iec/...-61784-3-13-2010
Withdrawn

7.7.8 SN recovery after Restart / Error 147
7.7.9 SCM power up 147
7.7.10 Address verification 150
7.7.11 Commissioning mode 152
7.7.12 Handle single UDID mismatch 152
7.7.13 Activate SN 156
7.7.14 Device exchange 157
8 Safety communication layer management 157
8.1 General 157
8.2 Goals of parameterization 158
8.3 Initial configuration of a device 158
8.3.1 General 158
8.3.2 SD setup by only configuring the SCM 158
8.3.3 SD setup configuring each SN 159
8.4 Avoiding of parameterize the wrong device 159
8.5 Parameter check mechanism 159
9 System requirements 159
9.1 Indicators and switches 159
9.2 Installation guidelines 159
9.3 Safety function response time 159
9.4 Duration of demands 161
9.5 Constraints for calculation of system characteristics 161
9.5.1 General 161
9.5.2 Number of sinks limit 161
9.5.3 Message rate limit 161
9.5.4 Message payload limit 161
9.5.5 Residual error rate 161
9.6 Maintenance 161
9.6.1 Diagnostic information 161
9.6.2 Replacement of safety related devices 161
9.6.3 Modification 162
9.6.4 Machine part changing 162
9.6.5 Firmware update of safety related nodes 162
9.6.6 Machine check due to service interval 162
9.7 Safety manual 162
10 Assessment 162
10.1 General 162
10.2 CP 13/1 assessment 163
10.3 FSCP 13/1 conformance test 163
10.4 Approval of functional safety by competent assessment body 163
10.5 Summary 163
Annex A (informative) Additional information for functional safety communication profiles of CPF 13 164
A.1 Hash function calculation 164
A.2 Stochastic errors – general considerations 167
A.2.1 General 167
A.2.2 Error detection mechanisms 167
A.2.3 Calculations 169

Withdrawn
iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/iec/a7a0dc38-48a2-42c6-a726-8a8809dd5dc5/iec-61784-3-13-2010

A.3 Stochastic errors (case A) 169
A.3.1 General 169
A.3.2 Constraints 169
A.3.3 Residual error rate 169
A.3.4 Summary 170
A.4 Stochastic errors (case B) 170
A.4.1 General 170
A.4.2 Constraints 170
A.4.3 Bit error probability considerations 170
A.4.4 Residual error rate (payload 1—8) 171
A.4.5 Residual error rate (payload 9—254) 171
A.4.6 Summary 171
Annex B (informative) Information for assessment of the functional safety communication profiles of CPF 13 172
Bibliography 173

Table 1 – Communication errors and detection measures (cyclic) 29
Table 2 – Communication errors and detection measures (acyclic) 30
Table 3 – Device roles 35
Table 4 – PDU format 48
Table 5 – PDU identification field (ID) 49
Table 6 – Used ID field combinations 49
Table 7 – Request / response identification 49
Table 8 – Type of CRC depending on LE 50
Table 9 – SPDO telegram types (ID field, bits 2, 3 and 4) 51
Table 10 – Fields of SPDO_Data_Only telegram 52
Table 11 – Fields of SPDO_Data_with_Time_Request telegram 53
Table 12 – Fields of SPDO_Data_with_Time_Response telegram 53
Table 13 – SSDO telegram types (ID field, bits 2, 3 and 4) 54
Table 14 – SOD Access Command (SACmd) – bit coding 54
Table 15 – Fields of Initiate Download SSDO_Service_Request telegram 56
Table 16 – Fields of Initiate Download SSDO_Service_Response telegram 57
Table 17 – Fields of Segmented Download SSDO_Service_Request telegram 57
Table 18 – Fields of Segmented Download SSDO_Service_Response telegram 58
Table 19 – Fields of Initiate Upload SSDO_Service_Request telegram 58
Table 20 – Fields of Initiate Upload SSDO_Service_Response telegram 59
Table 21 – Fields of Segmented Upload SSDO_Service_Request telegram 60
Table 22 – Fields of Segmented Upload SSDO_Service_Response telegram 60
Table 23 – Fields of Segmented Upload SSDO_Service_Request telegram 60
Table 24 – Fields of Segmented Upload SSDO_Service_Response telegram 61
Table 25 – SSDO Abort codes 61
Table 26 – SNMT telegram types (ID field, bits 2, 3 and 4) 62
Table 27 – Fields of SNMT_Request_UDID telegram 63
Table 28 – Fields of SNMT_Response_UDID telegram 63

Withdrawn
iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/iec/e2a0e038-48a2-42c6-a726-8a8809dd5dc5/iec-61784-3-13-2010

Table 29 – Fields of SNMT_Assign_SADR telegram 64
Table 30 – Fields of SNMT_SADR_ Assigned telegram 65
Table 31 – Fields of SNMT_SN_reset_guarding_SCM telegram 65
Table 32 – SNMT request telegram types 66
Table 33 – SNMT response telegram types 66
Table 34 – Fields of SNMT_SN_set_to_PRE_OP telegram 66
Table 35 – Fields of SNMT_SN_status_PRE_OP telegram 67
Table 36 – Fields of SNMT_SN_set_to_OP telegram 68
Table 37 – Fields of SNMT_SN_status_OP telegram 68
Table 38 – Fields of SNMT_SN_busy telegram 68
Table 39 – Fields of SNMT_SN_FAIL telegram 69
Table 40 – SNMT_SN_FAIL Error Group values 69
Table 41 – SNMT_SN_FAIL Error Code values 69
Table 42 – Fields of SNMT_SN_ACK telegram 70
Table 43 – Fields of SNMT_SCM_set_to_STOP telegram 70
Table 44 – Fields of SNMT_SCM_set_to_OP telegram 71
Table 45 – Fields of SNMT_SCM_guard_SN telegram 72
Table 46 – Fields of SNMT_SN_status_OP/SNMT_SN_status_OP telegrams 72
Table 47 – Fields of SNMT_assign_additional_SADR telegram 73
Table 48 – Fields of SNMT_assigned_additional_SADR telegram 73
Table 49 – Fields of SNMT_assign_UDID_of_SCM telegram 74
Table 50 – Fields of SNMT_assigned_UDID_of_SCM telegram 74
Table 51 – Object type definition 75
Table 52 – Access attributes for data objects 77
Table 53 – SPDO mapping attributes for data objects 77
Table 54 – Basic data type object definition example 77
Table 55 – Compound data type object definition example 78
Table 56 – Sub index interpretation 78
Table 57 – NumberOfEntries sub index specification 79
Table 58 – RECORD type object sub index specification 79
Table 59 – ARRAY type object sub index specification 80
Table 60 – StructureOfObject encoding 80
Table 61 – Object dictionary data types 81
Table 62 – 0021h Compound data type description 82
Table 63 – 0021h Compound sub index descriptions 82
Table 64 – Standard objects 83
Table 65 – Common communication objects 83
Table 66 – Receive SPDO communication objects 83
Table 67 – Receive SPDO mapping objects 84
Table 68 – Transmit SPDO communication objects 84
Table 69 – Transmit SPDO mapping objects 84
Table 70 – SADR DVI list 84
Table 71 – Additional SADR list 85

Withdrawn
iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/sist/...-42c6-a726-8a8809dd5dc5/iec-61784-3-13-2010

Table 72 – SADR UDID list 85
Table 73 – Object 1001h Error Register 85
Table 74 – Object 1001h Error Register value interpretation 86
Table 75 – Object 1002h Manufacturer status register 86
Table 76 – Object 1003h Pre defined error field 87
Table 77 – Object 1003h sub index 00h 87
Table 78 – Object 1003h sub index 01h 87
Table 79 – Object 1003h sub index 02h to FDh 88
Table 80 – Object 100Ch Life Guarding 88
Table 81 – Object 100Ch sub index 00h 88
Table 82 – Object 100Ch sub index 01h 89
Table 83 – Object 100Ch sub index 02h 89
Table 84 – Object 100Dh Refresh Interval of Reset Guarding 90
Table 85 – Object 1018h Device Vendor Information 90
Table 86 – Object 1018h sub index 00h 90
Table 87 – Object 1018h sub index 01h 91
Table 88 – Object 1018h sub index 02h 91
Table 89 – Object 1018h sub index 03h 91
Table 90 – Object 1018h sub index 04h 92
Table 91 – Object 1018h sub index 05h 92
Table 92 – Object 1018h sub index 06h 92
Table 93 – Object 1018h sub index 07h 93
Table 94 – Structure of Revision Number 93
Table 95 – Object 1019h Unique Device ID 94
Table 96 – Object 101Ah Parameter Download 94
Table 97 – Object 101Bh SCM Parameters 95
Table 98 – Object 101Bh sub index 00h 95
Table 99 – Object 101Bh sub index 01h 95
Table 100 – Object 1200h Common Communication Parameter 96
Table 101 – Object 1200h sub index 00h 96
Table 102 – Object 1200h sub index 01h 96
Table 103 – Object 1200h sub index 02h 97
Table 104 – Object 1200h sub index 03h 97
Table 105 – Object 1200h sub index 04h 98
Table 106 – Object 1201h SSDO Communication Parameter 98
Table 107 – Object 1201h sub index 00h 98
Table 108 – Object 1201h sub index 01h 99
Table 109 – Object 1201h sub index 02h 99
Table 110 – Object 1202h SNMT Communication Parameter 99
Table 111 – Object 1202h sub index 00h 100
Table 112 – Object 1202h sub index 01h 100
Table 113 – Object 1202h sub index 02h 100
Table 114 – Object 1400h -- 17FEh RxSPDO Communication Parameter 101

Withdrawn
iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/sist/[illegible]-48a2-42c6-a726-8a8809dd5dc5/iec-61784-3-13-2010

Table 115 – Object 1400h -- 17FEh sub index 00h 101
Table 116 – Object 1400h -- 17FEh sub index 01h 101
Table 117 – Object 1400h -- 17FEh sub index 02h 102
Table 118 – Object 1400h -- 17FEh sub index 03h 102
Table 119 – Object 1400h -- 17FEh sub index 04h 102
Table 120 – Object 1400h -- 17FEh sub index 05h 103
Table 121 – Object 1400h -- 17FEh sub index 06h 103
Table 122 – Object 1400h -- 17FEh sub index 07h 103
Table 123 – Object 1400h -- 17FEh sub index 08h 104
Table 124 – Object 1400h -- 17FEh sub index 09h 104
Table 125 – Object 1400h -- 17FEh sub index 0Ah 104
Table 126 – Object 1400h -- 17FEh sub index 0Bh 105
Table 127 – Object 1400h -- 17FEh sub index 0Ch 105
Table 128 – Object 1800h -- 1BFEh RxSPDO communication parameter 105
Table 129 – Object 1800h -- 1BFEh sub index 00h 106
Table 130 – Object 1800h -- 1BFEh sub index 01h 106
Table 131 – Object 1800h -- 1BFEh sub index 02h -- FDh 106
Table 132 – 1Object C00h -- 1FFEh TxSPDO communication parameter 107
Table 133 – Object 1C00h -- 1FFEh sub index 00h 107
Table 134 – Object 1C00h -- 1FFEh sub index 01h 107
Table 135 – Object 1C00h -- 1FFEh sub index 02h 108
Table 136 – Object 1C00h -- 1FFEh sub index 03h 108
Table 137 – Object C000h -- C3FEh TxSPDO mapping parameter 108
Table 138 – Object C000h -- C3FEh sub index 00h 109
Table 139 – Object C000h -- C3FEh sub index 01h 109
Table 140 – Object C000h -- C3FEh sub index 02h -- FDh 109
Table 141 – Object C400h -- C7FEh SADR-DVI list 110
Table 142 – Object C000h -- C3FEh sub index 00h 110
Table 143 – Object C000h -- C3FEh sub index 01h 110
Table 144 – Object C000h -- C3FEh sub index 02h 111
Table 145 – Object C000h -- C3FEh sub index 03h 111
Table 146 – Object C000h -- C3FEh sub index 04h 111
Table 147 – Object C000h -- C3FEh sub index 05h 112
Table 148 – Object C000h -- C3FEh sub index 06h 112
Table 149 – Object C000h -- C3FEh sub index 07h 112
Table 150 – Object C000h -- C3FEh sub index 08h 113
Table 151 – Object C000h -- C3FEh sub index 09h 113
Table 152 – Object C000h -- C3FEh sub index 0Ah 113
Table 153 – Object C000h -- C3FEh sub index 0Bh 114
Table 154 – Object C801h -- CBFFh Additional SADR list 114
Table 155 – Object C801h -- CBFFh sub index 00h 114
Table 156 – Object C801h -- CBFFh sub index 01h 115
Table 157 – Object C801h -- CBFFh sub index 02h 115

Withdrawn
iTeh Standards
(https://standards.iteh.ai)
Document Preview
https://standards.iteh.ai/catalog/standards/sist/60e4b2a2-42c6-a726-8a8809dd5dc5/iec-61784-3-13-2010

Table 158 – Object Additional SADR List Example 116
Table 159 – Object CC01h -- CFFFh SADR-UDID list 116
Table 160 – Object C801h -- CBFFh sub index 00h 116
Table 161 – Object C801h -- CBFFh sub index 01h -- FDh 117
Table 162 – SADR-UDID List Example 117
Table 163 – Structure of SPDO mapping entry 118
Table 164 – Mapping example table 1 119
Table 165 – Mapping example table 2 119
Table 166 – Mapping example table 3 120
Table 167 – Mapping example table 4 120
Table 168 – Mapping example table 5 120
Table 169 – Mapping example table 6 120
Table 170 – Mapping example table 7 121
Table 171 – SPDO communication producer item description 122
Table 172 – SPDO communication producer state description 122
Table 173 – SPDO communication consumer item description 123
Table 174 – SPDO communication consumer state description 124
Table 175 – SPDO communication consumer telegram validation item description 125
Table 176 – SPDO communication consumer telegram validation state description 125
Table 177 – Time synchronization item description 126
Table 178 – Time validation item description 129
Table 179 – Extended time synchronization item description 131
Table 180 – Time synchronization producer item description 132
Table 181 – Time synchronization producer state description 132
Table 182 – Time synchronization consumer item description 133
Table 183 – Time synchronization consumer state description 134
Table 184 – SSDO client item description 135
Table 185 – SSDO client state description 135
Table 186 – SSDO server state description 136
Table 187 – SOD access item description 137
Table 188 – Segmented SOD access client item description 139
Table 189 – Segmented SOD download access client state description 139
Table 190 – Segmented SOD access server item description 141
Table 191 – Segmented SOD access server state description 141
Table 192 – SNMT master item description 142
Table 193 – SNMT master state description 142
Table 194 – SNMT slave state description 143
Table 195 – SN power up state description 144
Table 196 – State and communication object relation 144
Table 197 – SN Pre-Operational state item description 145
Table 198 – SN Pre-Operational state description 146
Table 199 – SN Operational state item description 147
Table 200 – SN Operational state description 147

Withdrawn
iTeh Standards
(https://standards.iteh.ai)
Document Preview
https://standards.iteh.ai/catalog/standards/sist/8a8809dd5dc5/iec-61784-3-13-2010

Table 201 – SCM power up state description 148
Table 202 – State and communication object relation 148
Table 203 – SCM Operational state item description 150
Table 204 – SCM Operational state description 150
Table 205 – Address verification item description 152
Table 206 – Address verification state description 152
Table 207 – SCM handle single UDID mismatch state description 153
Table 208 – SCM verify parameters state description 156
Table 209 – Activate SN state description 157

Figure 1 – Relationships of IEC 61784-3 with other standards (machinery) 15
Figure 2 – Relationships of IEC 61784-3 with other standards (process) 16
Figure 3 – Producer consumer example 28
Figure 4 – Client server example 28
Figure 5 – Communication layer structure 31
Figure 6 – Safety communication channel 32
Figure 7 – Characteristic producer / consumer communication 33
Figure 8 – Extended producer / consumer communication 34
Figure 9 – Client Server communication 34
Figure 10 – Topology overview 35
Figure 11 – Safety Domain protection (example) 36
Figure 12 – Safety Domain separation (example) 37
Figure 13 – Data flow example 41
Figure 14 – Communication model 43
Figure 15 – SPDO transport 44
Figure 16 – SSDO transport 45
Figure 17 – Diagnostic data representation 46
Figure 18 – Safety PDUs inside a CP 13/1 PDU 47
Figure 19 – Safety PDU for n = 0 -- 8 octet payload data 47
Figure 20 – Safety PDU for n = 9 -- 254 octet payload data 47
Figure 21 – SPDO_Data_Only telegram 52
Figure 22 – SPDO_Data_with_Time_Request telegram 52
Figure 23 – SPDO_Data_with_Time_Response telegram 53
Figure 24 – SSDO download protocols 55
Figure 25 – SSDO upload protocols 56
Figure 26 – SSDO Initiate Download protocol 56
Figure 27 – SSDO Segmented Download protocol 57
Figure 28 – SSDO Initiate Upload protocol 58
Figure 29 – SSDO Segmented Upload protocol 59
Figure 30 – SSDO Abort protocol 60
Figure 31 – UDID Request / Response protocol 63
Figure 32 – SADR Assignment protocol 64

iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/sist/...-61784-3-13-2010
Withdrawn

Figure 33 – Reset Node Guarding Time protocol 65
Figure 34 – SN set to Pre-Operational protocol 66
Figure 35 – SN set to Operational protocol 67
Figure 36 – SN Acknowledge protocol 69
Figure 37 – SN set to stop protocol 70
Figure 38 – SCM set to Operational protocol 71
Figure 39 – Node Guarding protocol 71
Figure 40 – Additional SADR Assignment protocol 73
Figure 41 – UDID of SCM Assignment protocol 74
Figure 42 – SPDO mapping example 119
Figure 43 – State diagram TxSPDO 121
Figure 44 – SPDO communication producer 122
Figure 45 – State diagram RxSPDO 123
Figure 46 – SPDO communication consumer 123
Figure 47 – State diagram process data 124
Figure 48 – Time synchronization and validation 125
Figure 49 – Time synchronization detail 126
Figure 50 – Calculation of propagation delay 128
Figure 51 – Time validation, propagation delay explanation limits 128
Figure 52 – Time synchronization on a nonsafe network 130
Figure 53 – Explanation of time synchronization 130
Figure 54 – Time synchronization failure 131
Figure 55 – State diagram time synchronization producer 132
Figure 56 – State diagram time synchronization consumer 133
Figure 57 – State diagram SSDO client 135
Figure 58 – State diagram SSDO server 136
Figure 59 – Expedited SOD access 137
Figure 60 – State diagram segmented SOD download access client 138
Figure 61 – Segmented SOD download access 139
Figure 62 – State diagram segmented SOD download access server 140
Figure 63 – State diagram SNMT master 142
Figure 64 – State diagram SNMT slave 143
Figure 65 – State diagram SN power up 144
Figure 66 – State diagram SN Pre-Operational 145
Figure 67 – State diagram SN Operational 146
Figure 68 – Life Guarding telegram 147
Figure 69 – State diagram SCM power up 148
Figure 70 – State diagram SCM Operational 149
Figure 71 – State diagram SCM address verification 151
Figure 72 – State diagram SCM handle single UDID mismatch 153
Figure 73 – State diagram SCM verify parameters 155
Figure 74 – State diagram activate SN 157
Figure 75 – Safety function response time 160

Withdrawn
iTeh Standards
(https://standards.iteh.ai)
Document Preview
https://standards.iteh.ai/catalog/standards/sist/a0c38-48a2-42c6-a726-8a8809dd5dc5/iec-61784-3-13-2010

Figure 76 – Assessment flow of devices 163
Figure A.1 – Structure of safety PDU 168
Figure A.2 – Error detection by the use of a CRC 168
Figure A.3 – Residual errors per hour 170
Figure A.4 – Residual errors per hour (payload 9-254) 171

Withdrawn
iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 61784-3-13:2010
https://standards.iteh.ai/catalog/standards/iec/a7a0c38-48a2-42c6-a726-8a8809dd5dc5/iec-61784-3-13-2010