IEC 61158-4-2

Edition 5.0 2023-03

INTERNATIONAL STANDARD

colour inside

Industrial communication networks – Fieldbus specifications – Part 4-2: Data-link layer protocol specification – Type 2 elements

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/e29f2ae3-38d5-49af-9cd8-4b227218fdd6/iec-61158-4-2-2023

IEC 61158-4-2:2023-03(en)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2023 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 Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
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 It also gives information on projects, replaced and withdrawn publications.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 once a month by email.

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: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/e29f2ac3-38d5-49af-9cd8-4b227218fdd6/iec-61158-4-2-2023

IEC 61158-4-2

Edition 5.0 2023-03

INTERNATIONAL STANDARD

colour inside

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Industrial communication networks – Fieldbus specifications – Part 4-2: Data-link layer protocol specification – Type 2 elements

IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/e29f2ae3-38d5-49af-9cd8-4b227218fdd6/iec-61158-4-2-2023

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 25.040.40; 35.100.20; 35.110

ISBN 978-2-8322-6554-3

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

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 16
INTRODUCTION 18
1 Scope 19
1.1 General 19
1.2 Specifications 19
1.3 Procedures 19
1.4 Applicability 20
1.5 Conformance 20
2 Normative references 20
3 Terms, definitions, symbols, abbreviated terms and conventions 22
3.1 Reference model terms and definitions 22
3.2 Service convention terms and definitions 24
3.3 Common terms and definitions 24
3.4 Additional Type 2 definitions 25
3.5 Type 2 symbols and abbreviated terms 33
3.6 Conventions for station management objects 34
4 Overview of the data-link protocol 35
4.1 General 35
4.1.1 DLL architecture 35
4.1.2 Access control machine (ACM) and scheduling support functions 37
4.1.3 Connection-mode, connectionless-mode data transfer and DL service 37
4.2 Services provided by the DL 37
4.2.1 Overview 37
4.2.2 QoS 38
4.3 Structure and definition of DL-addresses 38
4.3.1 General 38
4.3.2 MAC ID address 39
4.3.3 Generic tag address 40
4.3.4 Fixed tag address 40
4.4 Services assumed from the PhL 41
4.4.1 General requirements 41
4.4.2 Data encoding rules 41
4.4.3 DLL to PhL interface 42
4.5 Functional classes 44
5 General structure and encoding of PhIDUs and DLPDUs and related elements of procedure 44
5.1 Overview 44
5.2 Media access procedure 44
5.3 DLPDU structure and encoding 48
5.3.1 General 48
5.3.2 DLPDU components 48
5.3.3 Preamble 48
5.3.4 Start and end delimiters 48
5.3.5 DLPDU octets and ordering 48
5.3.6 Source MAC ID 49
5.3.7 Lpackets field 49
5.3.8 Frame check sequence (FCS) 49

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/e29f2ae3-38d5-49af-9cd8-4b227218fdd6/iec-61158-4-2-2023

5.3.9 Null DLPDU 52
5.3.10 Abort DLPDU 52
5.4 Lpacket components 52
5.4.1 General Lpacket structure 52
5.4.2 Size 53
5.4.3 Control 53
5.4.4 Generic tag Lpackets 53
5.4.5 Fixed tag Lpackets 54
5.5 DLPDU procedures 54
5.5.1 General 54
5.5.2 Sending scheduled DLPDUs 55
5.5.3 Sending unscheduled DLPDUs 55
5.5.4 Receiving DLPDUs 55
5.6 Summary of DLL support services and objects 56
6 Specific DLPDU structure, encoding and procedures 57
6.1 Modeling language 57
6.1.1 State machine description 57
6.1.2 Use of DLL- prefix 58
6.1.3 Data types 58
6.2 DLS user services 59
6.2.1 General 59
6.2.2 Connected mode and connectionless mode transfer service 60
6.2.3 Queue maintenance service 61
6.2.4 Tag filter service 61
6.2.5 Link synchronization service 62
6.2.6 Synchronized parameter change service 62
6.2.7 Event reports service 63
6.2.8 Bad FCS service 64
6.2.9 Current moderator service 64
6.2.10 Power up and online services 64
6.2.11 Enable moderator service 65
6.2.12 Listen only service 65
6.3 Generic tag Lpacket 65
6.3.1 General 65
6.3.2 Structure of the generic-tag Lpacket 65
6.3.3 Sending and receiving the generic-tag Lpacket 66
6.4 Moderator Lpacket 66
6.4.1 General 66
6.4.2 Structure of the moderator Lpacket 66
6.4.3 Sending and receiving the moderator Lpacket 66
6.5 Time distribution Lpacket 67
6.5.1 General 67
6.5.2 Structure of the time distribution Lpacket 67
6.5.3 Sending and receiving the time distribution Lpacket 69
6.6 UCMM Lpacket 70
6.6.1 General 70
6.6.2 Structure of the UCMM Lpacket 70
6.6.3 Sending and receiving the UCMM Lpacket 70
6.7 Keeper UCMM Lpacket 70

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/38d5-49af-9ed8-4b227218fdd6/iec-61158-4-2-2023

6.7.1 General 70
6.7.2 Structure of the Keeper UCMM Lpacket 70
6.7.3 Sending and receiving the Keeper UCMM Lpacket 70
6.8 TUI Lpacket 71
6.8.1 General 71
6.8.2 Structure of the TUI Lpacket 71
6.8.3 Sending and receiving the TUI Lpacket 72
6.9 Link parameters Lpacket and tMinus Lpacket 72
6.9.1 General 72
6.9.2 Structure of link parameters and tMinus Lpackets 72
6.9.3 Sending and receiving the tMinus and Link parameters Lpackets 73
6.10 I'm-alive Lpacket 73
6.10.1 General 73
6.10.2 Structure or the I'm-alive Lpacket 73
6.10.3 Sending and receiving I'm Alive 74
6.10.4 I'm alive state processing 74
6.11 Ping Lpackets 75
6.11.1 General 75
6.11.2 Structure of the ping Lpackets 76
6.11.3 Sending and receiving the ping Lpackets 76
6.12 WAMI Lpacket 76
6.12.1 General 76
6.12.2 Structure of the WAMI Lpacket 77
6.12.3 Sending and receiving the WAMI Lpacket 77
6.13 Debug Lpacket 77
6.14 IP Lpacket 78
6.15 Ethernet Lpacket 78
7 Objects for station management 78
7.1 General 78
7.2 ControlNet™ object 80
7.2.1 Overview 80
7.2.2 Class attributes 80
7.2.3 Instance attributes 80
7.2.4 Common services 89
7.2.5 Class specific services 90
7.2.6 Behavior 91
7.2.7 Module status indicator 91
7.3 Keeper object 92
7.3.1 Overview 92
7.3.2 Revision history 92
7.3.3 Class attributes 92
7.3.4 Instance attributes 92
7.3.5 Common services 101
7.3.6 Class specific services 102
7.3.7 Service error codes 108
7.3.8 Behavior 108
7.3.9 Miscellaneous notes 109
7.3.10 Keeper power up sequence 110
7.4 Scheduling object 115

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/...-61158-4-2-2023

7.4.1 Overview 115
7.4.2 Class attributes 116
7.4.3 Instance attributes 116
7.4.4 Common services 117
7.4.5 Class specific services 119
7.4.6 Typical scheduling session 125
7.5 TCP/IP Interface object 126
7.5.1 Overview 126
7.5.2 Revision history 126
7.5.3 Class attributes 126
7.5.4 Instance attributes 127
7.5.5 Diagnostic connection points 142
7.5.6 Common services 142
7.5.7 Class specific services 145
7.5.8 Behavior 147
7.5.9 Address Conflict Detection (ACD) 148
7.6 Ethernet Link object 154
7.6.1 Overview 154
7.6.2 Revision history 154
7.6.3 Class attributes 154
7.6.4 Instance attributes 155
7.6.5 Diagnostic connection points 165
7.6.6 Common services 166
7.6.7 Class specific services 167
7.6.8 Behavior 168
7.7 DeviceNet™ object 169
7.7.1 Overview 169
7.7.2 Revision history 170
7.7.3 Class attributes 170
7.7.4 Instance attributes 170
7.7.5 Common services 177
7.7.6 Class specific services 178
7.8 Connection Configuration object (CCO) 179
7.8.1 Overview 179
7.8.2 Revision history 179
7.8.3 Class attributes 179
7.8.4 Instance attributes 181
7.8.5 Connection Configuration object change control 190
7.8.6 Common services 190
7.8.7 Class specific services 196
7.8.8 Behavior 200
7.9 DLR object 200
7.9.1 Overview 200
7.9.2 Revision history 201
7.9.3 Class attributes 201
7.9.4 Instance attributes 201
7.9.5 Diagnostic connection points 213
7.9.6 Common services 213
7.9.7 Class specific services 217

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/iec/61158-4-2-2023

7.10 QoS object 218
7.10.1 Overview 218
7.10.2 Revision History 218
7.10.3 Class attributes 218
7.10.4 Instance Attributes 219
7.10.5 Common services 220
7.11 Port object 221
7.11.1 Overview 221
7.11.2 Revision History 221
7.11.3 Class attributes 222
7.11.4 Instance attributes 222
7.11.5 Common services 229
7.12 PRP/HSR Protocol object 231
7.12.1 Overview 231
7.12.2 Revision history 231
7.12.3 Class attributes 231
7.12.4 Instance attributes 231
7.12.5 Diagnostic connection points 239
7.12.6 Common Services 239
7.13 PRP/HSR Nodes Table object 241
7.13.1 Overview 241
7.13.2 Revision history 241
7.13.3 Class attributes 242
7.13.4 Instance attributes 242
7.13.5 Common services 244
7.14 LLDP Management object 245
7.14.1 Overview 245
7.14.2 Revision history 245
7.14.3 Class attributes 246
7.14.4 Instance attributes 246
7.14.5 Common services 247
7.15 LLDP Data Table object 248
7.15.1 Overview 248
7.15.2 Revision history 249
7.15.3 Class attributes 249
7.15.4 Instance attributes 249
7.15.5 Common services 253
8 Other DLE elements of procedure 254
8.1 Network attachment monitor (NAM) 254
8.1.1 General 254
8.1.2 Default parameters 256
8.1.3 Auto-addressing 256
8.1.4 Valid MAC IDs 257
8.1.5 State machine description 257
8.2 Calculating link parameters 263
8.2.1 Link parameters 263
8.2.2 Conditions affecting link parameters 263
8.2.3 Moderator change 263
8.2.4 NUT timing 264

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/...
61158-4-2-2023

8.2.5 Slot timing 265
8.2.6 Blanking 266
8.2.7 Example implementation 266
9 Detailed specification of DL components 271
9.1 General 271
9.2 Access control machine (ACM) 271
9.3 TxLLC 290
9.4 RxLLC 295
9.5 Transmit machine (TxM) 298
9.6 Receive machine (RxM) 302
9.7 Serializer 308
9.8 Deserializer 310
9.8.1 Octet construction 310
9.8.2 FCS checking 311
9.8.3 End of DLPDU processing 311
9.9 DLL management 311
10 Device Level Ring (DLR) protocol 313
10.1 General 313
10.2 Support for Multiple DLR Ring Pairs 314
10.3 Supported topologies 315
10.4 Overview of DLR operation 316
10.4.1 Normal operation 316
10.4.2 Link failures 317
10.5 Classes of DLR implementation 318
10.6 DLR behavior 319
10.6.1 DLR variables 319
10.6.2 Ring supervisor 319
10.6.3 Ring node 322
10.6.4 Sign on process 323
10.6.5 Neighbor check process 324
10.7 Implementation requirements 324
10.7.1 Embedded switch requirements and recommendations 324
10.7.2 DLR implementation requirements 325
10.7.3 IEC 61588 and Type 2 Ethernet considerations 326
10.7.4 IEEE Std 802.1Q-2018 STP/RSTP/MSTP considerations 326
10.8 Using non-DLR nodes in the ring network 326
10.8.1 General considerations 326
10.8.2 Non-DLR end devices 327
10.8.3 Non-DLR switches 327
10.9 Redundant gateway devices on DLR network 329
10.9.1 General 329
10.9.2 Supported topologies 330
10.9.3 Redundant gateway capable device 330
10.9.4 Redundant gateway device behavior 331
10.10 DLR messages 334
10.10.1 General 334
10.10.2 Common frame header 335
10.10.3 Beacon frame 336
10.10.4 Neighbor_Check request 336

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/e29f2ae3-38d5-49af-9cd8-4b227218fdd6/iec-61158-4-2-2023

10.10.5 Neighbor_Check_response 337
10.10.6 Link_Status/Neighbor_Status 337
10.10.7 Locate_Fault 338
10.10.8 Announce 338
10.10.9 Sign_On 338
10.10.10 Advertise 339
10.10.11 Flush_Tables 339
10.10.12 Learning_Update 340
10.11 State diagrams and state-event-action matrices 340
10.11.1 Beacon-based ring node 340
10.11.2 Announce-based ring node 347
10.11.3 Ring supervisor 351
10.11.4 Redundant gateway 366
10.12 Performance analysis 369
10.12.1 General 369
10.12.2 Redundant gateway switchover performance 373
11 PRP and HSR redundancy protocols 375
11.1 General 375
11.2 PRP overview 375
11.2.1 General 375
11.2.2 Address Conflict Detection (ACD) 376
11.3 HSR overview 377
12 LLDP protocol 378
12.1 General 378
12.2 LLDP overview 379
12.3 Type 2 LLDP Transmission Requirements 379
12.3.1 General 379
12.3.2 Chassis ID TLV (TLV Type = 1) 380
12.3.3 Port ID TLV (TLV Type = 2) 380
12.3.4 System Capabilities TLV (TLV Type = 7) 381
12.3.5 Management Address (TLV Type = 8) 381
12.3.6 Type 2 Identification TLV (TLV Type = 127) 381
12.3.7 Type 2 MAC Address TLV (TLV Type = 127) 381
12.3.8 Type 2 Interface Label TLV (TLV Type = 127) 381
12.3.9 Additional Ethernet Capabilities TLV (TLV Type = 127) 382
12.4 Type 2 LLDP Reception Requirements 382
12.5 Type 2 LLDP Reporting Requirements 382
12.6 EtherNet/IP LLDP Link State Transition Requirements 382
Annex A (normative) Indicators and switches 383
A.1 Purpose 383
A.2 Indicators 383
A.2.1 General indicator requirements 383
A.2.2 Common indicator requirements 383
A.2.3 Fieldbus specific indicator requirements – option 1 385
A.2.4 Fieldbus specific indicator requirements – option 2 389
A.2.5 Fieldbus specific indicator requirements – option 3 393
A.3 Switches 398
A.3.1 Common switch requirements 398
A.3.2 Fieldbus specific switch requirements – option 1 398

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/[illegible]-38d5-49af-9cd8-4b227218fdd6/iec-61158-4-2-2023

A.3.3 Fieldbus specific switch requirements – option 2 398
A.3.4 Fieldbus specific switch requirements – option 3 399
Bibliography 400

Figure 1 – Data-link layer internal architecture 36
Figure 2 – Relationships of DLSAPs, DLSAP-addresses, and group DL-addresses 39
Figure 3 – Basic structure of a MAC ID address 39
Figure 4 – Basic structure of a generic tag address 40
Figure 5 – Basic structure of a fixed tag address 40
Figure 6 – M_symbols and Manchester encoding at 5 MHz 42
Figure 7 – NUT structure 45
Figure 8 – Media access during scheduled time 46
Figure 9 – Media access during unscheduled time 47
Figure 10 – DLPDU format 48
Figure 11 – Aborting a DLPDU during transmission 52
Figure 12 – Lpacket format 53
Figure 13 – Generic tag Lpacket format 54
Figure 14 – Fixed tag Lpacket format 54
Figure 15 – Goodness parameter of TimeDist_Lpacket 68
Figure 16 – Example I'm alive processing algorithm 75
Figure 17 – Keeper CRC algorithm 99
Figure 18 – Keeper object power-up state diagram 111
Figure 19 – Keeper object operating state diagram 112
Figure 20 – Synchronized network change processing 115
Figure 21 – State transition diagram for TCP/IP Interface object 147
Figure 22 – State transition diagram for TCP/IP Interface object 148
Figure 23 – ACD Behavior 150
Figure 24 – State transition diagram for Ethernet Link object 169
Figure 25 – Connection Configuration object edit flowchart 200
Figure 26 – Communication objects diagram for example device 229
Figure 27 – NAM state machine 256
Figure 28 – Devices with Multiple DLR Ring Pairs 314
Figure 29 – DLR rings connected to switches 315
Figure 30 – Normal operation of a DLR network 316
Figure 31 – Beacon and Announce frames 316
Figure 32 – Link failure 317
Figure 33 – Network reconfiguration after link failure 318
Figure 34 – Neighbor Check process 324
Figure 35 – Unsupported topology – example 1 328
Figure 36 – Unsupported topology – example 2 328
Figure 37 – DLR ring connected to switches through redundant gateways 330
Figure 38 – DLR redundant gateway capable device 331
Figure 39 – Advertise frame 333

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/e2912ac3-58d3-49af-9cd8-4b22f2f8fdd0/iec-61158-4-2-2023

Figure 40 – State transition diagram for Beacon frame based non-supervisor ring node 341
Figure 41 – State transition diagram for Announce frame based non-supervisor ring node 347
Figure 42 – State transition diagram for ring supervisor 351
Figure 43 – State transition diagram for redundant gateway 366
Figure 44 – PRP network 376
Figure 45 – Directly Attached SANs 377
Figure 46 – Virtual DANs 377
Figure 47 – HSR network 378
Figure 48 – IEEE LLDP PDU Format (source IEEE Std 802.1AB-2016) 379
Figure 49 – Type 2 LLDP PDU Format 380
Figure 50 – Type 2 Identification TLV Format 381
Figure 51 – Type 2 MAC Address TLV Format 381
Figure 52 – Type 2 Interface Label TLV Format 382
Figure A.1 – Non redundant network status indicator labeling 389
Figure A.2 – Redundant network status indicator labeling 389
Figure A.3 – Network status indicator state diagram 392
Figure A.4 – Examples of multiple network status indicators 392

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Table 1 – Format of attribute tables 34
Table 2 – Data-link layer components 36
Table 3 – MAC ID addresses allocation 40
Table 4 – Fixed tag service definitions 40
Table 5 – Data encoding rules 42
Table 6 – M Data symbols 43
Table 7 – Truth table for ph_status_indication 43
Table 8 – FCS length, polynomials and constants 49
Table 9 – DLL support services and objects 56
Table 10 – Elementary data types 59
Table 11 – DLL events 63
Table 12 – Time distribution priority 69
Table 13 – Format of the TUI Lpacket 71
Table 14 – ControlNet object class attributes 80
Table 15 – ControlNet object instance attributes 81
Table 16 – TUI status flag bits 86
Table 17 – Mac_ver bits 87
Table 18 – Channel state bits 87
Table 19 – ControlNet object common services 89
Table 20 – ControlNet object class specific services 90
Table 21 – Keeper object revision history 92
Table 22 – Keeper object class attributes 92
Table 23 – Keeper object instance attributes 93
Table 24 – Keeper operating state definitions 97

IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/e291ae5-58d5-49af-9cd8-4b2272f8fdd0/iec-61158-4-2-2023

Table 25 – Port status flag bit definitions 97
Table 26 – TUI status flag bits 98
Table 27 – Keeper attributes 101
Table 28 – Memory requirements (in octets) for the Keeper attributes 101
Table 29 – Keeper object common services 102
Table 30 – Keeper object class specific services 102
Table 31 – Service error codes 103
Table 32 – Wire order format of the TUI Lpacket 107
Table 33 – Service error codes 108
Table 34 – Keeper object operating states 109
Table 35 – Keeper object state event matrix 113
Table 36 – Scheduling object class attributes 116
Table 37 – Scheduling object instance attributes 117
Table 38 – Scheduling object common services 117
Table 39 – Status error descriptions for Create 118
Table 40 – Status error descriptions for Delete and Kick_Timer 119
Table 41 – Scheduling object class specific services 119
Table 42 – Status error descriptions for Read 121
Table 43 – Status error descriptions for Conditional_Write 122
Table 44 – Status error descriptions for Forced_Write 122
Table 45 – Status error descriptions for Change_Start 123
Table 46 – Status error descriptions for Break_Connections 124
Table 47 – Status error descriptions for Change_Complete 124
Table 48 – Status error descriptions for Restart_Connections 125
Table 49 – Revision history 126
Table 50 – TCP/IP Interface object class attributes 127
Table 51 – TCP/IP Interface object instance attributes 127
Table 52 – Status bits 132
Table 53 – Configuration capability bits 133
Table 54 – Configuration control bits 134
Table 55 – Example path 135
Table 56 – Interface configuration components 136
Table 57 – Alloc control values 138
Table 58 – AcdActivity values 139
Table 59 – ArpPdu – ARP Response PDU in binary format 139
Table 60 – Admin Capability member bit definitions 140
Table 61 – Admin Capability member bit definitions 141
Table 62 – TCP/IP Interface connection point 1, Standard Network Diagnostics 142
Table 63 – TCP/IP Interface object common services 143
Table 64 – Get_Attributes_All response format 144
Table 65 – Set_Attributes_All request format 145
Table 66 – TCP/IP Interface object class specific services 145
Table 67 – Set_Port_Admin_State service request parameters 146

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023

Table 68 – Set_Protocol_Admin_State service request parameters 146
Table 69 – Class specific error codes 147
Table 70 – Ethernet link object revision history 154
Table 71 – Ethernet link object class attributes 155
Table 72 – Ethernet link object instance attributes 155
Table 73 – Interface flags bits 160
Table 74 – Control bits 162
Table 75 – Interface type 163
Table 76 – Interface state 163
Table 77 – Admin state 163
Table 78 – Capability Bits 164
Table 79 – Ethernet Link connection point 1, Standard Network Diagnostics 165
Table 80 – Ethernet Link object common services 166
Table 81 – Get_Attributes_All response format 167
Table 82 – Ethernet Link object class specific services 168
Table 83 – DeviceNet object revision history 170
Table 84 – DeviceNet object class attributes 170
Table 85 – DeviceNet object instance attributes 170
Table 86 – Bit rate attribute values 173
Table 87 – BOI attribute values 173
Table 88 – Diagnostic counters bit description 176
Table 89 – DeviceNet object common services 177
Table 90 – Reset service parameter 177
Table 91 – Reset service parameter values 177
Table 92 – DeviceNet object class specific services 178
Table 93 – Connection Configuration object revision history 179
Table 94 – Connection Configuration object class attributes 179
Table 95 – Format number values 181
Table 96 – Connection Configuration object instance attributes 181
Table 97 – Originator connection status values 185
Table 98 – Target connection status values 185
Table 99 – Connection flags 186
Table 100 – I/O mapping formats 188
Table 101 – Services valid during a change operation 190
Table 102 – Connection Configuration object common services 190
Table 103 – Get_Attributes_All Response – class level 191
Table 104 – Get_Attributes_All response – instance level 191
Table 105 – Set_Attributes_All error codes 193
Table 106 – Set_Attributes_All request 193
Table 107 – Create request parameters 195
Table 108 – Create error codes 195
Table 109 – Delete error codes 195
Table 110 – Restore error codes 196

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023

Table 111 – Connection Configuration object class specific services 196
Table 112 – Change_Start error codes 197
Table 113 – Get_Status service parameter 198
Table 114 – Get_Status service response 198
Table 115 – Get_Status service error codes 198
Table 116 – Change_Complete service parameter 199
Table 117 – Change_Complete service error codes 199
Table 118 – Audit_Changes service parameter 199
Table 119 – Audit_Changes service error codes 199
Table 120 – Revision history 201
Table 121 – DLR object class attributes 201
Table 122 – DLR object instance attributes 202
Table 123 – Network Status values 206
Table 124 – Ring Supervisor Status values 206
Table 125 – Capability flags 210
Table 126 – Redundant Gateway Status values 212
Table 127 – DLR connection point 1, Standard Network Diagnostics 213
Table 128 – DLR connection point 2, Standard Network Diagnostics 213
Table 129 – DLR object common services 214
Table 130 – Get_Attributes_All Response – Object Revision 1, non supervisor device 214
Table 131 – Get_Attributes_All Response – Object Revision 1, supervisor-capable device 215
Table 132 – Get_Attributes_All Response – Object Revision 2, non supervisor device 215
Table 133 – Get_Attributes_All Response – All other cases 216
Table 134 – DLR object class specific services 217
Table 135 – QoS object revision history 218
Table 136 – QoS object class attributes 219
Table 137 – QoS object instance attributes 219
Table 138 – Default DCSP values and usages 220
Table 139 – QoS object common services 221
Table 140 – Port object revision history 222
Table 141 – Port object class attributes 222
Table 142 – Port object instance attributes 223
Table 143 – Port Type and associated Logical Link Object classes and Port Type Name values 225
Table 144 – Port Routing Capabilities attribute bit definitions 228
Table 145 – Contents of Associated Communication objects attribute 11 for the two Port object instances of the example device 229
Table 146 – Port object common services 230
Table 147 – Get_Attributes_All response– class level 230
Table 148 – Get_Attributes_All response– instance level 230
Table 149 – Revision history 231
Table 150 – Class attributes 231
Table 151 – Instance attributes 232

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-4-2:2023
https://standards.iteh.ai/catalog/standards/sist/e2912ac5-58d5-49af-9cd8-4b22721f8dd0/iec-61158-4-2-2023