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Industriell processtyrning – Fältbuss – Del 6-10: Specifikation av protokoll i applikationsskiktet – Delar i fältbuss, Typ 10

*Industrial communication networks –
Fieldbus specifications –
Part 6-10: Application layer protocol specification –
Type 10 elements*

Som svensk standard gäller europastandarden EN IEC 61158-6-10:2023. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 61158-6-10:2023.

Nationellt förord

Europastandarden EN IEC 61158-6-10:2023

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Fieldbus specifications – Part 6-10: Application layer
protocol specification – Type 10 elements**

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English Version

Industrial communication networks - Fieldbus specifications -
Part 6-10: Application layer protocol specification - Type 10
elements
(IEC 61158-6-10:2023)

Réseaux de communication industriels - Spécifications des
bus de terrain - Partie 6-10: Spécification du protocole de la
couche liaison de données - Eléments de type 10
(IEC 61158-6-10:2023)

Industrielle Kommunikationsnetze - Feldbusse - Teil 6-10:
Protokollspezifikation des Application Layer
(Anwendungsschicht) - Typ 10-Elemente
(IEC 61158-6-10:2023)

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 65C/1204/FDIS, future edition 5 of IEC 61158-6-10, prepared by SC 65C "Industrial networks" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61158-6-10:2023.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2024-01-28 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2026-04-28 document have to be withdrawn

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The text of the International Standard IEC 61158-6-10:2023 was approved by CENELEC as a European Standard without any modification.

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

IEC 60793-2-30	NOTE	Approved as EN 60793-2-30
IEC 60793-2-40	NOTE	Approved as EN IEC 60793-2-40
IEC 61158-1	NOTE	Approved as EN IEC 61158-1
IEC/IEEE 60802:— ¹	NOTE	Approved as EN IEC 60802:— ²
IEC 61784-1 (series)	NOTE	Approved as EN IEC 61784-1 (series)
IEC 61784-2 (series)	NOTE	Approved as EN IEC 61784-2 (series)
IEC 61784-3-3	NOTE	Approved as EN IEC 61784-3-3

¹ Under preparation. Stage at the time of publication: IEC/IEEE CD 60802:2022.

² Under preparation. Stage at the time of publication: prEN IEC 60802:2020.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61131-9	-	Programmable controllers - Part 9: Single-drop digital communication interface for small sensors and actuators (SDCI)	EN IEC 61131-9	-
IEC 61158-2	2023	Industrial communication networks - Fieldbus specifications - Part 2: Physical layer specification and service definition	EN IEC 61158-2	2023
IEC 61158-5-10	2023	Industrial communication networks - Fieldbus specifications - Part 5-10: Application layer service definition - Type 10 elements	-	-
IEC 61158-6-3	2019	Industrial communication networks - Fieldbus specifications - Part 6-3: Application layer protocol specification - Type 3 elements	EN IEC 61158-6-3	2019
IEC 61158-6-10	2010	Industrial communication networks - Fieldbus specifications - Part 6-10: Application layer protocol specification - Type 10 elements	-	-
IEC 62439-2	2021	Industrial communication networks - High availability automation networks - Part 2: Media Redundancy Protocol (MRP)	EN IEC 62439-2	2022
IEC/TS 60079-47	2021	Explosive atmospheres - Part 47: Equipment protection by 2-Wire Intrinsically Safe Ethernet concept (2-WISE)	CLC IEC/TS 60079-47	2021
ISO/IEC 646	1991	Information technology - ISO 7-bit coded character set for information interchange	-	-
ISO/IEC 7498-1	-	Information technology - Open Systems Interconnection - Basic reference model: The basic model	-	-
ISO/IEC 8822	1994	Information technology - Open Systems Interconnection - Presentation service definition	-	-
ISO/IEC 8824-1	-	Information technology - Abstract Syntax Notation One (ASN.1) - Part 1: Specification of basic notation	-	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO/IEC 9545	-	Information technology - Open Systems Interconnection - Application layer structure	-	-
ISO/IEC 9834-8	-	Information technology - Procedures for the operation of object identifier registration authorities - Part 8: Generation of universally unique identifiers (UUIDs) and their use in object identifiers	-	-
ISO/IEC 10646	-	Information technology - Universal coded character set (UCS)	-	-
ISO/IEC 10731	-	Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services	-	-
ISO/IEC/IEEE 60559	2020	Information technology - Microprocessor Systems - Floating-Point arithmetic	-	-
ISO 8601-1	2019	Date and time - Representations for information interchange - Part 1: Basic rules	-	-
IEEE Std 802	2014	IEEE Standard for Local and metropolitan area networks: Overview and Architecture	-	-
IEEE Std 802.1AB	2016	IEEE Standard for Local and metropolitan area networks: Station and Media Access Control Connectivity Discovery	-	-
IEEE 802.1AC	2016	IEEE Standard for Local and metropolitan area networks - Media Access Control (MAC) Service Definition	-	-
IEEE 802.1AS	2020	IEEE Standard for Local and Metropolitan Area Networks - Timing and Synchronization for Time-Sensitive Applications	-	-
IEEE 802.1CB	2017	IEEE Standard for Local and metropolitan area networks - Frame Replication and Elimination for Reliability	-	-
IEEE 802.1Q	2018	IEEE Standard for Local and Metropolitan Area Networks, Bridges and Bridged Networks	-	-
IEEE 802.3	2018	IEEE Standard for Ethernet	-	-
IEEE 802.11	2020	IEEE Standard for Information Technology - Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications	-	-
IEEE 802.15.1	2005	IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 15.1: Wireless medium access control (MAC) and physical layer (PHY) specifications for wireless personal area networks (WPANs)	-	-
IETF RFC 768	-	User Datagram Protocol	-	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IETF RFC 791	-	Internet Protocol Darpa Internet Program Protocol Specification	-	-
IETF RFC 792	-	Internet Control Message Protocol	-	-
IETF RFC 826	-	Ethernet Address Resolution Protocol: Or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware	-	-
IETF RFC 1034	-	Domain names - concepts and facilities	-	-
IETF RFC 1213	-	Management Information Base for Network Management of TCP/IP-based Internets: MIB-II	-	-
IETF RFC 2131	-	Dynamic Host Configuration Protocol	-	-
IETF RFC 2132	-	DHCP Options and BOOTP Vendor Extensions	-	-
IETF RFC 2236	-	Internet Group Management Protocol, Version 2	-	-
IETF RFC 2365	-	Administratively Scoped IP Multicast	-	-
IETF RFC 2474	-	Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers	-	-
IETF RFC 2475	-	An Architecture for Differentiated Services	-	-
IETF RFC 2674	-	Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions	-	-
IETF RFC 2863	-	The Interfaces Group MIB	-	-
IETF RFC 3418	-	Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)	-	-
IETF RFC 3535	-	Overview of the 2002 IAB Network Management Workshop	-	-
IETF RFC 3621	-	Power Ethernet MIB	-	-
IETF RFC 4361	-	Node-specific Client Identifiers for Dynamic Host Configuration Protocol Version Four (DHCPv4)	-	-
IETF RFC 4363	-	Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering, and Virtual LAN Extensions	-	-
IETF RFC 4604	-	Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast	-	-
IETF RFC 4632	-	Classless Inter-domain Routing (CIDR): The Internet Address Assignment and Aggregation Plan	-	-
IETF RFC 4836	-	Definitions of Managed Objects for IEEE 802.3 Medium Attachment Units (MAUs)	-	-
IETF RFC 4944	-	Transmission of IPv6 Packets over IEEE 802.15.4 Networks	-	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IETF RFC 5227	-	IPv4 Address Conflict Detection	-	-
IETF RFC 5277	-	NETCONF Event Notifications	-	-
IETF RFC 5539	-	NETCONF over Transport Layer Security (TLS)	-	-
IETF RFC 5890	-	Internationalized Domain Names for Applications (IDNA): Definitions and Document Framework	-	-
IETF RFC 5905	-	Network Time Protocol Version_4: Protocol and Algorithms Specification	-	-
IETF RFC 6020	-	A Data Modeling Language for the Network Configuration Protocol (NETCONF)	-	-
IETF RFC 6021	-	Common YANG Data Types	-	-
IETF RFC 6087	-	Guidelines for Authors and Reviewers of YANG Data Model Documents	-	-
IETF RFC 6110	-	Mapping YANG to Document Schema Definition Languages and Validating NETCONF Content	-	-
IETF RFC 6151	-	Updated Security Considerations for the MD5 MessageDigest and the HMAC-MD5 Algorithms	-	-
IETF RFC 6241	-	Network Configuration Protocol (NETCONF)	-	-
IETF RFC 6243	-	With-defaults Capability for NETCONF	-	-
IETF RFC 6244	-	An Architecture for Network Management Using NETCONF and YANG	-	-
IETF RFC 6470	-	Network Configuration Protocol (NETCONF) Base Notifications	-	-
IETF RFC 6536	-	Network Configuration Protocol (NETCONF) Access Control Model	-	-
IETF RFC 6890	-	Special-Purpose IP Address Registries	-	-
IETF RFC 6918	-	Formally Deprecating Some ICMPv4 Message Types	-	-
IETF RFC 8342	-	Network Management Datastore Architecture (NMDA)	-	-
ITU-T G.781	-	Synchronization layer functions for frequency synchronization based on the physical layer	-	-
The Open Group, Publication C706	-	Technical standard DCE1.1: Remote Procedure Call	-	-
Metro Ethernet Forum - MEF 10.4	2018	Subscriber Ethernet Service Attributes	-	-
NIST FIPS PUB 180-4	2015	Federal Information Processing Standards Publication, Secure Standard (SHS)	-	-
NIST FIPS PUB 186-4	2013	Federal Information Processing Standards Publication, Digital Signature Standard (DSS),	-	-

INTERNATIONAL STANDARD



Industrial communication networks – Fieldbus specifications – Part 6-10: Application layer protocol specification – Type 10 elements

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CONTENTS

FOREWORD.....	46
INTRODUCTION.....	48
1 Scope.....	49
1.1 General.....	49
1.2 Specifications	49
1.3 Conformance	50
2 Normative references	50
3 Terms, definitions, abbreviated terms, symbols, and conventions	54
3.1 Referenced terms and definitions.....	54
3.1.1 ISO/IEC 7498-1 terms.....	54
3.1.2 ISO/IEC 8822 terms.....	55
3.1.3 ISO/IEC 8824-1 terms.....	55
3.1.4 ISO/IEC 9545 terms.....	55
3.2 Terms and definitions.....	55
3.3 Abbreviated terms and symbols	64
3.3.1 Abbreviated terms and symbols for services	64
3.3.2 Abbreviated terms and symbols for distributed I/O	64
3.3.3 Abbreviated terms and symbols for IEC 62439-2	68
3.3.4 Abbreviated terms and symbols for IEC/IEEE 60802.....	68
3.3.5 Abbreviated terms and symbols for IEEE Std 802.1CB	68
3.3.6 Abbreviated terms and symbols for IEEE Std 802.1Q	68
3.3.7 Abbreviated terms and symbols for IEEE Std 802.3	69
3.3.8 Abbreviated terms and symbols for IETF RFC 2474.....	69
3.3.9 Abbreviated terms and symbols for IETF RFC 4291.....	69
3.4 Conventions.....	69
3.4.1 General concept	69
3.4.2 Conventions for distributed I/O	70
3.4.3 Conventions used in state machines.....	78
4 Application layer protocol specification for common protocols.....	83
4.1 FAL syntax description.....	83
4.1.1 DLPDU abstract syntax reference	83
4.1.2 Data types	85
4.2 Transfer syntax.....	87
4.2.1 Coding of basic data types	87
4.2.2 Coding section related to common basic fields	95
4.3 Discovery and basic configuration.....	109
4.3.1 DCP syntax description	109
4.3.2 DCP protocol state machines.....	143
4.3.3 DLL Mapping Protocol Machines.....	162
4.4 Precision transparent clock protocol	162
4.4.1 FAL syntax description	162
4.4.2 AP-Context state machine	173
4.4.3 FAL Service Protocol Machines	173
4.4.4 Application Relationship Protocol Machines.....	173
4.4.5 DLL Mapping Protocol Machines.....	238
4.5 Time synchronization	238
4.5.1 General	238

4.5.2	GlobalTime	241
4.5.3	WorkingClock	242
4.6	Media redundancy	246
4.6.1	Media redundancy and loop prevention.....	246
4.6.2	Seamless media redundancy	249
4.7	Real time cyclic.....	249
4.7.1	FAL syntax description	249
4.7.2	FAL transfer syntax	250
4.7.3	FAL Service Protocol Machines	260
4.7.4	Application Relationship Protocol Machines.....	260
4.7.5	DLL Mapping Protocol Machines.....	282
4.8	Real time acyclic.....	282
4.8.1	RTA syntax description	282
4.8.2	RTA transfer syntax	284
4.8.3	FAL Service Protocol Machines	294
4.8.4	Application Relationship Protocol Machines.....	294
4.8.5	DLL Mapping Protocol Machines.....	339
4.9	Fragmentation.....	340
4.9.1	General	340
4.9.2	FRAG syntax description	343
4.9.3	FRAG transfer syntax	344
4.9.4	FAL Service Protocol Machines	346
4.9.5	Application Relationship Protocol Machines.....	346
4.9.6	DLL Mapping Protocol Machines.....	346
4.10	Remote procedure call	356
4.10.1	General	356
4.10.2	RPC syntax description	356
4.10.3	RPC Transfer syntax	358
4.10.4	FAL Service Protocol Machines	374
4.10.5	Application Relationship Protocol Machines.....	374
4.10.6	DLL Mapping Protocol Machines.....	375
4.11	Link layer discovery	375
4.11.1	General	375
4.11.2	FAL common syntax description	376
4.11.3	LLDP transfer syntax	378
4.11.4	FAL Service Protocol Machines	388
4.11.5	Application Relation Protocol Machines	388
4.11.6	DLL Mapping Protocol Machines.....	388
4.12	End stations and bridges.....	388
4.12.1	General	388
4.12.2	Traffic classes	390
4.12.3	End station	393
4.12.4	Bridge.....	416
4.12.5	Bridged end station.....	461
4.12.6	Q port state machine	470
4.12.7	Pruning port state machine	476
4.12.8	Bridge extensions	478
4.12.9	FAL Service Protocol Machines	479
4.12.10	Application Relation Protocol Machines	479

4.12.11	DLL Mapping Protocol Machines.....	479
4.13	IP suite	516
4.13.1	Overview	516
4.13.2	IP/UDP syntax description	516
4.13.3	IP/UDP transfer syntax	517
4.13.4	ARP.....	520
4.14	Domain name system.....	522
4.14.1	General	522
4.14.2	Primitive definitions	523
4.14.3	DNS state transition diagram	523
4.14.4	State machine description	523
4.14.5	DNS state table	523
4.14.6	Functions, Macros, Timers and Variables	523
4.15	Dynamic host configuration	524
4.15.1	General	524
4.15.2	Primitive definitions	524
4.15.3	DHCP state transition diagram.....	524
4.15.4	State machine description	525
4.15.5	DHCP state table.....	525
4.15.6	Functions, Macros, Timers and Variables	526
4.16	Simple network management	526
4.16.1	General	526
4.16.2	MIB overview.....	527
4.16.3	MIB access.....	527
4.16.4	IETF RFC 1213-MIB	527
4.16.5	Enterprise number for PNIO MIB	528
4.16.6	MIB cross reference	528
4.16.7	Behavior in case of modular built bridges	529
4.16.8	LLDP EXT MIB	529
4.17	Network configuration	529
4.17.1	Overview	529
4.17.2	NETCONF	530
4.17.3	YANG	531
4.18	Common DLL Mapping Protocol Machines	532
4.18.1	Overview	532
4.18.2	Data Link Layer Mapping Protocol Machine	533
4.19	Void	540
4.20	Additional information	540
5	Application layer protocol specification for distributed I/O	540
5.1	FAL syntax description.....	540
5.1.1	DLPDU abstract syntax reference	540
5.1.2	APDU abstract syntax.....	540
5.2	Transfer syntax	567
5.2.1	Coding section related to BlockHeader specific fields	567
5.2.2	Coding section related to RTA-SDU specific fields	586
5.2.3	Coding section related to common address fields	591
5.2.4	Coding section related to AL services	613
5.2.5	Coding section related to ARVendorBlock.....	652
5.2.6	Coding section related to PNIOStatus.....	653

5.2.7	Coding section related to I&M Records	670
5.2.8	Coding section related to Alarm and Diagnosis Data	677
5.2.9	Coding section related to upload and retrieval	701
5.2.10	Coding section related to iParameter	701
5.2.11	Coding section related to NME	702
5.2.12	Coding section related to CIM	711
5.2.13	Coding section related to Physical Sync Data	776
5.2.14	Coding section related to Physical Time Data	781
5.2.15	Coding section related to Isochrone Mode Data	786
5.2.16	Coding section related to fast startup	788
5.2.17	Coding section related to DFP	791
5.2.18	Coding section related to MRPD	795
5.2.19	Coding section related to controller to controller communication	796
5.2.20	Coding section related to system redundancy	797
5.2.21	Coding section related to energy saving	800
5.2.22	Coding section related to asset management	800
5.2.23	Coding section related to reporting system	805
5.2.24	Coding section related to logbook	811
5.2.25	Coding section related to Time	812
5.2.26	Coding section related to Channel Related Process Alarm Reason	812
5.2.27	Void	815
5.3	FAL protocol state machines	816
5.3.1	Overall structure	816
5.4	AP-Context state machine	817
5.5	FAL Service Protocol Machines	817
5.5.1	Overview	817
5.5.2	FAL Service Protocol Machine Power-On	817
5.5.3	FAL Service Protocol Machine Device	818
5.5.4	FAL Service Protocol Machine Controller	828
5.5.5	FAL Service Protocol Machine Network Management Entity	839
5.6	Application Relationship Protocol Machines	840
5.6.1	Alarm Protocol Machine Initiator	840
5.6.2	Alarm Protocol Machine Responder	844
5.6.3	Device	848
5.6.4	Controller	934
5.6.5	Network Management Entity	1013
5.7	DLL Mapping Protocol Machines	1047
5.8	Checking rules	1048
5.8.1	General	1048
5.8.2	IODConnectReq	1048
5.8.3	IODConnectRes	1061
5.8.4	IODControlReq	1066
5.8.5	IODControlRes	1068
5.8.6	IOXControlReq	1072
5.8.7	IOXControlRes	1073
5.8.8	IODReleaseReq	1075
5.8.9	IODReleaseRes	1076
5.8.10	IODWriteReq	1077
5.8.11	IODWriteRes	1079

5.8.12	IODWriteMultipleReq	1081
5.8.13	IODWriteMultipleRes	1082
5.8.14	IODReadReq	1084
5.8.15	IODReadRes	1086
Annex A (normative)	Unified establishing of an AR for all RT classes	1089
A.1	General.....	1089
A.2	AR establishing.....	1090
A.3	Startup of Alarm transmitter and receiver	1097
A.4	Time-aware systems path establishment.....	1099
A.5	Void	1100
A.6	Void	1100
Annex B (normative)	Compatible establishing of an AR.....	1101
Annex C (informative)	Establishing of a device access AR.....	1104
Annex D (informative)	Establishing of an AR (accelerated procedure).....	1106
Annex E (informative)	Establishing of an AR (fast startup procedure).....	1109
Annex F (informative)	Example of the upload, storage and retrieval procedure	1111
Annex G (informative)	Implementation of send list control.....	1113
G.1	General.....	1113
G.2	Implementation model.....	1114
G.3	Constraints	1116
Annex H (informative)	Overview of the IO controller and the IO device state machines	1117
Annex I (informative)	Overview of the PTCP synchronization master hierarchy	1119
Annex J (informative)	Optimization of bandwidth usage for Time Aware Shaping	1121
Annex K (informative)	Time constraints for RT_CLASS_3 bandwidth allocation	1123
Annex L (informative)	Time constraints for the forwarding of a frame	1125
L.1	Principle	1125
L.2	Forwarding.....	1125
Annex M (informative)	Principle of dynamic frame packing.....	1127
Annex N (informative)	Principle of Fragmentation	1131
Annex O (informative)	MRPD – Principle of seamless media redundancy.....	1133
Annex P (normative)	Principle of a RED_RELAY without forwarding information in PDIRFrameData	1135
Annex Q (informative)	Constraints for Auto-negotiation.....	1138
Q.1	Optimization for fast startup without auto-negotiation	1138
Q.2	Gigabit PHYs, 2 pair Ethernet cables, and auto-negotiation	1140
Annex R (informative)	Example of a PrmBegin, PrmEnd and ApplRdy sequence.....	1141
Annex S (informative)	List of supported MIBs.....	1142
Annex T (informative)	Structure and content of BLOB	1143
Annex U (normative)	Management information bases	1144
U.1	Void	1144
U.2	LLDP EXT MIB.....	1144
Annex V (normative)	Cross reference to IEC 62439-2	1167
V.1	Cross reference to IEC 62439-2.....	1167
V.1.1	General	1167
V.1.2	Ring	1167
V.1.3	Interconnection.....	1168

Annex W (normative) Maintaining statistic counters for Ethernet	1170
W.1 General.....	1170
W.2 Counting model.....	1170
W.3 Explanation of the IETF RFC defined statistic counters	1172
W.4 Value range of the IETF RFC defined statistic counters	1173
W.5 VLAN specific statistic counters	1173
Annex X (informative) Example of RSI fragmentation	1175
Annex Y (informative) Delayed cut through	1177
Bibliography.....	1179
Figure 1 – Common structure of specific fields for octet 1	71
Figure 2 – Common structure of specific fields for octet 2	71
Figure 3 – Common structure of specific fields for octet 3	71
Figure 4 – Common structure of specific fields for octet 4	72
Figure 5 – Common structure of specific fields for octet 5	72
Figure 6 – Common structure of specific fields for octet 6	72
Figure 7 – Common structure of specific fields for octet 7	73
Figure 8 – Common structure of specific fields for octet 8	73
Figure 9 – Common structure of specific fields for octet 9	73
Figure 10 – Common structure of specific fields for octet 10	74
Figure 11 – Common structure of specific fields for octet 11	74
Figure 12 – Common structure of specific fields for octet 12	74
Figure 13 – Common structure of specific fields for octet 13	75
Figure 14 – Common structure of specific fields for octet 14	75
Figure 15 – Common structure of specific fields for octet 15	75
Figure 16 – Common structure of specific fields for octet 16	76
Figure 17 – Coding of the data type BinaryDate	88
Figure 18 – Encoding of TimeofDay with date indication value	88
Figure 19 – Encoding of TimeofDay without date indication value	89
Figure 20 – Encoding of TimeDifference with date indication value	89
Figure 21 – Encoding of TimeDifference without date indication value	90
Figure 22 – Encoding of a NetworkTime value	90
Figure 23 – Encoding of NetworkTimeDifference value	91
Figure 24 – Encoding of TimeStamp value	92
Figure 25 – Encoding of TimeStampDifference value	93
Figure 26 – Encoding of TimeStampDifferenceShort value.....	94
Figure 27 – FastForwardingMulticastMACAdd.....	100
Figure 28 – Stream Destination MAC Address – StreamDA.....	102
Figure 29 – State transition diagram of DCPUCS	145
Figure 30 – State transition diagram of DCPUCR.....	149
Figure 31 – State transition diagram of DCPMCS.....	154
Figure 32 – Basic structure of a DCP Multicast Receiver	156
Figure 33 – State transition diagram of DCPMCR	157
Figure 34 – State transition diagram of DCPHMCS	160

Figure 35 – State transition diagram of DCPHMCR	161
Figure 36 – PTCP_SequenceID value range	167
Figure 37 – Message timestamp point.....	173
Figure 38 – Timer model	174
Figure 39 – Four message timestamps	174
Figure 40 – Line delay protocol with follow up.....	175
Figure 41 – Line delay protocol without follow up	176
Figure 42 – Line delay measurement	178
Figure 43 – Model parameter for GSDML usage	180
Figure 44 – Bridge delay measurement.....	181
Figure 45 – Delay accumulation for PTCP.....	182
Figure 46 – Delay accumulation for PTP	183
Figure 47 – Worst case accumulated time deviation of synchronization	183
Figure 48 – Signal generation for measurement of deviation	184
Figure 49 – Measurement of deviation	184
Figure 50 – PTCP master sending Sync-Frame without Follow Up-Frame	185
Figure 51 – PTCP master sending Sync-Frame with FollowUp-Frame	186
Figure 52 – !FU Sync Slave Forwarding Sync-Frame	187
Figure 53 – FU Sync Slave Forwarding Sync- and FollowUp-Frame	188
Figure 54 – FU Sync Slave Forwarding Sync- and Generating FollowUp-Frame.....	189
Figure 55 – Principle of the monitoring of the line delay measurement.....	190
Figure 56 – State transition diagram of DELAY_REQ	192
Figure 57 – State transition diagram of DELAY_RSP	200
Figure 58 – Overview of PTCP.....	204
Figure 59 – State transition diagram of SYN_BMA	207
Figure 60 – State transition diagram of SYN_MPSM	216
Figure 61 – State transition diagram of SYN_SPSM.....	222
Figure 62 – State transition diagram of SYNC_RELAY	229
Figure 63 – State transition diagram of SCHEDULER	235
Figure 64 – Station clock model.....	240
Figure 65 – End station model with time synchronization	241
Figure 66 – GlobalTime timer model	242
Figure 67 – WorkingClock timer model.....	243
Figure 68 – Non-time-aware system – WorkingClock and CycleCounter.....	243
Figure 69 – Time-aware system – Queue masking – WorkingClock and CycleCounter	244
Figure 70 – Time-aware system – WorkingClock and CycleCounter	245
Figure 71 – Media redundancy – Ring.....	246
Figure 72 – Media redundancy – Interconnection	248
Figure 73 – CycleCounter value range	251
Figure 74 – Structure of the CycleCounter	252
Figure 75 – Optimized CycleCounter setting	253
Figure 76 – SFCRC16 generation rule	257
Figure 77 – SFCycleCounter value range.....	258

Figure 78 – Overview Buffer Lifetime Model	261
Figure 79 – PPM Flow Model	262
Figure 80 – CPM Flow Model	262
Figure 81 – Basic structure of a PPM with frame structure	264
Figure 82 – Basic structure of a PPM with subframe structure	265
Figure 83 – State transition diagram of PPM	267
Figure 84 – Basic structure of a CPM	271
Figure 85 – State transition diagram of CPM	273
Figure 86 – Addressing scheme of RTA	285
Figure 87 – Structure of the APM	295
Figure 88 – Structure of the RSI	296
Figure 89 – Structure of the APMS	297
Figure 90 – State transition diagram of APMS	299
Figure 91 – Structure of the APMR	304
Figure 92 – State transition diagram of APMR	306
Figure 93 – State transition diagram of RSII	310
Figure 94 – State transition diagram of RSIIN	322
Figure 95 – State transition diagram of RSIR	325
Figure 96 – State transition diagram of RSIRN	337
Figure 97 – State transition diagram of FRAG_D	347
Figure 98 – State transition diagram of FRAG_S	350
Figure 99 – State transition diagram of DEFRAG	353
Figure 100 – DLL Mapping Protocol Machines (DMPM)	389
Figure 101 – Schematic diagram of data flow of control loop	390
Figure 102 – End station model with IEEE Std 802.1Q alignment	394
Figure 103 – Ethernet interface model with IEEE alignment – transmit direction	395
Figure 104 – SendListControl alignment with Ethernet interface model	396
Figure 105 – Algorithm for end station ETS model	397
Figure 106 – Credit-based shaper algorithm	399
Figure 107 – Send List Feed	401
Figure 108 – Bandwidth vs. SendClock @ 10 Mbit/s	403
Figure 109 – 10 Mbps SendClock adaption	403
Figure 110 – Bandwidth vs. SendClock @ 100 Mbit/s	403
Figure 111 – Bandwidth vs. SendClock @ 1 Gbit/s	404
Figure 112 – Queue masking – time-aware end stations – without time-aware streams	408
Figure 113 – Queue masking – time-aware end station – with time-aware streams	410
Figure 114 – Queue masking – non-time-aware – without RT_CLASS_3	412
Figure 115 – Queue masking – non-time-aware end station – with RT_CLASS_3	414
Figure 116 – End station	415
Figure 117 – End station System – with multiple end station components	416
Figure 118 – System incorporating a bridge	417
Figure 119 – Domain Boundary	418
Figure 120 – Domain Boundary – RT_CLASS_STREAM, class RT	419

Figure 121 – Domain Boundary – Boundary Port.....	420
Figure 122 – Domain Boundary – Inter NME domain streams.....	421
Figure 123 – LLC protocol flow	425
Figure 124 – Ingress rate limiter – Domain boundary	434
Figure 125 – Ingress rate limiter – Link speed transition	438
Figure 126 – Schematic traffic flow model of a bridge	441
Figure 127 – Time-aware system – Egress port resource model of a bridge.....	445
Figure 128 – Non-time-aware system – Egress port resource model of a bridge	446
Figure 129 – Bridge queue masking usage model	452
Figure 130 – RED_RELAY – Bridge queue masking usage model.....	453
Figure 131 – TAS setup – Bridge queue masking model	454
Figure 132 – RED_RELAY setup – Queue masking model	455
Figure 133 – Bridge with end station	458
Figure 134 – Transmit – one port of a bridge	458
Figure 135 – Forwarding process – bridge	459
Figure 136 – Receive – one port of a bridge	459
Figure 137 – Transmit – Management port.....	460
Figure 138 – Receive – Management port.....	461
Figure 139 – Bridged end station	462
Figure 140 – Bridged end station interface model with IEEE alignment	463
Figure 141 – Bridged end station system reference planes	464
Figure 142 – Send List principle.....	465
Figure 143 – Fallback in case of sync loss / resync for WorkingClock	466
Figure 144 – Bridged end station with proprietary interfaces	467
Figure 145 – Internal vs. external reference plane	468
Figure 146 – Forwarding bridge resources vs. dedicated bridge resources	469
Figure 147 – Bridged end station with multiple entities – one end station per bridge component.....	470
Figure 148 – Bridged end station with multiple entities – multiple end station per bridge component.....	470
Figure 149 – State transition diagram of QPSM	471
Figure 150 – State transition diagram of PPSM.....	477
Figure 151 – State transition diagram of RTC3PSM	481
Figure 152 – State transition diagram for generating events	485
Figure 153 – State transition diagram of RED_RELAY	487
Figure 154 – Scheme of the DFP_RELAY	491
Figure 155 – Scheme of the DFP_RELAY_INBOUND and DFP_RELAY_IN_STORAGE	491
Figure 156 – Scheme of the DFP_RELAY_OUTBOUND.....	492
Figure 157 – State transition diagram of DFP_RELAY	493
Figure 158 – State transition diagram of DFP_RELAY_INBOUND	496
Figure 159 – State transition diagram of DFP_RELAY_IN_STORAGE.....	500
Figure 160 – State transition diagram of DFP_RELAY_OUTBOUND	504
Figure 161 – State transition diagram of MUX.....	508
Figure 162 – State transition diagram of DEMUX	513

Figure 163 – State transition diagram of ACCM	521
Figure 164 – State transition diagram of DHCP	524
Figure 165 – Network Management Entity	530
Figure 166 – NMDA model for network management	531
Figure 167 – YANG models of a bridge component	532
Figure 168 – YANG models of an end station component	532
Figure 169 – Structuring of the protocol machines within the DMPM (bridge)	533
Figure 170 – State transition diagram of LMPM	536
Figure 171 – AlarmSpecifier.SequenceNumber value range	589
Figure 172 – FrameSendOffset vs. duration of a cycle	644
Figure 173 – Severity classification of fault, maintenance and normal operation	700
Figure 174 – UpdateInterval measurement	706
Figure 175 – Deadline measurement	707
Figure 176 – MaxCalculatedLatency	709
Figure 177 – Timing model with RR = 1	710
Figure 178 – Timing model with RR = 4	710
Figure 179 – Calculation principle for a cycle	718
Figure 180 – Calculation principle for the minimum YellowTime	719
Figure 181 – Example IPG behavior of an ideal end station component in case of bursts	751
Figure 182 – Example IPG behavior of an end station component in case of bursts	752
Figure 183 – Detection of dropped frames – appear	761
Figure 184 – Detection of dropped frames – disappear	761
Figure 185 – Definition of the reserved interval	778
Figure 186 – Toplevel view of the PLL window	781
Figure 187 – Definition of PLL window	781
Figure 188 – Toplevel view of the time PLL window	783
Figure 189 – Definition of time PLL window	784
Figure 190 – Detection of DFP late error – appear and disappear	794
Figure 191 – MediaRedundancyWatchDog expired – appear and disappear	795
Figure 192 – EndPoint1 and Endpoint2 scheme – above and below	798
Figure 193 – EndPoint1 and Endpoint2 scheme – left and right	798
Figure 194 – Relationship among Protocol Machines	816
Figure 195 – State transition diagram of ALPMI	841
Figure 196 – State transition diagram of ALPMR	845
Figure 197 – Scheme of the IO device CM	849
Figure 198 – State transition diagram of the IO device CM	851
Figure 199 – State transition diagram of CMDEV	855
Figure 200 – Scheme of the IO device CM – device access	860
Figure 201 – State transition diagram of CMDEV_DA	863
Figure 202 – State transition diagram of CMSU	867
Figure 203 – State transition diagram of CMIO	872
Figure 204 – State transition diagram of CMRS	875

Figure 205 – State transition diagram of CMWRR	878
Figure 206 – State transition diagram of CMRDR	883
Figure 207 – State transition diagram of CMSM	886
Figure 208 – State transition diagram of CMPBE	890
Figure 209 – State transition diagram of CMDMC	895
Figure 210 – State transition diagram of CMINA	899
Figure 211 – State transition diagram of CMRPC	904
Figure 212 – Intersection and residual amount using different ARUUID.ConfigIDs	912
Figure 213 – Intersection and removed amount using different ARUUID.ConfigIDs	912
Figure 214 – State transition diagram of CMSRL	914
Figure 215 – Single Input and single Output buffer of CMSRL	920
Figure 216 – Dynamic reconfiguration with CMSRL	921
Figure 217 – Alarm queue management of CMSRL	922
Figure 218 – Reporting System management of CMSRL	923
Figure 219 – Primary: Switchover time between two ARs of an ARset	923
Figure 220 – Backup: Switchover time between two ARs of an ARset	924
Figure 221 – State transition diagram of CMSRL_AL	926
Figure 222 – State transition diagram of CMRSI	931
Figure 223 – Scheme of the IO controller CM	935
Figure 224 – State transition diagram of the IO controller CM	937
Figure 225 – State transition diagram of CMCTL	941
Figure 226 – State transition diagram of CTLSM	949
Figure 227 – State transition diagram of CTLIO	951
Figure 228 – State transition diagram of CTRLDI	955
Figure 229 – State transition diagram of CTRLDR	958
Figure 230 – State transition diagram of CTRLRPC	962
Figure 231 – State transition diagram of CTLSU	967
Figure 232 – State transition diagram of CTLWRI	973
Figure 233 – State transition diagram of CTLWRR	978
Figure 234 – State transition diagram of CTLPBE	981
Figure 235 – State transition diagram of CTLDINA	986
Figure 236 – Automatic NameOfStation assignment	992
Figure 237 – State transition diagram of CTLSRL	994
Figure 238 – Input and Output buffer of CTLSRL	998
Figure 239 – Input and Output buffer with dynamic reconfiguration	998
Figure 240 – Alarm queue management of CTLSRL	999
Figure 241 – Alarm queue management with dynamic reconfiguration	999
Figure 242 – State transition diagram of CTLSC	1001
Figure 243 – State transition diagram of CTRLRSI	1006
Figure 244 – State transition diagram of CTLINA	1010
Figure 245 – Scheme of a station hosting CIM and NME	1014
Figure 246 – Scheme of the station hosting CIM and Query Stream	1014
Figure 247 – Scheme of a station hosting CIM only	1015

Figure 248 – State transition diagram of NME	1019
Figure 249 – State transition diagram of TDE	1025
Figure 250 – State transition diagram of PCE	1028
Figure 251 – State transition diagram of NCE	1032
Figure 252 – State transition diagram of NUE	1036
Figure 253 – State transition diagram of BNME	1042
Figure 254 – State transition diagram of NMEINA	1045
Figure A.1 – Establishing of an AR using RT_CLASS_1, RT_CLASS_2 or RT_CLASS_3 (Initial connection monitoring w/o RT)	1090
Figure A.2 – Establishing of an AR using RT_CLASS_1, RT_CLASS_2 or RT_CLASS_3 (Connection monitoring with RT)	1091
Figure A.3 – Principle of the data evaluation during startup (RED channel establishment delayed)	1092
Figure A.4 – Principle of the data evaluation during startup (RED channel establishment immediately)	1093
Figure A.5 – Principle of the data evaluation during startup (Special case: Isochronous mode application)	1094
Figure A.6 – Establishing of an AR using RSI	1095
Figure A.7 – Establishing of an AR using Streams and isochronous mode application	1096
Figure A.8 – Startup of Alarm transmitter and receiver without System Redundancy	1097
Figure A.9 – Startup of Alarm transmitter and receiver with System Redundancy	1098
Figure A.10 – Startup of Alarm transmitter and receiver during a PrmBegin / PrmEnd / ApplRdy sequence	1099
Figure A.11 – Time-aware systems path establishment	1100
Figure B.1 – Establishing of an AR using RT_CLASS_3 AR with startup mode “Legacy” ...	1102
Figure B.2 – Establishing of an AR using RT_CLASS_1, 2 or UDP AR with startup mode “Legacy”	1103
Figure C.1 – Establishing of a device access AR	1104
Figure C.2 – Establishing of a device access AR using RSI	1105
Figure D.1 – Accelerated establishing of an IOAR without error	1107
Figure D.2 – Accelerated establishing of an IOAR with “late error”	1108
Figure E.1 – Establishing of an IOAR using fast startup	1110
Figure F.1 – Example of upload from storage	1111
Figure F.2 – Example of retrieval from storage	1112
Figure G.1 – Application queues to implement reduction ratio	1114
Figure G.2 – Application queue to implement phases	1115
Figure H.1 – Overview of the IO controller state machines	1117
Figure H.2 – Overview of the IO device state machines	1117
Figure H.3 – Overview of the Network Management Entity state machines	1118
Figure H.4 – Overview of the common state machines	1118
Figure I.1 – Level model for synchronization master hierarchy	1119
Figure I.2 – Two level variant of the synchronization master hierarchy	1120
Figure J.1 – Devices built up in a linear structure	1121
Figure J.2 – Propagation of frames in linear transmit direction	1121
Figure J.3 – Propagation of a frames in receive direction	1122

Figure K.1 – Overview of time constraints for bandwidth allocation	1123
Figure K.2 – Calculation of the length of a RED period	1123
Figure K.3 – Calculation of the length of a GREEN period.....	1124
Figure L.1 – IEEE Std 802.3 definition	1125
Figure L.2 – Minimization of bridge delay	1125
Figure M.1 – Dynamic frame packing	1127
Figure M.2 – Dynamic frame packing – truncation of outputs	1128
Figure M.3 – Dynamic frame packing – concatenation of inputs	1128
Figure M.4 – End node mode	1129
Figure M.5 – DFPFeed definition.....	1129
Figure N.1 – Principle of fragmentation	1131
Figure N.2 – Protocol elements of fragments	1131
Figure N.3 – Bandwidth allocation using fragmentation	1132
Figure N.4 – Guardian for a fragmentation domain.....	1132
Figure O.1 – Principle of seamless media redundancy – IOCR.....	1133
Figure O.2 – Principle of seamless media redundancy – MCR	1134
Figure O.3 – Principle of seamless media redundancy – Line.....	1134
Figure P.1 – Generating the FrameSendOffset for a RED_RELAY without forwarding information in PDIRFrameData	1135
Figure Q.1 – Scheme of a 2-port switch	1138
Figure Q.2 – Scheme of 2-ports	1138
Figure Q.3 – 2 pair Ethernet cables	1140
Figure Q.4 – 4 pair Ethernet cables	1140
Figure R.1 – PrmBegin, PrmEnd and ApplRdy procedure.....	1141
Figure W.1 – IEEE Std 802 structure used for statistic counters.....	1171
Figure W.2 – IEEE Std 802 summary for statistic counters.....	1172
Figure X.1 – Macro FragmentOf()	1176
Figure Y.1 – Cut through principle – empty	1177
Figure Y.2 – Cut through principle – delayed	1178
Figure Y.3 – Cut through principle – blocked.....	1178
 Table 1 – One octet	 76
Table 2 – Two subsequent octets.....	77
Table 3 – Four subsequent octets	77
Table 4 – Eight subsequent octets	78
Table 5 – Sixteen subsequent octets	78
Table 6 – State machine description elements	79
Table 7 – Description of state machine elements	79
Table 8 – Conventions used in state machines	80
Table 9 – Conventions for services used in state machines	81
Table 10 – IEEE Std 802.3 DLPDU syntax	83
Table 11 – IEEE Std 802.11 DLPDU syntax	84
Table 12 – IEEE Std 802.15.1 DLPDU syntax	85

Table 13 – Status	90
Table 14 – Time source	92
Table 15 – SourceAddress.....	95
Table 16 – Single port device.....	95
Table 17 – DCP_MulticastMACAdd for Identify	96
Table 18 – DCP_MulticastMACAdd for Hello.....	96
Table 19 – DCP_MulticastMACAdd range 1	96
Table 20 – DCP_MulticastMACAdd range for filterable Identify	96
Table 21 – DCP_MulticastMACAdd range 2	96
Table 22 – MulticastMACAdd range 1	97
Table 23 – MulticastMACAdd range 2	97
Table 24 – MulticastMACAdd range 3	97
Table 25 – PTCP_MulticastMACAdd range 2	97
Table 26 – PTCP_MulticastMACAdd range 3	98
Table 27 – PTCP_MulticastMACAdd range 4	98
Table 28 – PTCP_MulticastMACAdd range 5	98
Table 29 – PTCP_MulticastMACAdd range 6	98
Table 30 – PTCP_MulticastMACAdd range 7	99
Table 31 – MulticastMACAdd range 8	99
Table 32 – MulticastMACAdd range 9	99
Table 33 – MulticastMACAdd range 10	99
Table 34 – MulticastMACAdd range 11	99
Table 35 – RT_CLASS_3 destination multicast address	100
Table 36 – RT_CLASS_3 invalid frame multicast address	101
Table 37 – Stream categories for RT_CLASS_STREAM	101
Table 38 – LT (Length/Type).....	102
Table 39 – TCI.VID	103
Table 40 – TCI.DEI	104
Table 41 – TCI.PCP for time-aware system.....	104
Table 42 – TCI.PCP for non-time-aware system.....	104
Table 43 – RTI.SequenceNumber	105
Table 44 – RTI.Reserved	105
Table 45 – FrameID range 1	105
Table 46 – FrameID range 2	105
Table 47 – FrameID range 3a	106
Table 48 – FrameID range 3b	106
Table 49 – FrameID range 4	106
Table 50 – FrameID range 5	106
Table 51 – FrameID range 6	107
Table 52 – FrameID range 7	107
Table 53 – FrameID range 8	107
Table 54 – FrameID range 9	108
Table 55 – FrameID range 10	108

Table 56 – FrameID range 11	108
Table 57 – FrameID range 12	109
Table 58 – FrameID range 13	109
Table 59 – FrameID range 14	109
Table 60 – FragmentationFrameID.FragSequence	109
Table 61 – FragmentationFrameID.Constant.....	109
Table 62 – DCP APDU syntax.....	110
Table 63 – DCP substitutions.....	111
Table 64 – ServiceID	115
Table 65 – Destination MAC addresses used together with the Identify service.....	115
Table 66 – ServiceType.Selection	115
Table 67 – ServiceType.Reserved	116
Table 68 – ServiceType.Selection.....	116
Table 69 – ServiceType.Reserved_1.....	116
Table 70 – ServiceType.Response.....	116
Table 71 – ServiceType.Reserved_2.....	117
Table 72 – ResponseDelayFactor	117
Table 73 – ResponseDelayTime	118
Table 74 – ResponseDelayTimeout.....	119
Table 75 – List of options.....	119
Table 76 – List of suboptions for option IPOption	119
Table 77 – List of suboptions for option DevicePropertiesOption.....	120
Table 78 – List of suboptions for option DHCPOption.....	120
Table 79 – List of suboptions for option ControlOption	120
Table 80 – List of suboptions for option DeviceInitiativeOption.....	121
Table 81 – List of suboptions for option NMEDomainOption	121
Table 82 – List of suboptions for option AllSelectorOption	121
Table 83 – List of suboptions for option ManufacturerSpecificOption.....	121
Table 84 – SuboptionDHCP	123
Table 85 – Coding of DCPBlockLength in conjunction with SuboptionStart.....	124
Table 86 – Coding of DCPBlockLength in conjunction with SuboptionStop	124
Table 87 – Coding of DCPBlockLength in conjunction with SuboptionSignal	124
Table 88 – Coding of DCPBlockLength in conjunction with SuboptionFactoryReset	125
Table 89 – Alignment between FactoryReset and ResetToFactory	125
Table 90 – Coding of DCPBlockLength in conjunction with SuboptionResetToFactory	125
Table 91 – Meaning of the different ResetToFactory modes.....	126
Table 92 – Coding of DCPBlockLength in conjunction with SuboptionDeviceInitiative	126
Table 93 – Coding of DCPBlockLength	127
Table 94 – BlockQualifier with options IPOption, DevicePropertiesOption, DHCPOption and ManufacturerSpecificOption	128
Table 95 – BlockQualifier with option ControlOption and suboption SuboptionResetToFactory.....	128
Table 96 – BlockQualifier with option NMEDomainOption	129
Table 97 – BlockQualifier with other options	129

Table 98 – BlockError	130
Table 99 – BlockInfo for SuboptionIPParameter	130
Table 100 – Bit 1 and Bit 0 of BlockInfo for SuboptionIPParameter	131
Table 101 – Bit 7 of BlockInfo for SuboptionIPParameter	131
Table 102 – BlockInfo for all other suboptions.....	131
Table 103 – DeviceInitiativeValue	131
Table 104 – SignalValue	132
Table 105 – DeviceRoleDetails.IO Device	134
Table 106 – DeviceRoleDetails.IOcontroller	134
Table 107 – DeviceRoleDetails.IOMultiDevice	134
Table 108 – DeviceRoleDetails.IOSupervisor	135
Table 109 – IPAddress	135
Table 110 – Subnetmask	137
Table 111 – StandardGateway.....	138
Table 112 – Correlation between the subfields of IPSuite	139
Table 113 – MACAddress as client identifier.....	140
Table 114 – NameOfStation as client identifier.....	140
Table 115 – Arbitrary client identifier	140
Table 116 – DHCPParameterValue using DHCP Option 255	141
Table 117 – StandardGatewayValue.StandardGateway	142
Table 118 – RsiPropertiesValue.....	142
Table 119 – NMEPrio.....	143
Table 120 – Remote primitives issued or received by DCPUCS	144
Table 121 – Local primitives issued or received by DCPUCS	144
Table 122 – DCPUCS state table	145
Table 123 – Functions, Macros, Timers and Variables used by the DCPUCS	148
Table 124 – Remote primitives issued or received by DCPUCR	148
Table 125 – Local primitives issued or received by DCPUCR.....	149
Table 126 – DCPUCR state table.....	149
Table 127 – Functions, Macros, Timers and Variables used by the DCPUCR.....	152
Table 128 – Return values for CheckAPDU.....	152
Table 129 – Remote primitives issued or received by DCPMCS	153
Table 130 – Local primitives issued or received by DCPMCS.....	154
Table 131 – DCPMCS state table.....	154
Table 132 – Functions used by the DCPMCS.....	156
Table 133 – Remote primitives issued or received by DCPMCR.....	157
Table 134 – Local primitives issued or received by DCPMCR	157
Table 135 – DCPMCR state table	158
Table 136 – Functions, Macros, Timers and Variables used by the DCPMCR	158
Table 137 – Remote primitives issued or received by DCPHMCS	159
Table 138 – Local primitives issued or received by DCPHMCS	159
Table 139 – DCPHMCS state table	160
Table 140 – Functions, Macros, Timers and Variables used by the DCPHMCS	161

Table 141 – Remote primitives issued or received by DCPHMCR	161
Table 142 – Local primitives issued or received by DCPHMCR	161
Table 143 – DCPHMCR state table	162
Table 144 – Functions, Macros, Timers and Variables used by the DCPHMCR	162
Table 145 – PTCP APDU syntax	163
Table 146 – PTCP substitutions	163
Table 147 – PTCP_TLVHeader.Type	164
Table 148 – PTCP_Delay10ns	165
Table 149 – PTCP_Delay1ns_Byte.Value	165
Table 150 – PTCP_Delay1ns	165
Table 151 – PTCP_Delay1ns_FUP	166
Table 152 – PTCP_SequenceID	166
Table 153 – PTCP_SubType for OUI (=00-0E-CF)	167
Table 154 – PTCP_Seconds	168
Table 155 – PTCP_NanoSeconds	168
Table 156 – PTCP_Flags.LeapSecond	168
Table 157 – Timescale correspondence between PTCP_EPOCHNumber, PTCP_Second, PTCP_Nanosecond, CycleCounter and SendClockFactor	169
Table 158 – PTCP_CurrentUTCOffset	169
Table 159 – PTCP_MasterPriority1.Priority for SyncID == 0 and SyncProperties.Role == 2	170
Table 160 – PTCP_MasterPriority1.Priority for SyncID == 0 and SyncProperties.Role == 1	170
Table 161 – PTCP_MasterPriority1.Level	170
Table 162 – PTCP_MasterPriority2	171
Table 163 – PTCP_ClockClass for SyncID == 0 (working clock synchronization)	171
Table 164 – PTCP_ClockAccuracy	171
Table 165 – PTCP_ClockVariance	172
Table 166 – PTCP_T2PortRxDelay	172
Table 167 – PTCP_T3PortTxDelay	172
Table 168 – PTCP_T2TimeStamp	173
Table 169 – Remote primitives issued or received by DELAY_REQ	191
Table 170 – Local primitives issued or received by DELAY_REQ	191
Table 171 – DELAY_REQ state table	193
Table 172 – Functions, macros, timers and variables used by the DELAY_REQ	197
Table 173 – Remote primitives issued or received by DELAY_RSP	199
Table 174 – Local primitives issued or received by DELAY_RSP	199
Table 175 – DELAY_RSP state table	201
Table 176 – Functions, Macros, Timers and Variables used by the DELAY_RSP	203
Table 177 – Remote primitives issued or received by SYN_BMA	205
Table 178 – Local primitives issued or received by SYN_BMA	205
Table 179 – SYN_BMA state table	208
Table 180 – Functions, Macros, Timers and Variables used by the SYN_BMA	212
Table 181 – Remote primitives issued or received by SYN_MPSM	215

Table 182 – Local primitives issued or received by SYN_MPSM	215
Table 183 – SYN_MPSM state table	217
Table 184 – Functions, Macros, Timers and Variables used by the SYN_MPSM	220
Table 185 – Remote primitives issued or received by SYN_SPSM	221
Table 186 – Local primitives issued or received by SYN_SPSM	221
Table 187 – SYN_SPSM state table	223
Table 188 – Functions, Macros, Timers and Variables used by the SYN_SPSM	226
Table 189 – Truth table for one SyncID for receiving sync and follow up frames	227
Table 190 – Remote primitives issued or received by SYNC_RELAY	228
Table 191 – Local primitives issued or received by SYNC_RELAY	228
Table 192 – SYNC_RELAY state table	230
Table 193 – Functions, Macros, Timers and Variables used by the SYNC_RELAY	231
Table 194 – Truth table for one SyncID for receiving	233
Table 195 – Truth table for one SyncID for transmitting	234
Table 196 – Remote primitives issued or received by SCHEDULER	234
Table 197 – Local primitives issued or received by SCHEDULER	235
Table 198 – SCHEDULER state table	236
Table 199 – Functions, Macros, Timers and Variables used by the SCHEDULER	237
Table 200 – Truth table for RxPeriodChecker of one port	238
Table 201 – Truth table for TxPeriodChecker of one port	238
Table 202 – Alignment of terms to IEEE Std 802.1AS	239
Table 203 – Timescales	239
Table 204 – Timescale correspondence between GlobalTime, TAI and UTC	241
Table 205 – Timescale correspondence between WorkingClock, TAI and UTC	242
Table 206 – Conjunction between supported MRP_Role and default MRP_Prio	247
Table 207 – Extended forwarding rule	247
Table 208 – Managed Multicast MAC address	247
Table 209 – RTC APDU syntax	249
Table 210 – RTC substitutions	250
Table 211 – CycleCounter Difference	251
Table 212 – DataStatus.State	253
Table 213 – DataStatus.Redundancy in conjunction with DataStatus.State==Backup	254
Table 214 – DataStatus.Redundancy in conjunction with DataStatus.State==Primary	254
Table 215 – DataStatus.DataValid	254
Table 216 – DataStatus.ProviderState	254
Table 217 – DataStatus.StationProblemIndicator	255
Table 218 – DataStatus.Ignore of a frame	255
Table 219 – DataStatus.Ignore of a sub frame	255
Table 220 – TransferStatus for RT_CLASS_3	256
Table 221 – SFPosition.Position	257
Table 222 – SFPosition.Reserved	257
Table 223 – SFDataLength	257
Table 224 – SFCycleCounter Difference	259

Table 225 – IOxS.Extension.....	259
Table 226 – IOxS.Instance.....	259
Table 227 – IOxS.DataState	260
Table 228 – APDU_Status of a PPM with subframe structure.....	265
Table 229 – Remote primitives issued or received by PPM	266
Table 230 – Local primitives issued or received by PPM.....	266
Table 231 – PPM state table	268
Table 232 – Functions, Macros, Timers and Variables used by the PPM.....	270
Table 233 – Truth table used by the PPM for TxOption for non-streams.....	270
Table 234 – Truth table used by the PPM for TxOption for streams.....	271
Table 235 – Remote primitives issued or received by CPM	272
Table 236 – Local primitives issued or received by CPM.....	272
Table 237 – CPM state table.....	274
Table 238 – Functions, Macros, Timers and Variables used by the CPM.....	277
Table 239 – Truth table used by the CPM for RxOption for non-streams	279
Table 240 – Truth table used by the CPM for RxOption for streams	279
Table 241 – Truth table for one frame using RT_CLASS_x	280
Table 242 – Truth table for one frame using RT_CLASS_UDP	280
Table 243 – Truth table for the C_SDU	280
Table 244 – Truth table for arranging DHt and data	281
Table 245 – Truth table for the Subframe – frame check.....	281
Table 246 – Truth table for the Subframe – sub frame check	281
Table 247 – Truth table for the Subframe – sub frame data check.....	282
Table 248 – Truth table for the Subframe – DHt and data	282
Table 249 – RTA APDU syntax	282
Table 250 – RTA substitutions	283
Table 251 – RSI APDU syntax	284
Table 252 – RSI substitutions	284
Table 253 – AlarmEndpoint in conjunction with PDUType.Version := 1.....	285
Table 254 – AlarmEndpoint in conjunction with PDUType.Version := 2.....	286
Table 255 – PDUType.Type with PDUType.Version := 1	286
Table 256 – PDUType.Type with PDUType.Version := 2	286
Table 257 – PDUType.Version.....	287
Table 258 – AddFlags.WindowSize in conjunction with PDUType.Version := 1.....	287
Table 259 – AddFlags.WindowSize in conjunction with PDUType.Version := 2.....	287
Table 260 – AddFlags.TACK in conjunction with PDUType.Version := 1.....	288
Table 261 – AddFlags.TACK in conjunction with PDUType.Version := 2.....	288
Table 262 – AddFlags.MoreFrag in conjunction with PDUType.Version := 1.....	288
Table 263 – AddFlags.MoreFrag in conjunction with PDUType.Version := 2.....	288
Table 264 – AddFlags.Notification in conjunction with PDUType.Version := 1	289
Table 265 – AddFlags.Notification in conjunction with PDUType.Version := 2	289
Table 266 – SendSeqNum in conjunction with PDUType.Version := 1	289
Table 267 – SendSeqNum in conjunction with PDUType.Version := 2	289

Table 268 – SendSeqNum and AckSeqNum start sequence in conjunction with PDUType.Version := 1	290
Table 269 – SendSeqNum and AckSeqNum start sequence in conjunction with PDUType.Version := 2	290
Table 270 – AckSeqNum in conjunction with PDUType.Version := 1	291
Table 271 – AckSeqNum in conjunction with PDUType.Version := 2	291
Table 272 – VarPartLen	291
Table 273 – FopnumOffset.Offset	292
Table 274 – FopnumOffset.OpNum	292
Table 275 – FopnumOffset.CallSequence	293
Table 276 – RspMaxLength	293
Table 277 – RsilInterface	293
Table 278 – Relationship between OpNum and RsilInterface	294
Table 279 – Remote primitives issued or received by APMS	298
Table 280 – Local primitives issued or received by APMS	299
Table 281 – APMS state table	300
Table 282 – Functions, Macros, Timers and Variables used by the APMS	303
Table 283 – Remote primitives issued or received by APMR	305
Table 284 – Local primitives issued or received by APMR	305
Table 285 – APMR state table	307
Table 286 – Functions, Macros, Timers and Variables used by the APMR	309
Table 287 – Remote primitives issued or received by RSII	309
Table 288 – Local primitives issued or received by RSII	310
Table 289 – RSII state table	311
Table 290 – Functions, Macros, Timers and Variables used by the RSII	317
Table 291 – Remote primitives issued or received by RSIIN	321
Table 292 – Local primitives issued or received by RSIIN	322
Table 293 – RSIIN state table	323
Table 294 – Functions, Macros, Timers and Variables used by the RSIIN	323
Table 295 – Remote primitives issued or received by RSIR	324
Table 296 – Local primitives issued or received by RSIR	324
Table 297 – RSIR state table	326
Table 298 – Functions, Macros, Timers and Variables used by the RSIR	331
Table 299 – Remote primitives issued or received by RSIRN	336
Table 300 – Local primitives issued or received by RSIRN	336
Table 301 – RSIRN state table	337
Table 302 – Functions, Macros, Timers and Variables used by the RSIRN	339
Table 303 – TCI.PCP vs. streams	340
Table 304 – Lower limit of fragments	343
Table 305 – FRAG APDU syntax	344
Table 306 – FRAG substitutions	344
Table 307 – FragDataLength	345
Table 308 – FragStatus.FragmentNumber	345
Table 309 – FragStatus.Reserved	345

Table 310 – FragStatus.MoreFollows	346
Table 311 – Remote primitives issued or received by FRAG_D	346
Table 312 – Local primitives issued or received by FRAG_D	346
Table 313 – FRAG_D state table (dynamic)	348
Table 314 – Functions, Macros, Timers and Variables used by the FRAG_D (dynamic)	349
Table 315 – Remote primitives issued or received by FRAG_S	350
Table 316 – Local primitives issued or received by FRAG_S	350
Table 317 – FRAG_S state table (static)	351
Table 318 – Functions, Macros, Timers and Variables used by the FRAG_S (static)	352
Table 319 – Remote primitives issued or received by DEFRAG	353
Table 320 – Local primitives issued or received by DEFRAG	353
Table 321 – DEFRAG state table	354
Table 322 – Functions, Macros, Timers and Variables used by the DEFRAG	355
Table 323 – Truth table for the DefragGuard – first fragment	355
Table 324 – Truth table for the DefragGuard – next fragment	356
Table 325 – Truth table for the DefragGuard – last fragment	356
Table 326 – RPC APDU syntax	357
Table 327 – RPC substitutions	357
Table 328 – RPCVersion	358
Table 329 – RPCPacketType	358
Table 330 – RPCFlags	359
Table 331 – RPCFlags2	359
Table 332 – RPCDRep.Character- and IntegerEncoding	360
Table 333 – RPCDRep Octet 2 – Floating Point Representation	360
Table 334 – RPCObjectUUID.Data4	361
Table 335 – RPCObjectUUID for devices	361
Table 336 – RPCInterfaceUUID for PNIO	362
Table 337 – RPCInterfaceUUID for the RPC endpoint mapper	362
Table 338 – RPCInterfaceVersion.Major	363
Table 339 – RPCInterfaceVersion.Minor	363
Table 340 – RPCOperationNmb	364
Table 341 – RPCOperationNmb for endpoint mapper	364
Table 342 – RPCVersionFack	365
Table 343 – RPCDataRepresentationUUID – defined value	366
Table 344 – RPCInquiryType	368
Table 345 – RPCEPMapStatus	370
Table 346 – Values of NCAFaultStatus	372
Table 347 – Values of NCARrejectStatus	374
Table 348 – Remote primitives issued or received by RPC	374
Table 349 – Local primitives issued or received by RPC	375
Table 350 – LLDP APDU syntax	376
Table 351 – LLDP substitutions	377
Table 352 – LLDP_PNIO_SubType	378

Table 353 – PTCP_PortRxDelayLocal	379
Table 354 – PTCP_PortRxDelayRemote	379
Table 355 – PTCP_PortTxDelayLocal	379
Table 356 – PTCP_PortTxDelayRemote	379
Table 357 – CableDelayLocal	380
Table 358 – RTClass2_PortStatus.State	380
Table 359 – RTClass3_PortStatus.State	380
Table 360 – RTClass3_PortStatus.Fragmentation	381
Table 361 – RTClass3_PortStatus.PreambleLength	381
Table 362 – Truth table for shortening of the preamble	381
Table 363 – RTClass3_PortStatus.Optimized	382
Table 364 – MRRT_PortStatus.State	382
Table 365 – IRDataUUID	383
Table 366 – LLDP_RedOrangePeriodBegin.Offset	383
Table 367 – LLDP_RedOrangePeriodBegin.Valid	383
Table 368 – LLDP_OrangePeriodBegin.Offset	383
Table 369 – LLDP_OrangePeriodBegin.Valid	384
Table 370 – LLDP_GreenPeriodBegin.Offset	384
Table 371 – LLDP_GreenPeriodBegin.Valid	384
Table 372 – LLDP_LengthOfPeriod.Length	385
Table 373 – LLDP_LengthOfPeriod.Valid	385
Table 374 – LLDP_ChassisID in conjunction with MultipleInterfaceMode.NameOfDevice == 0 and NameOfStation	386
Table 375 – LLDP_ChassisID in conjunction with MultipleInterfaceMode.NameOfDevice == 1	386
Table 376 – LLDP_PortID in conjunction with MultipleInterfaceMode.NameOfDevice	386
Table 377 – Traffic classes	391
Table 378 – Traffic class usage for time-aware system	392
Table 379 – Traffic class usage for non-time-aware system	393
Table 380 – Traffic class usage for engineering tools	393
Table 381 – TCBandwidth	398
Table 382 – Committed burst size	398
Table 383 – Committed information rate	398
Table 384 – Credit-based shaper parameters	399
Table 385 – Enhancements for scheduled traffic	400
Table 386 – Enhanced Transmission Selection	400
Table 387 – Transmission Selection	400
Table 388 – Traffic classes	401
Table 389 – Number of entries per SendClock per Ethernet interface at 10 Mbps	402
Table 390 – Number of entries per SendClock per Ethernet interface at 100 Mbps	402
Table 391 – Number of entries per SendClock per Ethernet interface at > 100 Mbps	402
Table 392 – SendClock and ReductionRatio	404
Table 393 – Queue usage – time-aware end station – without time-aware streams	407
Table 394 – Queue masking – time-aware end station – without time-aware streams	408

Table 395 – Queue usage – time-aware end station – with time-aware streams	409
Table 396 – Queue masking – time-aware end station – with time-aware streams.....	410
Table 397 – Queue usage – non-time-aware end station – without RT_CLASS_3	411
Table 398 – Queue masking – non-time-aware end station – without RT_CLASS_3.....	412
Table 399 – Queue usage – non-time-aware end station – with RT_CLASS_3	413
Table 400 – Queue masking – non-time-aware end station – with RT_CLASS_3.....	414
Table 401 – Selection of managed objects for ingress	418
Table 402 – Selection of managed objects for egress	418
Table 403 – Priority remapping at an ingress boundary port connected to a non-time-aware device according to this document.....	420
Table 404 – Priority remapping at a domain ingress boundary port	421
Table 405 – Priority remapping at a domain ingress boundary port	422
Table 406 – “Active Destination MAC and VLAN Stream identification” at a domain ingress boundary port	422
Table 407 – Number of FDB entries	423
Table 408 – Neighborhood for hashed entries.....	424
Table 409 – FDB attributes for “Non streams”	424
Table 410 – List of MAC address	425
Table 411 – Unicast FDB entries	426
Table 412 – Multicast FDB entries	427
Table 413 – Broadcast FDB entry	427
Table 414 – VID, FID and MSTID.....	428
Table 415 – Trees and FDBs	429
Table 416 – Number of stream FDB entries	429
Table 417 – Neighborhood for Stream entries.....	430
Table 418 – FDB attributes for “Streams”	430
Table 419 – Trees and FDBs	431
Table 420 – Traffic grouping	432
Table 421 – Ingress rate limiter / Flow meter parameter.....	432
Table 422 – Ingress rate limiter / Flow meter identifier	432
Table 423 – Flow classification / Flow meter	433
Table 424 – Flow classification and metering.....	435
Table 425 – Example values for flow classification and metering – (A) only	436
Table 426 – Example values for flow classification and metering – (A) and (B)	436
Table 427 – Flow classification and metering.....	439
Table 428 – Example values for flow classification and metering	440
Table 429 – Queues and TCI	440
Table 430 – MinimumFrameMemory for 10 Mbit/s (50 % @ 8 ms).....	443
Table 431 – MinimumFrameMemory for 100 Mbit/s (50 % @ 1 ms).....	443
Table 432 – MinimumFrameMemory for 1 Gbit/s (20 % @ 1 ms).....	443
Table 433 – MinimumFrameMemory for 2,5 Gbit/s (10 % @ 1 ms).....	444
Table 434 – MinimumFrameMemory for 5 Gbit/s (5 % @ 1 ms).....	444
Table 435 – MinimumFrameMemory for 10 Gbit/s (5 % @ 1 ms).....	444
Table 436 – Minimum Frame Buffer Memory for one egress port (time-aware system)	445

Table 437 – Minimum Frame Buffer Memory for one egress port (Non-time-aware system).....	447
Table 438 – Model selection	448
Table 439 – Queue usage – time-aware bridge – without queue masking.....	448
Table 440 – Queue usage – time-aware bridge – with queue masking	449
Table 441 – Queue usage – non-time-aware bridge – without RT_CLASS_3.....	450
Table 442 – Queue usage – non-time-aware bridge – with RT_CLASS_3	451
Table 443 – Preemption parameter	455
Table 444 – Media Types.....	457
Table 445 – Remote primitives issued or received by QPSM.....	471
Table 446 – Local primitives issued or received by QPSM	471
Table 447 – QPSM state table	472
Table 448 – Functions, Macros, Timers and Variables used by the QPSM	473
Table 449 – QPSM Port truth table	475
Table 450 – QPSM Port ingress behavior	475
Table 451 – QPSM Port egress behavior	476
Table 452 – QPSM Port enable and disable behavior	476
Table 453 – Remote primitives issued or received by PPSM	476
Table 454 – Local primitives issued or received by PPSM.....	477
Table 455 – PPSM state table.....	478
Table 456 – Functions, Macros, Timers and Variables used by the PPSM.....	478
Table 457 – PPSM truth table	478
Table 458 – Remote primitives issued or received by MAC_RELAY	479
Table 459 – Local primitives issued or received by MAC_RELAY.....	480
Table 460 – Functions, Macros, Timers and Variables used by the MAC_RELAY.....	480
Table 461 – Remote primitives issued or received by RTC3PSM	481
Table 462 – Local primitives issued or received by RTC3PSM	481
Table 463 – RTC3PSM state table	482
Table 464 – Functions, Macros, Timers and Variables used by the RTC3PSM	483
Table 465 – Truth table for the RTC3PSM	484
Table 466 – RXBeginEndAssignment and TXBeginEndAssignment.....	485
Table 467 – Event function table.....	486
Table 468 – Remote primitives issued or received by RED_RELAY	486
Table 469 – Local primitives issued or received by RED_RELAY	487
Table 470 – RED_RELAY state table	488
Table 471 – Functions, Macros, Timers and Variables used by the RED_RELAY	489
Table 472 – Truth table for the RedGuard with full check	489
Table 473 – Truth table for the RedGuard with reduced check	490
Table 474 – Truth table for the RedGuard with minimal check.....	490
Table 475 – Remote primitives issued or received by DFP_RELAY	492
Table 476 – Local primitives issued or received by DFP_RELAY	493
Table 477 – DFP_RELAY state table	494
Table 478 – Functions, Macros, Timers and Variables used by the DFP_RELAY	494

Table 479 – Truth table for the DFPGuard	495
Table 480 – Remote primitives issued or received by DFP_RELAY_INBOUND	495
Table 481 – Local primitives issued or received by DFP_RELAY_INBOUND	496
Table 482 – DFP_RELAY_INBOUND state table	497
Table 483 – Functions, Macros, Timers and Variables used by the DFP_RELAY_INBOUND	497
Table 484 – Truth table for the InboundGuard – frame check	498
Table 485 – Truth table for the InboundGuard – subframe check	498
Table 486 – Truth table for the InboundGuard – subframe data check	498
Table 487 – Truth table for the InboundGuard – full check	499
Table 488 – Remote primitives issued or received by DFP_RELAY_IN_STORAGE	499
Table 489 – Local primitives issued or received by DFP_RELAY_IN_STORAGE	500
Table 490 – DFP_RELAY_IN_STORAGE state table	501
Table 491 – Functions, Macros, Timers and Variables used by the DFP_RELAY_IN_STORAGE	502
Table 492 – Remote primitives issued or received by DFP_RELAY_OUTBOUND	503
Table 493 – Local primitives issued or received by DFP_RELAY_OUTBOUND	504
Table 494 – APDU_Status used if frame is shortened	505
Table 495 – DFP_RELAY_OUTBOUND state table	505
Table 496 – Functions, Macros, Timers and Variables used by the DFP_RELAY_OUTBOUND	506
Table 497 – Truth table for the OutboundGuard – frame check	507
Table 498 – Truth table for the OutboundGuard – subframe check	507
Table 499 – Remote primitives issued or received by MUX	508
Table 500 – Local primitives issued or received by MUX	508
Table 501 – MUX state table	509
Table 502 – Functions, Macros, Timers and Variables used by MUX	511
Table 503 – Truth table for FrameSizeFits	511
Table 504 – Truth table for StateChecker	512
Table 505 – Remote primitives issued or received by DEMUX	512
Table 506 – Local primitives issued or received by DEMUX	513
Table 507 – DEMUX state table	514
Table 508 – Functions, Macros, Timers and Variables used by the DEMUX	516
Table 509 – IP/UDP APDU syntax	516
Table 510 – IP/UDP substitutions	517
Table 511 – UDP_SrcPort	518
Table 512 – UDP_DstPort	518
Table 513 – IP_DstIPAddress	518
Table 514 – IP Multicast DstIPAddress according to IETF RFC 2365	519
Table 515 – IP_DifferentiatedServices.DSCP	519
Table 516 – IP_DifferentiatedServices.ECN	520
Table 517 – Remote primitives issued or received by ACCM	521
Table 518 – Local primitives issued or received by ACCM	521
Table 519 – ACCM state table	522

Table 520 – Functions, Macros, Timers and Variables used by the ACCM	522
Table 521 – Remote primitives issued or received by DNS	523
Table 522 – Local primitives issued or received by DNS	523
Table 523 – Functions, Macros, Timers and Variables used by the DNS	523
Table 524 – Remote primitives issued or received by DHCP	524
Table 525 – Local primitives issued or received by machines.....	524
Table 526 – DHCP state table.....	525
Table 527 – Functions, Macros, Timers and Variables used by the DHCP.....	526
Table 528 – Return values of macro CheckAPDU	526
Table 529 – SNMP service overview	527
Table 530 – List of supported IETF RFC 1213-MIB objects	528
Table 531 – Enterprise number	528
Table 532 – Cross reference – MIBs	528
Table 533 – Cross reference – PDPortDataAdjust.....	528
Table 534 – Remote primitives issued or received by LMPM.....	534
Table 535 – Local primitives issued or received by LMPM	536
Table 536 – LMPM state table	537
Table 537 – Functions, Macros, Timers and Variables used by the LMPM	540
Table 538 – IO APDU substitutions	541
Table 539 – IO APDU substitutions for CIM	564
Table 540 – IO APDU substitutions for UNI.....	566
Table 541 – IO APDU substitutions for security.....	567
Table 542 – IO APDU substitutions for CIM services.....	567
Table 543 – BlockType	568
Table 544 – BlockLength	585
Table 545 – BlockVersionHigh	585
Table 546 – BlockVersionLow	585
Table 547 – AlarmType	586
Table 548 – AlarmSpecifier.SequenceNumber	589
Table 549 – AlarmSpecifier.SequenceNumber Difference	590
Table 550 – AlarmSpecifier.ChannelDiagnosis.....	590
Table 551 – AlarmSpecifier.ManufacturerSpecificDiagnosis	590
Table 552 – AlarmSpecifier.SubmoduleDiagnosisState	591
Table 553 – AlarmSpecifier.ARDiagnosticsState.....	591
Table 554 – API.....	592
Table 555 – SlotNumber	592
Table 556 – SubslotNumber.....	593
Table 557 – Index range	595
Table 558 – Expression 1 (subslot specific)	595
Table 559 – Expression 2 (slot specific).....	595
Table 560 – Expression 3 (AR specific).....	596
Table 561 – Expression 4 (API specific).....	596
Table 562 – Expression 5 (device specific)	596

Table 563 – Grouping of DiagnosisData	596
Table 564 – SecurityControlRole	597
Table 565 – AccessControlRole	597
Table 566 – Index (user specific)	598
Table 567 – Index (subslot specific)	599
Table 568 – Index (slot specific)	605
Table 569 – Index (AR specific)	606
Table 570 – Index (API specific)	608
Table 571 – Index (device specific)	609
Table 572 – RecordDataLength	613
Table 573 – ARType	613
Table 574 – IOCRMulticastMACAdd using RT_CLASS_UDP	614
Table 575 – IOCRMulticastMACAdd using RT_CLASS_x	615
Table 576 – Type 10 OUI	615
Table 577 – ARProperties.State	616
Table 578 – ARProperties.SupervisorTakeoverAllowed	616
Table 579 – ARProperties.ParameterizationServer	616
Table 580 – ARProperties.DeviceAccess	616
Table 581 – ARProperties.CompanionAR	617
Table 582 – ARProperties.AcknowledgeCompanionAR	617
Table 583 – ARProperties.RejectDCPsetRequests	617
Table 584 – ARProperties.TimeAwareSystem	618
Table 585 – ARProperties.CombinedObjectContainer	618
Table 586 – ARProperties.StartupMode	618
Table 587 – ARProperties.PullModuleAlarmAllowed	618
Table 588 – IOCRProperties.RTClass	619
Table 589 – IOCRTagHeader.IOCRVLANID	620
Table 590 – IOCRTagHeader.IOUserPriority	620
Table 591 – IOCRTYPE	621
Table 592 – CMInitiatorActivityTimeoutFactor with ARProperties.DeviceAccess == 0	621
Table 593 – CMInitiatorActivityTimeoutFactor with ARProperties.DeviceAccess == 1 or ARProperties.StartupMode == Advanced	621
Table 594 – CMInitiatorTriggerTimeoutFactor	622
Table 595 – IODataObjectFrameOffset	623
Table 596 – IOCSFrameOffset	623
Table 597 – LengthIOCS	623
Table 598 – LengthIOPS	624
Table 599 – LengthData	624
Table 600 – AlarmCRProperties.Priority	624
Table 601 – AlarmCRProperties.Transport	625
Table 602 – AlarmCRTagHeaderHigh.AlarmCRVLANID	625
Table 603 – AlarmCRTagHeaderHigh.AlarmUserPriority	625
Table 604 – AlarmCRTagHeaderLow.AlarmCRVLANID	626

Table 605 – AlarmCRTagHeaderLow.AlarmUserPriority	626
Table 606 – AlarmSequenceNumber	626
Table 607 – AlarmCRType	626
Table 608 – RTATimeoutFactor	627
Table 609 – RTARetries	627
Table 610 – PROFINETIOConstantValue	628
Table 611 – PROFINETIOConstantValue.Data1	628
Table 612 – AddressResolutionProperties.Protocol	628
Table 613 – AddressResolutionProperties.Factor	629
Table 614 – MCITimeoutFactor	629
Table 615 – InstanceLow and InstanceHigh	630
Table 616 – InstanceHigh	630
Table 617 – DeviceIDLow and DeviceIDHigh	630
Table 618 – VendorIDLow and VendorIDHigh	631
Table 619 – ModuleIdentNumber	631
Table 620 – SubmoduleIdentNumber	632
Table 621 – ARUUID	633
Table 622 – ARUUID in conjunction with ARTYPE==IOCARSR	633
Table 623 – Conjunction between ARUUID.Arnumber and Endpoint1 or Endpoint2	633
Table 624 – ARUUID.ConfigID generation rule	634
Table 625 – TargetARUUID	634
Table 626 – AdditionalValue1 and AdditionalValue2	634
Table 627 – ControlBlockProperties in conjunction with ControlCommand.ApplicationReady	634
Table 628 – ControlBlockProperties in conjunction with the other values of the field ControlCommand	634
Table 629 – ControlCommand.PrmEnd	635
Table 630 – ControlCommand.ApplicationReady	635
Table 631 – ControlCommand.Release	635
Table 632 – ControlCommand.Done	635
Table 633 – ControlCommand.ReadyForCompanion	636
Table 634 – ControlCommand.ReadyForRT_CLASS_3	636
Table 635 – ControlCommand.PrmBegin	636
Table 636 – DataDescription.Type	636
Table 637 – Values of DataLength	637
Table 638 – Values of SendClockFactor with time-base 31,25 µs	637
Table 639 – Values of SendClockFactor with time-base 25 µs	638
Table 640 – Frame size vs. SendClockFactor	638
Table 641 – Values of ReductionRatio for RT_CLASS_1, RT_CLASS_2, and RT_CLASS_STREAM	639
Table 642 – Values of ReductionRatio for RT_CLASS_3 and SendClockFactor ≥ 8	640
Table 643 – Values of ReductionRatio for RT_CLASS_3 and SendClockFactor < 8	640
Table 644 – Values of ReductionRatio in conjunction with a non-power of 2 SendClockFactor	640

Table 645 – Values of ReductionRatio for RT_CLASS_UDP	640
Table 646 – Values of Phase	641
Table 647 – Values of Sequence	641
Table 648 – Data-RTC-PDUs – DataHoldFactor of a frame	642
Table 649 – UDP-RTC-PDUs – DataHoldFactor of a frame	642
Table 650 – DataHoldFactor of a Subframe	642
Table 651 – Values of FrameSendOffset.....	643
Table 652 – ModuleState	644
Table 653 – SubmoduleState.AddInfo	645
Table 654 – SubmoduleState.Advice.....	645
Table 655 – SubmoduleState.MaintenanceRequired	645
Table 656 – SubmoduleState.MaintenanceDemanded	645
Table 657 – SubmoduleState.Fault	646
Table 658 – SubmoduleState.ARInfo	646
Table 659 – SubmoduleState.IdentInfo	646
Table 660 – SubmoduleState.FormatIndicator.....	647
Table 661 – SubmoduleProperties.Type.....	647
Table 662 – SubmoduleProperties.SharedInput	647
Table 663 – SubmoduleProperties.ReduceInputSubmoduleDataLength	648
Table 664 – SubmoduleProperties.ReduceOutputSubmoduleDataLength.....	648
Table 665 – SubmoduleProperties.DiscardIOXS	648
Table 666 – SubstitutionMode.....	649
Table 667 – SubstituteActiveFlag.....	649
Table 668 – InitiatorUDPRTPort.....	650
Table 669 – ResponderUDPRTPort.....	650
Table 670 – InitiatorRPCServerPort	650
Table 671 – ResponderRPCServerPort.....	651
Table 672 – MaxAlarmDataLength	651
Table 673 – APStructureIdentifier with API==0	652
Table 674 – APStructureIdentifier with API ≠ 0.....	652
Table 675 – ExtendedIdentificationVersionHigh	652
Table 676 – ExtendedIdentificationVersionLow	653
Table 677 – Values of ErrorCode for negative responses.....	653
Table 678 – Values of ErrorDecode	654
Table 679 – Coding of ErrorCode1 with ErrorDecode PNIORW	654
Table 680 – Coding of ErrorCode2 with ErrorDecode PNIORW	655
Table 681 – Coding of ErrorCode1 with ErrorDecode := PNIO	656
Table 682 – Values of ErrorCode2 for ErrorDecode := PNIO and ErrorCode1 (part 1).....	659
Table 683 – Values of ErrorCode2 for ErrorDecode := PNIO and ErrorCode1 (part 2 – alarm acknowledge).....	662
Table 684 – Values of ErrorCode2 for ErrorDecode := PNIO and ErrorCode1 (part 3 – machines).....	663
Table 685 – Values of ErrorCode2 for ErrorDecode := PNIO and ErrorCode1 (part 4 – IO controller)	665

Table 686 – Values of ErrorCode2 for ErrorDecode := PNIO and ErrorCode1 (part 5 – IO device)	667
Table 687 – Values of ErrorCode2 for ErrorDecode := PNIO and ErrorCode1 (part 6 – abort reasons)	668
Table 688 – Values of ErrorCode2 for ErrorDecode := PNIO and ErrorCode1 (part 7 – Reserved)	670
Table 689 – Coding of ErrorCode1 for ErrorDecode with the value ManufacturerSpecific	670
Table 690 – Coding of ErrorCode2 for ErrorDecode with the value ManufacturerSpecific	670
Table 691 – Visible characters	671
Table 692 – FactoryReset / ResetToFactory behavior (legacy from IEC 61158-6-3)	671
Table 693 – FactoryReset / ResetToFactory behavior (default without IEC 61158-6-3 history)	671
Table 694 – FactoryReset / ResetToFactory behavior if used in conjunction with functional safety submodules	671
Table 695 – IM_Hardware_Revision	672
Table 696 – IM_SWRevision_Functional_Enhancement	672
Table 697 – IM_SWRevision_Bug_Fix	672
Table 698 – IM_SWRevision_Internal_Change	672
Table 699 – IM_Revision_Counter	672
Table 700 – IM_Profile_ID	673
Table 701 – IM_Profile_Specific_Type in conjunction with IM_Profile_ID == 0x0000	673
Table 702 – IM_Profile_Specific_Type in conjunction with IM_Profile_ID range 0x0001 – 0xF6FF	673
Table 703 – IM_Version_Major	674
Table 704 – IM_Version_Minor	674
Table 705 – IM_Supported.I&M1	674
Table 706 – IM_Date with time	676
Table 707 – IM_Date without time	676
Table 708 – IM_Annotation	676
Table 709 – IM_OrderID	677
Table 710 – IM_UniquelIdentifier	677
Table 711 – UserStructureIdentifier	677
Table 712 – ChannelErrorType – range 1	679
Table 713 – ChannelErrorType – range 2	680
Table 714 – ChannelErrorType – range 3	681
Table 715 – ChannelErrorType – range 4	681
Table 716 – ChannelNumber	682
Table 717 – ChannelProperties.Type	683
Table 718 – ChannelProperties.Accumulative	683
Table 719 – ChannelProperties.Maintenance	683
Table 720 – Valid combinations within ChannelProperties	684
Table 721 – Valid combinations for AlarmNotification and RecordDataRead(DiagnosisData)	685
Table 722 – ChannelProperties.Specifier	686

Table 723 – ChannelProperties.Direction	686
Table 724 – ExtChannelErrorType	686
Table 725 – Allowed combinations of ChannelErrorType, ExtChannelErrorType, and ExtChannelAddValue	687
Table 726 – ExtChannelErrorType for ChannelErrorType 0 – 0xFF	687
Table 727 – Additional ExtChannelErrorType for ChannelErrorType 0x0F and 0x10	687
Table 728 – ExtChannelErrorType for ChannelErrorType 0x0100 – 0x7FFF	688
Table 729 – ExtChannelErrorType for ChannelErrorType “Data transmission impossible”	688
Table 730 – ExtChannelErrorType for ChannelErrorType “Remote mismatch”	689
Table 731 – ExtChannelErrorType for ChannelErrorType “Media redundancy mismatch – Ring”	689
Table 732 – ExtChannelErrorType for ChannelErrorType “Media redundancy mismatch – Interconnection”	690
Table 733 – ExtChannelErrorType for ChannelErrorType “Sync mismatch” and for ChannelErrorType “Time mismatch”	691
Table 734 – ExtChannelErrorType for ChannelErrorType “Isochronous mode mismatch”	691
Table 735 – ExtChannelErrorType for ChannelErrorType “Multicast CR mismatch”	691
Table 736 – ExtChannelErrorType for ChannelErrorType “Fiber optic mismatch”	692
Table 737 – ExtChannelErrorType for ChannelErrorType “Network component function mismatch”	692
Table 738 – ExtChannelErrorType for ChannelErrorType “Dynamic Frame Packing function mismatch”	693
Table 739 – ExtChannelErrorType for ChannelErrorType “Media redundancy with planned duplication mismatch”	693
Table 740 – ExtChannelErrorType for ChannelErrorType “Multiple interface mismatch”	694
Table 741 – ExtChannelErrorType for ChannelErrorType “Power failure over Single Pair Ethernet”	694
Table 742 – Values for ExtChannelAddValue	695
Table 743 – Values for “Accumulative Info”	695
Table 744 – Values for ExtChannelErrorType “Parameter fault detail”	696
Table 745 – Values for ExtChannelAddValue.Index	696
Table 746 – Values for ExtChannelAddValue.Offset	696
Table 747 – Values for ExtChannelErrorType “Consistency fault detail”	696
Table 748 – Values for ExtChannelAddValue.Index	697
Table 749 – Values for “Fiber optic mismatch” – “Power Budget”	697
Table 750 – Values for “Network component function mismatch” – “Frame dropped”	697
Table 751 – Values for “Remote mismatch” – “Peer CableDelay mismatch”	698
Table 752 – Values for “Multiple interface mismatch” – “Conflicting MultipleInterfaceMode.NameOfDevice mode”	698
Table 753 – Values for “Multiple interface mismatch” – “Inactive StandardGateway”	698
Table 754 – Values for QualifiedChannelQualifier	699
Table 755 – Values for MaintenanceStatus	699
Table 756 – URRecordIndex	701
Table 757 – URRecordLength	701

Table 758 – iPar_Req_Header.....	701
Table 759 – Max_Segm_Size.....	701
Table 760 – Transfer_Index.....	702
Table 761 – Total_iPar_Size.....	702
Table 762 – NMEDomainUUID.....	702
Table 763 – NMENameUUID.....	703
Table 764 – NMEParameterUUID.....	703
Table 765 – NMENameAddressSubtype.....	704
Table 766 – StreamIdentification.....	704
Table 767 – StreamControl.Priority.....	704
Table 768 – StreamControl.Redundancy.....	705
Table 769 – StreamControl.Append.....	705
Table 770 – StreamControl.Dependency.....	705
Table 771 – Values of UpdateInterval.....	706
Table 772 – NetworkDeadline.....	707
Table 773 – Application Interval.....	707
Table 774 – ApplicationDeadline.....	708
Table 775 – PduSize.....	708
Table 776 – StreamTCI.VID.....	708
Table 777 – StreamTCI.PCP.....	708
Table 778 – MaxCalculatedLatency.....	709
Table 779 – StreamType.....	710
Table 780 – RxPort.....	711
Table 781 – NumberOfTxPortGroups.....	711
Table 782 – TxPortEntry.....	712
Table 783 – FrameDetails.SyncFrame in conjunction with FrameDataProperties.ForwardingMode=="Absolute mode".....	713
Table 784 – FrameDetails.SyncFrame in conjunction with FrameDataProperties.ForwardingMode=="Relative mode".....	713
Table 785 – FrameDetails.MeaningFrameSendOffset.....	714
Table 786 – FrameDetails.MediaRedundancyWatchDog.....	714
Table 787 – FrameDataProperties.ForwardingMode.....	714
Table 788 – FrameDataProperties.FastForwardingMulticastMACAdd.....	714
Table 789 – FrameDataProperties.FragmentationMode.....	715
Table 790 – MaxBridgeDelay.....	715
Table 791 – NumberOfPorts.....	715
Table 792 – MaxPortTxDelay.....	716
Table 793 – MaxPortRxDelay.....	716
Table 794 – MaxLineRxDelay.....	716
Table 795 – YellowTime.....	717
Table 796 – StartOfRedFrameID.....	719
Table 797 – EndOfRedFrameID.....	720
Table 798 – Dependencies of StartOfRedFrameID and EndOfRedFrameID.....	720
Table 799 – NumberOfAssignments.....	720

Table 800 – NumberOfPhases	721
Table 801 – AssignedValueForReservedBegin.....	721
Table 802 – AssignedValueForOrangeBegin	721
Table 803 – AssignedValueForReservedEnd	722
Table 804 – Values of RedOrangePeriodBegin	722
Table 805 – Dependencies of RedOrangePeriodBegin, OrangePeriodBegin and GreenPeriodBegin	722
Table 806 – Values of OrangePeriodBegin.....	723
Table 807 – Values of GreenPeriodBegin	723
Table 808 – MultipleInterfaceMode.NameOfDevice	723
Table 809 – NumberOfPeers in conjunction with PDPortDataCheck or CIMNetConfExpectedNetworkAttributes	724
Table 810 – NumberOfPeers in conjunction with PDPortDataReal or PDPortDataRealExtended	724
Table 811 – LineDelay.Value with LineDelay.FormatIndicator == 0	725
Table 812 – LineDelay.Value with LineDelay.FormatIndicator == 1	725
Table 813 – LineDelay.FormatIndicator.....	726
Table 814 – MAUType	726
Table 815 – MAUType with MAUTypeExtension.....	733
Table 816 – Valid combinations between MAUType and LinkState	733
Table 817 – MAUTypeExtensions and its corresponding MAUTypes	734
Table 818 – CheckSyncMode.CableDelay.....	735
Table 819 – CheckSyncMode.SyncMaster	735
Table 820 – MAUTypeMode.Check	735
Table 821 – DomainBoundaryIngress	736
Table 822 – DomainBoundaryEgress	736
Table 823 – DomainBoundaryAnnounce	736
Table 824 – MulticastBoundary	737
Table 825 – PeerToPeerBoundary	737
Table 826 – DCPBoundary.....	738
Table 827 – PreambleLength.Length.....	738
Table 828 – LinkState.Link	739
Table 829 – LinkState.Port	739
Table 830 – MediaType	740
Table 831 – NMEDomainVIDConfig.StreamHighVID	740
Table 832 – NMEDomainVIDConfig.StreamHighRedVID	740
Table 833 – NMEDomainVIDConfig.StreamLowVID	741
Table 834 – NMEDomainVIDConfig.StreamLowRedVID	741
Table 835 – NMEDomainVIDConfig.NonStreamVID	741
Table 836 – NMEDomainVIDConfig.NonStreamVIDB	741
Table 837 – NMEDomainVIDConfig.NonStreamVIDC.....	742
Table 838 – NMEDomainVIDConfig.NonStreamVIDD	742
Table 839 – NMEDomainQueueConfig.QueueID	742
Table 840 – NMEDomainQueueConfig.TciPcp	742

Table 841 – NMEDomainQueueConfig.Shaper	743
Table 842 – NMEDomainQueueConfig.PreemptionMode	743
Table 843 – NMEDomainQueueConfig.UnmaskTimeOffset	743
Table 844 – NMEDomainQueueConfig.MaskTimeOffset	743
Table 845 – PortQueueEgressRateLimiter.CIR	744
Table 846 – PortQueueEgressRateLimiter.CBS	744
Table 847 – PortQueueEgressRateLimiter.Envelope	744
Table 848 – PortQueueEgressRateLimiter.Rank	744
Table 849 – PortQueueEgressRateLimiter.QueueID	745
Table 850 – PortQueueEgressRateLimiter.Reserved	745
Table 851 – CIMStationPortStatus.PreemptionStatus	745
Table 852 – CIMStationPortStatus.BoundaryPortStatus	745
Table 853 – PortIngressRateLimiter.CIR	746
Table 854 – PortIngressRateLimiter.CBS	746
Table 855 – PortIngressRateLimiter.Envelope	746
Table 856 – PortIngressRateLimiter.Rank	747
Table 857 – GatingCycle.Valid	747
Table 858 – NumberOfQueues	747
Table 859 – TransferTimeTX	748
Table 860 – TransferTimeRX	748
Table 861 – PortCapabilities.TimeAware	748
Table 862 – PortCapabilities.Preemption	748
Table 863 – PortCapabilities.QueueMasking	749
Table 864 – ForwardingGroup	749
Table 865 – ForwardingDelay.Independent	749
Table 866 – ForwardingDelay.Dependent	750
Table 867 – MaxSupportedRecordSize	750
Table 868 – Traffic classes	750
Table 869 – TrafficClassTranslateEntry.VID	751
Table 870 – TrafficClassTranslateEntry.PCP	751
Table 871 – MinIPGBreakingPoint	752
Table 872 – MinIPGFrameSize	752
Table 873 – FrameSendOffsetDeviation	753
Table 874 – SupportedBurstSize.Frames	753
Table 875 – SupportedBurstSize.Octets	753
Table 876 – FDBCommand	754
Table 877 – StreamClass	754
Table 878 – SyncPortRole	754
Table 879 – CounterStatus.ifInOctets	755
Table 880 – CounterStatus.ifOutOctets	755
Table 881 – CounterStatus.ifInDiscards	755
Table 882 – CounterStatus.ifOutDiscards	755
Table 883 – CounterStatus.ifInErrors	755

Table 884 – CounterStatus.ifOutErrors	756
Table 885 – CounterStatus.Reserved	756
Table 886 – VendorBlockType	757
Table 887 – FiberOpticType	757
Table 888 – FiberOpticCableType	757
Table 889 – FiberOpticPowerBudgetType.Value	758
Table 890 – FiberOpticPowerBudgetType.CheckEnable	758
Table 891 – MaintenanceDemandedAdminStatus.Temperature	758
Table 892 – MaintenanceDemandedAdminStatus.TXBias	759
Table 893 – MaintenanceDemandedAdminStatus.TXPower	759
Table 894 – MaintenanceDemandedAdminStatus.RXPower	759
Table 895 – MaintenanceDemandedAdminStatus.Reserved	759
Table 896 – ErrorAdminStatus.TXFaultState	759
Table 897 – ErrorAdminStatus.RXLossState	760
Table 898 – ErrorAdminStatus.Reserved	760
Table 899 – NCDropBudgetType.Value	760
Table 900 – NCDropBudgetType.CheckEnable	760
Table 901 – MRP_Version	761
Table 902 – MRP_RingState	762
Table 903 – MRP_DomainUUID	762
Table 904 – MRP_LengthDomainName	762
Table 905 – MRP_DomainName	763
Table 906 – MRP_Role	763
Table 907 – MRP_Version	763
Table 908 – MRP_Prio	763
Table 909 – MRP_TOPchgT	764
Table 910 – MRP_TOPNRmax	764
Table 911 – MRP_TSTshortT	764
Table 912 – MRP_TSTdefaultT	765
Table 913 – MRP_TSTNRmax	765
Table 914 – MRP_LNKdownT	765
Table 915 – MRP_LNKupT	766
Table 916 – MRP_LNKNRmax	766
Table 917 – MRP_Check.MediaRedundancyManager	766
Table 918 – MRP_Check.MRP_DomainUUID	767
Table 919 – MRP_NumberOfEntries	767
Table 920 – MRP_Instance	767
Table 921 – MRPIC_LengthDomainName	767
Table 922 – MRPIC_DomainName	768
Table 923 – MRPIC_State	768
Table 924 – MRPIC_Role	768
Table 925 – MRPIC_DomainID	768
Table 926 – MRPIC_TOPchgT	769

Table 927 – MRPIC_TOPNRmax	769
Table 928 – MRPIC_LinkStatusChangeT	770
Table 929 – MRPIC_LinkStatusNRmax	770
Table 930 – MRPIC_LNKdownT	770
Table 931 – MRPIC_LNKupT	771
Table 932 – MRPIC_LNKNRmax	771
Table 933 – MRPIC_StartDelay	772
Table 934 – MRPIC_MICPosition	772
Table 935 – MRPIC_Check.MIM	772
Table 936 – MRPIC_Check.MRPIC_DomainID	773
Table 937 – SNMPControl.SNMPControl	773
Table 938 – CommunityNameLength	773
Table 939 – CommunityName	774
Table 940 – ElectricPowerDeviceVoltage.Voltage	774
Table 941 – ElectricPowerDeviceVoltage.Type	774
Table 942 – ElectricPowerPortVoltage.Voltage	775
Table 943 – ElectricPowerPortVoltage.Type	775
Table 944 – ElectricPowerPortCurrent.Current	775
Table 945 – ElectricPowerPortCurrent.CurrentLimit	776
Table 946 – SyncProperties.Role	776
Table 947 – SyncProperties.SyncID	777
Table 948 – ReservedIntervalBegin	777
Table 949 – ReservedIntervalEnd	777
Table 950 – Dependencies of ReservedIntervalBegin and ReservedIntervalEnd	777
Table 951 – SyncSendFactor	778
Table 952 – PTCPTimeoutFactor	779
Table 953 – PTCPTakeoverTimeoutFactor	779
Table 954 – PTCPMasterStartupTime	780
Table 955 – PLLWindow	780
Table 956 – TimeDomainUUID	782
Table 957 – TimeDomainNumber	782
Table 958 – TimePLLWindow	783
Table 959 – TimeMasterPriority1	784
Table 960 – TimeMasterPriority2	784
Table 961 – MessageIntervalFactor	785
Table 962 – MessageTimeoutFactor	785
Table 963 – TimeSyncProperties.Role	786
Table 964 – TimeIOBase	786
Table 965 – TimeDataCycle	786
Table 966 – TimeIOInput	787
Table 967 – TimeIOOutput	787
Table 968 – TimeIOInputValid	787
Table 969 – TimeIOOutputValid	788

Table 970 – ControllerApplicationCycleFactor.....	788
Table 971 – FSHelloMode.Mode	788
Table 972 – FSHelloInterval.....	789
Table 973 – FSHelloRetry	789
Table 974 – FSHelloDelay	790
Table 975 – FSPParameterMode.Mode	790
Table 976 – FSPParameterUUID.....	790
Table 977 – NumberOfSubframeBlocks	791
Table 978 – SFIOCRProperties.DistributedWatchDogFactor	791
Table 979 – SFIOCRProperties.RestartFactorForDistributedWD	792
Table 980 – SFIOCRProperties.DFPMMode	792
Table 981 – SFIOCRProperties.DFPDirection	792
Table 982 – SFIOCRProperties.DFPRedundantPathLayout.....	793
Table 983 – SFIOCRProperties.SFCRC16	793
Table 984 – SubframeData.Position.....	793
Table 985 – SubframeData.DataLength	793
Table 986 – Event function table.....	794
Table 987 – SubframeOffset	795
Table 988 – Event function table.....	796
Table 989 – FromOffsetData.....	796
Table 990 – NextOffsetData.....	796
Table 991 – TotalSize	797
Table 992 – RedundancyInfo.EndPoint1	797
Table 993 – RedundancyInfo.EndPoint2	797
Table 994 – Valid combination of RedundancyInfo.EndPoint1 and RedundancyInfo.EndPoint2.....	797
Table 995 – SRProperties.InputValidOnBackupAR with SRProperties.Mode == 0	798
Table 996 – SRProperties.InputValidOnBackupAR with SRProperties.Mode == 1	798
Table 997 – SRProperties.Reserved_1	799
Table 998 – SRProperties.Mode	799
Table 999 – RedundancyDataHoldFactor	799
Table 1000 – NumberOfEntries.....	800
Table 1001 – PE_OperationalMode.....	800
Table 1002 – AM_Location.Structure	800
Table 1003 – AM_Location.Levelx	801
Table 1004 – AM_Location.Reserved1	802
Table 1005 – AM_Location.BeginSubslotNumber	802
Table 1006 – AM_Location.EndSubslotNumber.....	802
Table 1007 – AM_Location.Reserved2.....	802
Table 1008 – AM_Location.Reserved3.....	802
Table 1009 – AM_Location.Reserved4.....	803
Table 1010 – AM_DeviceIdentification.DeviceSubID	803
Table 1011 – AM_DeviceIdentification.DeviceSubID for AM_DeviceIdentification.Organization := 0x0000	804

Table 1012 – AM_DeviceIdentification.DeviceID	804
Table 1013 – AM_DeviceIdentification.VendorID	804
Table 1014 – AM_DeviceIdentification.Organization	804
Table 1015 – RS_Properties.AlarmTransport	805
Table 1016 – RS_BlockType used for events	806
Table 1017 – RS_BlockType used for adjust	806
Table 1018 – RS_BlockLength in conjunction with RS_EventBlock	807
Table 1019 – RS_BlockLength in conjunction with other blocks	807
Table 1020 – RS_Specifier.SequenceNumber	807
Table 1021 – RS_Specifier.Specifier	807
Table 1022 – RS_MinusError	808
Table 1023 – RS_PlusError	808
Table 1024 – RS_ExtensionBlockType	808
Table 1025 – RS_ExtensionBlockLength	808
Table 1026 – RS_MaxScanDelay	809
Table 1027 – RS_AdjustSpecifier.Incident	809
Table 1028 – RS_ReasonCode.Reason	809
Table 1029 – RS_ReasonCode.Detail	810
Table 1030 – RS_DigitalInputCurrentValue.Value	810
Table 1031 – RS_DomainIdentification	810
Table 1032 – RS_MasterIdentification	810
Table 1033 – ActualLocalTimeStamp	811
Table 1034 – LocalTimeStamp	811
Table 1035 – NumberOfLogEntries	811
Table 1036 – EntryDetail	811
Table 1037 – Time_TimeStamp	812
Table 1038 – Allowed combinations of PRAL_Reason, PRAL_ExtReason, and PRAL_ReasonAddValue	812
Table 1039 – PRAL_ChannelProperties.Reserved_1	812
Table 1040 – PRAL_ChannelProperties.Accumulative	813
Table 1041 – PRAL_ChannelProperties.Reserved_2	813
Table 1042 – PRAL_ChannelProperties.Direction	813
Table 1043 – Values for PRAL_Reason	813
Table 1044 – Values for PRAL_ExtReason	815
Table 1045 – Usage of PRAL_ReasonAddValue	815
Table 1046 – Values for PRAL_ReasonAddValue[0..3]	815
Table 1047 – Values for PRAL_ReasonAddValue[0] to [127]	815
Table 1048 – Primitives issued by AP-Context (FAL user) to FSPMPON	818
Table 1049 – Primitives issued by FSPMPON to AP-Context (FAL user)	818
Table 1050 – Primitives issued by AP-Context (FAL user) to FSPMDEV	819
Table 1051 – Primitives issued by FSPMDEV to AP-Context (FAL user)	821
Table 1052 – Functions, Macros, Timers and Variables used by the AP-Context (FAL user) to FSPMDEV	825

Table 1053 – Functions, Macros, Timers and Variables used by the FSPMDEV to AP-Context (FAL user)	826
Table 1054 – Primitives issued by AP-Context (FAL user) to FSPMCTL.....	828
Table 1055 – Primitives issued by FSPMCTL to AP-Context (FAL user).....	831
Table 1056 – Functions, Macros, Timers and Variables used by AP-Context (FAL user) to FSPMCTL.....	835
Table 1057 – Functions, Macros, Timers and Variables used by FSPMCTL to AP-Context (FAL user)	836
Table 1058 – Primitives issued by AP-Context (FAL user) to FSPMNME.....	839
Table 1059 – Primitives issued by FSPMNME to AP-Context (FAL user).....	839
Table 1060 – Remote primitives issued or received by ALPMI	840
Table 1061 – Local primitives issued or received by ALPMI	841
Table 1062 – ALPMI state table	842
Table 1063 – Functions, Macros, Timers and Variables used by ALPMI.....	843
Table 1064 – Remote primitives issued or received by ALPMR	844
Table 1065 – Local primitives issued or received by ALPMR.....	845
Table 1066 – ALPMR state table.....	846
Table 1067 – Functions, Macros, Timers and Variables used by ALPMR	848
Table 1068 – Remote primitives issued or received by CMDEV	852
Table 1069 – Local primitives issued or received by CMDEV	854
Table 1070 – CMDEV state table	857
Table 1071 – Functions, Macros, Timers and Variables used by CMDEV.....	860
Table 1072 – Remote primitives issued or received by CMDEV_DA.....	861
Table 1073 – Local primitives issued or received by CMDEV_DA.....	862
Table 1074 – CMDEV_DA state table	864
Table 1075 – Functions, Macros, Timers and Variables used by CMDEV_DA	864
Table 1076 – Remote primitives issued or received by CMSU	865
Table 1077 – Local primitives issued or received by CMSU	865
Table 1078 – CMSU state table	868
Table 1079 – Functions, Macros, Timers and Variables used by the CMSU	871
Table 1080 – Remote primitives issued or received by CMIO.....	871
Table 1081 – Local primitives issued or received by CMIO	871
Table 1082 – CMIO state table	873
Table 1083 – Functions used by the CMIO.....	874
Table 1084 – Remote primitives issued or received by CMRS.....	874
Table 1085 – Local primitives issued or received by CMRS	875
Table 1086 – CMRS state table	876
Table 1087 – Functions, Macros, Timers and Variables used by the CMRS	876
Table 1088 – Remote primitives issued or received by CMWRR	877
Table 1089 – Local primitives issued or received by CMWRR	877
Table 1090 – CMWRR state table	879
Table 1091 – Functions, Macros, Timers and Variables used by CMWRR.....	881
Table 1092 – Remote primitives issued or received by CMRDR	882
Table 1093 – Local primitives issued or received by CMRDR.....	883

Table 1094 – CMRDR state table.....	884
Table 1095 – Functions, Macros, Timers and Variables used by CMRDR.....	884
Table 1096 – Remote primitives issued or received by CMSM	885
Table 1097 – Local primitives issued or received by CMSM	886
Table 1098 – CMSM state table	887
Table 1099 – Functions, Macros, Timers and Variables used by the CMSM	888
Table 1100 – Remote primitives received by CMPBE.....	889
Table 1101 – Local primitives issued or received by CMPBE	889
Table 1102 – CMPBE state table	891
Table 1103 – Functions, Macros, Timers and Variables used by the CMPBE	893
Table 1104 – Remote primitives issued or received by CMDMC.....	893
Table 1105 – Local primitives issued or received by CMDMC	894
Table 1106 – CMDMC state table	896
Table 1107 – Functions, Macros, Timers and Variables used by the CMDMC	898
Table 1108 – Remote primitives issued or received by CMINA.....	898
Table 1109 – Local primitives issued or received by CMINA	899
Table 1110 – CMINA state table	900
Table 1111 – Functions, Macros, Timers and Variables used by the CMINA	901
Table 1112 – Return values of CheckDatabase.....	902
Table 1113 – Remote primitives issued or received by CMRPC	902
Table 1114 – Local primitives issued or received by CMRPC	904
Table 1115 – CMRPC state table.....	905
Table 1116 – Functions, Macros, Timers and Variables used by the CMRPC	909
Table 1117 – Return values of CheckRPC	911
Table 1118 – Remote primitives issued or received by CMSRL.....	913
Table 1119 – Local primitives issued or received by CMSRL	913
Table 1120 – CMSRL state table	915
Table 1121 – Functions, Macros, Timers and Variables used by the CMSRL	917
Table 1122 – Combinations of DataStatus for Output buffers	918
Table 1123 – Combinations of DataStatus for Input buffers.....	919
Table 1124 – Remote primitives issued or received by CMSRL_AL.....	925
Table 1125 – Local primitives issued or received by CMSRL_AL	925
Table 1126 – CMSRL_AL state table	927
Table 1127 – Functions, Macros, Timers and Variables used by the CMSRL_AL	928
Table 1128 – Remote primitives issued or received by CMRSI.....	929
Table 1129 – Local primitives issued or received by CMRSI	930
Table 1130 – CMRSI state table	931
Table 1131 – Functions, Macros, Timers and Variables used by the CMRSI	934
Table 1132 – Remote primitives issued or received by CMCTL	938
Table 1133 – Local primitives issued or received by CMCTL.....	939
Table 1134 – CMCTL state table.....	943
Table 1135 – Functions, Macros, Timers and Variables used by the CMCTL.....	947
Table 1136 – Remote primitives issued or received by CTLSM	947

Table 1137 – Local primitives issued or received by CTLSM	948
Table 1138 – CTLSM state table	949
Table 1139 – Functions, Macros, Timers and Variables used by the CTLSM	950
Table 1140 – Remote primitives issued or received by CTLIO	950
Table 1141 – Local primitives issued or received by CTLIO	951
Table 1142 – CTLIO state table	952
Table 1143 – Functions, Macros, Timers and Variables used by the CTLIO	953
Table 1144 – Remote primitives received by CTLRDI	954
Table 1145 – Local primitives issued or received by CTLRDI	955
Table 1146 – CTLRDI state table	956
Table 1147 – Functions, Macros, Timers and Variables used by CTLRDI	957
Table 1148 – Remote Primitives received by CTLRDR	957
Table 1149 – Local primitives issued or received by CTLRDR	958
Table 1150 – CTLRDR state table	958
Table 1151 – Functions, Macros, Timers and Variables used by CTLRDR	959
Table 1152 – Remote primitives received by CTLRPC	959
Table 1153 – Local primitives issued or received by CTLRPC	962
Table 1154 – CTLRPC state table	963
Table 1155 – Functions, Macros, Timers and Variables used by the CTLRPC	965
Table 1156 – Remote primitives issued or received by CTLSU	966
Table 1157 – Local Primitives issued or received by CTLSU	966
Table 1158 – CTLSU state table	968
Table 1159 – Functions, Macros, Timers and Variables used by the CTLSU	971
Table 1160 – Remote primitives issued or received by CTLWRI	971
Table 1161 – Local primitives issued or received by CTLWRI	972
Table 1162 – CTLWRI state table	974
Table 1163 – Functions, Macros, Timers and Variables used by CTLWRI	976
Table 1164 – Remote primitives issued or received by CTLWRR	977
Table 1165 – Local primitives issued or received by CTLWRR	977
Table 1166 – CTLWRR state table	978
Table 1167 – Functions, Macros, Timers and Variables used by CTLWRR	979
Table 1168 – Remote primitives issued or received by CTLPBE	979
Table 1169 – Local primitives issued or received by CTLPBE	980
Table 1170 – CTLPBE state table	982
Table 1171 – Functions, Macros, Timers and Variables used by CTLPBE	984
Table 1172 – Remote primitives issued or received by CTLDINA	984
Table 1173 – Local primitives issued or received by CTLDINA	985
Table 1174 – CTLDINA state table	987
Table 1175 – Functions, Macros, Timers and Variables used by the CTLDINA	990
Table 1176 – Remote primitives issued or received by CTLSRL	993
Table 1177 – Local primitives issued or received by CTLSRL	993
Table 1178 – CTLSRL state table	995
Table 1179 – Functions, Macros, Timers and Variables used by the CTLSRL	997

Table 1180 – Remote primitives issued or received by CTLSC.....	1000
Table 1181 – Local primitives issued or received by CTLSC	1000
Table 1182 – CTLSC state table	1002
Table 1183 – Functions, Macros, Timers and Variables used by CTLSC	1003
Table 1184 – Remote primitives received by CTLRSI.....	1003
Table 1185 – Local primitives issued or received by CTLRSI	1006
Table 1186 – CTLRSI state table	1006
Table 1187 – Functions, Macros, Timers and Variables used by the CTLRSI	1009
Table 1188 – Remote primitives issued or received by CTLINA	1010
Table 1189 – Local primitives issued or received by CTLINA	1010
Table 1190 – CTLINA state table	1011
Table 1191 – Functions, Macros, Timers and Variables used by the CTLINA	1012
Table 1192 – Return values of CheckDatabase.....	1013
Table 1193 – Remote primitives issued or received by NME	1016
Table 1194 – Local primitives issued or received by NME	1016
Table 1195 – NME state table	1020
Table 1196 – Functions, Macros, Timers and Variables used by NME.....	1024
Table 1197 – Remote primitives issued or received by TDE	1024
Table 1198 – Local primitives issued or received by TDE.....	1025
Table 1199 – TDE state table.....	1026
Table 1200 – Functions, Macros, Timers and Variables used by TDE	1027
Table 1201 – Remote primitives issued or received by PCE.....	1027
Table 1202 – Local primitives issued or received by PCE	1028
Table 1203 – PCE state table	1029
Table 1204 – Functions, Macros, Timers and Variables used by PCE	1031
Table 1205 – Remote primitives issued or received by NCE.....	1032
Table 1206 – Local primitives issued or received by NCE	1032
Table 1207 – NCE state table	1033
Table 1208 – Functions, Macros, Timers and Variables used by NCE	1034
Table 1209 – Remote primitives issued or received by NUE.....	1034
Table 1210 – Local primitives issued or received by NUE	1035
Table 1211 – NUE state table	1037
Table 1212 – Functions, Macros, Timers and Variables used by NUE	1041
Table 1213 – Remote primitives issued or received by BNME	1041
Table 1214 – Local primitives issued or received by BNME.....	1042
Table 1215 – BNME state table.....	1043
Table 1216 – Functions, Macros, Timers and Variables used by BNME	1043
Table 1217 – Remote primitives issued or received by NMEINA	1044
Table 1218 – Local primitives issued or received by NMEINA	1044
Table 1219 – NMEINA state table	1046
Table 1220 – Functions, Macros, Timers and Variables used by the NMEINA	1047
Table 1221 – Return values of CheckDatabase.....	1047
Table 1222 – ArgsLength check.....	1048

Table 1223 – Offset check	1049
Table 1224 – IODConnectReq block structure.....	1049
Table 1225 – ARBlockReq – request check	1050
Table 1226 – IOCRBlockReq – request check.....	1051
Table 1227 – AlarmCRBlockReq – request check	1056
Table 1228 – ExpectedSubmoduleBlockReq – request check	1057
Table 1229 – PrmServerBlock – request check	1058
Table 1230 – MCRBlockReq – request check.....	1058
Table 1231 – ARRPCBlockReq – request check	1059
Table 1232 – IRInfoBlock – request check	1060
Table 1233 – SRInfoBlock – request check.....	1060
Table 1234 – RSInfoBlock – request check.....	1061
Table 1235 – ArgsLength check.....	1061
Table 1236 – Offset check	1062
Table 1237 – ARBlockRes – response check	1062
Table 1238 – IOCRBlockRes – response check	1063
Table 1239 – AlarmCRBlockRes – response check.....	1064
Table 1240 – ModuleDiffBlock – response check	1064
Table 1241 – ARServerBlockRes – response check.....	1065
Table 1242 – ArgsLength check.....	1066
Table 1243 – Offset check	1066
Table 1244 – ControlBlockConnect(PrmEnd) – request check.....	1067
Table 1245 – ControlBlockPlug(PrmEnd) – request check.....	1067
Table 1246 – ControlBlockConnect(PrmBegin) – request check	1068
Table 1247 – SubmoduleListBlock – request check.....	1068
Table 1248 – ArgsLength check.....	1069
Table 1249 – Offset check	1069
Table 1250 – ControlBlockConnect – response check.....	1070
Table 1251 – ControlBlockPlug – response check.....	1070
Table 1252 – ControlBlockConnect(PrmBegin) – response check	1071
Table 1253 – ArgsLength check.....	1072
Table 1254 – ControlBlockConnect(ApplRdy) – request check	1072
Table 1255 – ControlBlockPlug(ApplRdy) – request check	1073
Table 1256 – ArgsLength check.....	1073
Table 1257 – ControlBlockConnect – response check.....	1074
Table 1258 – ControlBlockPlug – response check.....	1074
Table 1259 – ArgsLength check.....	1075
Table 1260 – ReleaseBlock – request check.....	1076
Table 1261 – ArgsLength check.....	1076
Table 1262 – ReleaseBlock – response check	1077
Table 1263 – ArgsLength check.....	1078
Table 1264 – Offset check	1078
Table 1265 – IODWriteReqHeader – request check	1079

Table 1266 – ArgsLength check	1079
Table 1267 – Offset check	1080
Table 1268 – IODWriteResHeader – response check	1080
Table 1269 – ArgsLength check	1081
Table 1270 – Offset check	1082
Table 1271 – ArgsLength check	1083
Table 1272 – Offset check	1083
Table 1273 – ArgsLength check	1084
Table 1274 – Offset check	1085
Table 1275 – IODReadReqHeader – request check	1085
Table 1276 – RecordDataReadQuery – request check	1086
Table 1277 – ArgsLength check	1086
Table 1278 – Offset check	1087
Table 1279 – IODReadResHeader – response check	1087
Table A.1 – Examples for the AR establishing	1089
Table A.2 – Startup of Alarm transmitter and receiver	1089
Table B.1 – Examples for compatible AR establishing	1101
Table L.1 – IEEE Std 802.3 cross reference	1125
Table Q.1 – Truth table	1139
Table Q.2 – “MAC/PHY configuration/status” with Auto-negotiation disabled	1139
Table Q.3 – “MAC/PHY configuration/status” with Auto-negotiation enabled	1139
Table Q.4 – Auto-negotiation support within “MAC/PHY configuration/status”	1139
Table Q.5 – Auto-negotiation settings	1140
Table S.1 – List of supported MIBs	1142
Table T.1 – Content of archive	1143
Table V.1 – Cross reference IEC 62439-2 “MRP MIB objects” (ring)	1167
Table V.2 – Cross reference IEC 62439-2 “Events, created by state machines” (ring)	1167
Table V.3 – Cross reference IEC 62439-2 “MRM parameter”	1168
Table V.4 – Cross reference IEC 62439-2 “MRC parameter”	1168
Table V.5 – Cross reference IEC 62439-2 “MRP MIB objects” (interconnection)	1168
Table V.6 – Cross reference IEC 62439-2 “Events, created by state machines” (interconnection)	1169
Table V.7 – Cross reference IEC 62439-2 “MIM parameter”	1169
Table V.8 – Cross reference IEC 62439-2 “MIC parameter”	1169
Table W.1 – Meaning of numbers	1171
Table W.2 – Statistic counters – octets	1172
Table W.3 – Statistic counters – packets or frames	1172
Table W.4 – Statistic counters – errors	1173
Table W.5 – VLAN specific Statistic counters	1174
Table X.1 – RsiHeaderSize	1175
Table X.2 – Fragments of a Connect request	1175
Table X.3 – Fragments of a Connect response	1175
Table Y.1 – Cut through cases	1177

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**INDUSTRIAL COMMUNICATION NETWORKS –
FIELDBUS SPECIFICATIONS –****Part 6-10: Application layer protocol specification –
Type 10 elements****FOREWORD**

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IEC 61158-6-10 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2019. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) integration of time-aware system basic functionality;
- b) integration of time-aware network functionality;
- c) integration of remote service interface functionality;
- d) integration of SFP diagnosis functionality;
- e) integration of media redundancy ring interconnection basic functionality.

The text of this International Standard is based on the following documents:

Draft	Report on voting
65C/1204/FDIS	65C/1245/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all the parts of the IEC 61158 series, under the general title *Industrial communication networks – Fieldbus specifications*, can be found on the IEC web site.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be:

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This document is one of a series produced to facilitate the interconnection of automation system components. It is related to other standards in the set as defined by the “three-layer” fieldbus reference model described in IEC 61158-1.

The application protocol provides the application service by making use of the services available from the data-link or other immediately lower layer. The primary aim of this document is to provide a set of rules for communication expressed in terms of the procedures to be carried out by peer application entities (AEs) at the time of communication. These rules for communication are intended to provide a sound basis for development in order to serve a variety of purposes:

- as a guide for implementers and designers;
- for use in the testing and procurement of equipment;
- as part of an agreement for the admittance of systems into the open systems environment;
- as a refinement to the understanding of time-critical communications within OSI.

This document is concerned, in particular, with the communication and interworking of sensors, effectors and other automation devices. By using this document together with other standards positioned within the OSI or fieldbus reference models, otherwise incompatible systems can work together in any combination.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent. IEC takes no position concerning the evidence, validity, and scope of this patent right.

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-10: Application layer protocol specification – Type 10 elements

1 Scope

1.1 General

The Fieldbus Application Layer (FAL) provides user programs with a means to access the fieldbus communication environment. In this respect, the FAL can be viewed as a “window between corresponding application programs”.

This part of IEC 61158 provides common elements for basic time-critical and non-time-critical messaging communications between application programs in an automation environment and material specific to Type 10 fieldbus. The term “time-critical” is used to represent the presence of a time window, within which one or more specified actions are required to be completed with a defined level of certainty. Failure to complete specified actions within the time window risks failure of the applications requesting the actions, with attendant risk to equipment, plant and possibly human life.

This document defines in an abstract way the externally visible behavior provided by the Type 10 fieldbus application layer in terms of:

- the abstract syntax defining the application layer protocol data units conveyed between communicating application entities,
- the transfer syntax defining the application layer protocol data units conveyed between communicating application entities,
- the application context state machine defining the application service behavior visible between communicating application entities, and
- the application relationship state machines defining the communication behavior visible between communicating application entities.

The purpose of this document is to define the protocol provided to:

- define the wire-representation of the service primitives defined in IEC 61158-5-10 and
- define the externally visible behavior associated with their transfer.

This document specifies the protocol of the Type 10 fieldbus application layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498-1) and the OSI Application Layer Structure (ISO/IEC 9545).

1.2 Specifications

The principal objective of this document is to specify the syntax and behavior of the application layer protocol that conveys the application layer services defined in IEC 61158-5-10.

A secondary objective is to provide migration paths from previously existing industrial communications protocols. It is this latter objective which gives rise to the diversity of protocols standardized in IEC 61158-6.

1.3 Conformance

This document does not specify individual implementations or products, nor does it constrain the implementations of application layer entities within industrial automation systems. Conformance is achieved through implementation of this application layer protocol specification.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE All parts of the IEC 61158 series, as well as the IEC 61784-1 series and the IEC 61784-2 series are maintained simultaneously. Cross-references to these documents within the text therefore refer to the editions as dated in this list of normative references.

IEC 61131-9, *Programmable controllers – Part 9: Single-drop digital communication interface for small sensors and actuators (SDCI)*

IEC 61158-2:2023, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 61158-5-10:2023, *Industrial communication networks – Fieldbus specifications – Part 5-10: Application layer service definition – Type 10 elements*

IEC 61158-6-3:2019, *Industrial communication networks – Fieldbus specifications – Part 6-3: Application layer protocol specification – Type 3 elements*

IEC 61158-6-10:2010¹, *Industrial communication networks – Fieldbus specifications – Part 6-10: Application layer protocol specification – Type 10 elements*

IEC 62439-2:2021, *Industrial communication networks – High availability automation networks – Part 2: Media Redundancy Protocol (MRP)*

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

ISO/IEC 8822:1994, *Information technology – Open Systems Interconnection – Presentation service definition*

ISO/IEC 8824-1, *Information technology – Abstract Syntax Notation One (ASN.1) – Part 1: Specification of basic notation*

ISO/IEC 9545, *Information technology – Open Systems Interconnection – Application Layer structure*

¹ This earlier edition is mentioned here and in the text for legacy purposes.

ISO/IEC 9834-8, *Information technology – Procedures for the operation of object identifier registration authorities – Part 8: Generation of universally unique identifiers (UUIDs) and their use in object identifiers*

ISO/IEC 10646, *Information technology – Universal coded character set (UCS)*

ISO/IEC 10731, *Information technology – Open Systems Interconnection – Basic Reference Model – Conventions for the definition of OSI services*

ISO/IEC/IEEE 60559:2020, *Information technology – Microprocessor Systems – Floating-Point arithmetic*

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IEEE Std 802-2014, *IEEE Standard for Local and metropolitan area networks: Overview and Architecture*

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IEEE Std 802.3-2018, *IEEE Standard for Ethernet*

IEEE Std 802.11-2020, *IEEE Standard for Information Technology – Telecommunications and Information Exchange between Systems – Local and Metropolitan Area Networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications*

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