ICS 25.040.40, 35.100.05 SLOVENSKÁ TECHNICKÁ NORMA Marec 2017

STN	**Priemyselné komunikačné siete. Bezdrôtová komunikačná sieť a komunikačné profily. WirelessHART™.**	**STN EN 62591** 18 4020

Industrial communication networks - Wireless communication network and communication profiles - WirelessHARTÔäó

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 02/17

Obsahuje: EN 62591:2016, IEC 62591:2016

Oznámením tejto normy sa od 16.09.2019 ruší
STN EN 62591 (18 4020) z decembra 2010

124358

Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, 2017
Podľa zákona č. 264/1999 Z. z. v znení neskorších predpisov sa môžu slovenské technické normy rozmnožovať a rozširovať iba so súhlasom Úradu pre normalizáciu, metrológiu a skúšobníctvo SR.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 62591

September 2016

ICS 25.040.40; 35.100.05

Supersedes EN 62591:2010

English Version

Industrial communication networks - Wireless communication network and communication profiles - WirelessHART(tm) (IEC 62591:2016)

Réseaux de communication industriels - Réseau de communications sans fil et profils de communication - WirelessHART(tm)
(IEC 62591:2016)

Industrielle Kommunikationsnetze - Drahtlose Kommunikationsnetze und Kommunikationsprofile - WirelessHART(tm)
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European foreword

The text of document 65C/835/FDIS, future edition 2 of IEC 62591, 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 62591:2016.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2017-03-16
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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61158-6-9:2014	NOTE	Harmonized as EN 61158-6-9:2014.
IEC 62657-2:2013	NOTE	Harmonized as EN 62657-2:2013.
IEC 62657-2:2013	NOTE	Harmonized as EN 62657-2:2013.

Annex ZA
(normative)
Normative references to international publications with their corresponding European publications

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

NOTE 1 When 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.

Publication	Year	Title	EN/HD	Year
IEC 61158-1	2014	Industrial communication networks - Fieldbus specifications - Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series	EN 61158-1	2014
IEC 61158-2	-	Industrial communication networks - Fieldbus specifications - Part 2: Physical layer specification and service definition	EN 61158-2	-
IEC 61158-3-20	2014	Industrial communication networks - Fieldbus specifications - Part 3-20: Data-link layer service definition - Type 20 elements	EN 61158-3-20	2014
IEC 61158-4-20	2014	Industrial communication networks - Fieldbus specifications - Part 4-20: Data-link layer protocol specification - Type 20 elements	EN 61158-4-20	2014
IEC 61158-5-20	2014	Industrial communication networks - Fieldbus specifications - Part 5-20: Application layer service definition - Type 20 elements	EN 61158-5-20	2014
IEC 61158-6-20	2014	Industrial communication networks - Fieldbus specifications - Part 6-20: Application layer protocol specification - Type 20 elements	EN 61158-6-20	2014
IEC 61784-1	2014	Industrial communication networks - Profiles -- Part 1: Fieldbus profiles	EN 61784-1	2014
IEC 61784-2	-	Industrial communication networks - Profiles - Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC 8802-3	EN 61784-2	-
ISO/IEC 7498-1	-	Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model	-	-
ISO/IEC 7498-3	-	Information technology - Open Systems Interconnection - Basic Reference Model: Naming and addressing	-	-
ISO/IEC 8824	series	Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation	-	series
ISO/IEC 8859-1	-	Information technology - 8-bit single-byte coded graphic character sets - Part 1: Latin alphabet No.1	-	-
ISO/IEC 9545	-	Information technology - Open Systems Interconnection - Application layer structure	-	-

ISO/IEC 10731	-	Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services	-	-
IEEE 802.15.4e	2012	IEEE Standard for Local and metropolitan area networks--Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs) Amendment 1: MAC sublayer	-	-
IEEE Std 802-2001	2002	IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture	-	-
IEEE std 802.15.4-2011	2011	IEEE Standard for Local and metropolitan area networks--Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs)	-	-
ISO/IEC/IEEE 60559	-	Information technology - Microprocessor Systems - Floating-Point arithmetic	-	-

IEC 62591

Edition 2.0 2016-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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IEC 62591:2016-03(en-fr)

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IEC 62591

Edition 2.0 2016-03

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Industrial networks – Wireless communication network and communication profiles – WirelessHART™

Réseaux industriels – Réseau de communications sans fil et profils de communication – WirelessHART™

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ICS 25.040.40; 35.100.05

ISBN 978-2-8322-3174-6

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CONTENTS

FOREWORD....24
INTRODUCTION....26
1 Scope....28
2 Normative references....28
3 Terms, definitions, symbols, abbreviations and conventions....29
3.1 Reference model terms and definitions....29
3.1.1 Terms and definitions from ISO/IEC 7498-1 terms and ISO/IEC 7498-3 terms....29
3.1.2 Terms and definitions from ISO/IEC 9545....30
3.1.3 Terms and definitions from ISO/IEC 8824....30
3.1.4 Terms and definitions from ISO/IEC 8825-1....31
3.2 Specific terms and definitions....31
3.3 Abbreviations....40
3.4 Conventions....42
3.4.1 Conventions used for DL-services....42
3.4.2 Conventions used for DL-protocol (state machine)....43
3.4.3 Conventions for Application Layer service....44
3.4.4 Conventions for the AL-protocol....47
4 Physical layer specification and service definition....51
4.1 General....51
4.2 Physical layer service definition....51
4.2.1 General overview....51
4.2.2 Physical layer services....52
4.3 Physical layer protocol specification....56
5 Data-link layer service definition – Type 20 elements....56
5.1 General....56
5.2 Data-link layer services....56
5.2.1 Facilities of the data-link layer services....56
5.2.2 QoS for message service....57
5.2.3 Sequence of primitives....58
5.2.4 DL-TRANSMIT service....60
5.2.5 DL-RECEIVE service....62
5.2.6 DL-DISCONNECT service....63
5.2.7 DL-PATH-FAILURE service....63
5.2.8 DL-ADVERTISE service....63
5.2.9 DL-NEIGHBOR service....64
5.2.10 DLM-SET....64
5.2.11 DLM-GET....65
5.2.12 DLM-ACTION....66
5.2.13 DLM-EVENT....67
5.3 Network layer services....67
5.3.1 Facilities of the network layer services....67
5.3.2 QoS for message service....67
5.3.3 Sequence of primitives....68
5.3.4 NL-TRANSMIT Service....68
5.3.5 NLM-SET....70

5.3.6 NLM-GET 71
5.3.7 NLM-ACTION 71
5.4 Transport layer services 72
5.4.1 Facilities of the transport layer services 72
5.4.2 QoS for message service 73
5.4.3 Sequence of primitives 73
5.4.4 TL-DATA-TRANSFER Service 74
5.4.5 TL-DATA-EXCHANGE Service 76
5.4.6 TLM-SET 78
5.4.7 TLM-GET 78
6 Data-link layer protocol specification – Type 20 elements 79
6.1 General 79
6.2 Overview 79
6.2.1 Data-link layer operation 79
6.2.2 Network layer operation 82
6.2.3 Device procedures 84
6.3 Logical link control 84
6.3.1 General DLPDU structure 84
6.3.2 DLPDU-specific structure, encoding and elements of procedure 88
6.3.3 DLPDU Priority and Flow Control 92
6.3.4 Error detection and security 93
6.4 Medium Access Control 95
6.4.1 Function 95
6.4.2 Slot timing 95
6.4.3 Communication tables and buffers 98
6.4.4 Link scheduling 104
6.4.5 MAC operation 108
6.5 DL-management-information 118
6.5.1 General 118
6.5.2 DL attributes 118
6.5.3 DLM actions 119
6.6 Network layer 119
6.6.1 Two level model of NL 119
6.6.2 NPDU structure 122
6.6.3 Security function 125
6.6.4 Network layer tables 130
6.6.5 NLE machine 132
6.6.6 NLE elements of procedure 135
6.6.7 NL-management information 138
6.7 Transport layer 139
6.7.1 General 139
6.7.2 TPDU structure 139
6.7.3 Transport pipe table 140
6.7.4 TLE elements of procedure 141
6.7.5 TLE state machines 144
6.7.6 TL-management information 147
7 Application layer service definition – Type 20 elements 148
7.1 Common concepts 148
7.2 General 148

7.3 Data type ASE 148
7.3.1 Overview 148
7.3.2 Formal definition of data type objects 150
7.3.3 FAL defined data types 152
7.3.4 Data type ASE service specification 155
7.3.5 Summary of data types 155
7.4 Communication model specification 156
7.4.1 Common parameters 156
7.4.2 ASEs 157
7.4.3 ARs 230
7.4.4 Summary of classes 233
7.4.5 Permitted services by AREP role 233
8 Application layer protocol specification – Type 20 elements 234
8.1 General 234
8.2 Abstract syntax 234
8.3 Transfer syntax 234
8.3.1 Common APDU fields 234
8.3.2 Common APDU structure 235
8.3.3 Device application service-specific APDU structures 238
8.3.4 Layer management service specific APDU structures 263
8.3.5 Gateway and network manager specific APDU structures 306
8.3.6 Network management configuration specific APDU structures 328
8.3.7 Data coding rules 346
8.4 Common procedures 350
8.4.1 Delayed response 350
8.4.2 Response time 354
8.5 FAL service protocol machine (FSPM) 355
8.5.1 General 355
8.5.2 FSPM state tables 355
8.5.3 Functions used by FSPM 357
8.5.4 Parameters of FSPM/ARPM primitives 358
8.6 Application relationship protocol machines (ARPMs) 359
8.6.1 AREP mapping to transport layer 359
8.6.2 Application relationship protocol machines (ARPMs) 360
8.6.3 AREP state machine primitive definitions 362
8.6.4 AREP state machine functions 363
8.7 TL mapping protocol machine (TMPM) 363
8.7.1 TMPM states 363
8.7.2 TMPM state machines 363
8.7.3 Primitives exchanged between transport layer and TMPM 364
8.7.4 Functions used by TMPM 365
9 Communication Profile Family 9 (HART™) 365
9.1 General Overview 365
9.2 Profile 9/1 366
9.3 Profile 9/2 366
9.3.1 Conformance statement 366
9.3.2 Device types 367
9.3.3 Device worldwide applicability 369
9.3.4 Physical layer 370

9.3.5 Data-link layer 373
9.3.6 Application layer 374
Annex A (normative) Security 385
A.1 General 385
A.2 Joining 386
A.2.1 The join sequence 386
A.2.2 The network layer join process 392
A.2.3 The data-link layer join process 393
A.3 Network key change operation 396
A.4 Security management 397
A.5 Maintenance Port 397
Annex B (normative) Wireless procedures 399
B.1 Initializing a wireless network 399
B.2 Neighbor Discovery 399
B.3 Path failure 400
B.4 Device leaving the network 401
Annex C (normative) Network management 403
C.1 Overview 403
C.2 Network manager functions 404
Annex D (normative) Gateway 406
D.1 Overview 406
D.2 Access point 406
D.3 Functions 408
D.3.1 General requirements 408
D.3.2 Adding new network devices 409
D.3.3 Device configuration change status notifications 409
D.3.4 Gateway change notification function 409
D.3.5 Cached response messages 409
D.3.6 Service access point 410
D.3.7 Communication between gateway and network manager 410
Annex E (normative) Command response codes 411
E.1 Overview 411
E.1.1 General 411
E.1.2 Response code classifications 411
E.1.3 Reserved values 411
E.1.4 Unimplemented command 412
E.1.5 Busy 412
E.2 Response code definitions 412
E.2.1 General 412
E.2.2 Value ‘0’ 412
E.2.3 Value ‘1’ – single-definition error 412
E.2.4 Value ‘2’ – single-definition error 412
E.2.5 Value ‘3’ – single-definition error 412
E.2.6 Value ‘4’ – single-definition error 412
E.2.7 Value ‘5’ – single-definition error 412
E.2.8 Value ‘6’ – single-definition error 413
E.2.9 Value ‘7’ – single-definition error 413
E.2.10 Value ‘8’ – multi-definition warning 413

E.2.11 Value ‘9’ – multi-definition error 413
E.2.12 Value ‘10’ – multi-definition error 414
E.2.13 Value ‘11’ – multi-definition error 414
E.2.14 Value ‘12’ – multi-definition error 414
E.2.15 Value ‘13’ – multi-definition error 414
E.2.16 Value ‘14’ – multi-definition warning 415
E.2.17 Value ‘15’ – multi-definition error 415
E.2.18 Value ‘16’ – single-definition error 415
E.2.19 Value ‘17’ – single-definition error 415
E.2.20 Value ‘18’ – single-definition error 415
E.2.21 Value ‘19’ – single-definition error 415
E.2.22 Value ‘20’ – single-definition error 415
E.2.23 Values ‘21’to ‘23’ – single-definition error 416
E.2.24 Values ‘24’to ‘27’ – single-definition warning 416
E.2.25 Value ‘28’ – multi-definition error 416
E.2.26 Value ‘29’ – multi-definition error 416
E.2.27 Value ‘30’ – multi-definition warning 416
E.2.28 Value ‘31’ – multi-definition warning 416
E.2.29 Value ‘32’ – single-definition error 416
E.2.30 Value ‘33’ – single-definition error 416
E.2.31 Value ‘34’ – single-definition error 416
E.2.32 Value ‘35’ – single-definition error 417
E.2.33 Value ‘36’ – single-definition error 417
E.2.34 Values ‘37’ to ‘59’ – single-definition error 417
E.2.35 Value ‘60’ – single-definition error 417
E.2.36 Value ‘61’ – single-definition error 417
E.2.37 Value ‘62’ – single-definition error 417
E.2.38 Value ‘63’ – single-definition error 417
E.2.39 Value ‘64’ – single-definition error 417
E.2.40 Value ‘65’ – multi-definition error 417
E.2.41 Value ‘66’ – multi-definition error 418
E.2.42 Value ‘67’ – multi-definition error 418
E.2.43 Value ‘68’ – multi-definition error 419
E.2.44 Value ‘69’ – multi-definition error 419
E.2.45 Value ‘70’ – multi-definition error 419
E.2.46 Value ‘71’ – multi-definition error 419
E.2.47 Values ‘72’ to ‘95’ – multi-definition error 419
E.2.48 Values ‘96’ to ‘111’ – single-definition warning 419
E.2.49 Values ‘112’ to ‘127’ – multi-definition warning 419
Annex F (normative) Common tables 420
F.1 Overview 420
F.1.1 General 420
F.1.2 Enumeration 420
F.1.3 Bit Field 420
F.2 Table definitions 421
F.2.1 Publish mode control codes 421
F.2.2 Write device variable codes 421
F.2.3 Device variable family codes 422
F.2.4 Device variable classification codes 422

F.2.5 Analog channel saturated codes 423
F.2.6 Analog channel fixed codes 424
F.2.7 Standardized status 0 codes 424
F.2.8 Standardized status 1 codes 424
F.2.9 Standardized status 2 codes 425
F.2.10 Standardized status 3 codes 425
F.2.11 Publish trigger mode codes 426
F.2.12 Event notification control codes 426
F.2.13 Event status codes 426
F.2.14 Timetable request codes 426
F.2.15 Timetable application domain codes 427
F.2.16 Synchronous action control codes 427
F.2.17 Real-time clock flags codes 427
F.2.18 Wireless timer codes 427
F.2.19 Device power source codes 428
F.2.20 Link_type codes 428
F.2.21 Link option flags codes 428
F.2.22 Superframe mode flags codes 429
F.2.23 Session_type codes 429
F.2.24 Timetable deletion reason codes 429
F.2.25 Disconnect cause codes 429
F.2.26 Wireless operation codes 430
F.2.27 Join process status codes 430
F.2.28 Security type codes 430
F.2.29 Device list codes 431
F.2.30 Network access mode codes 431
F.2.31 Device profile codes 432
F.2.32 Device power status codes 432
F.2.33 Neighbor flags codes 432
F.2.34 Notification mask codes 433
F.2.35 Join mode codes 433
F.2.36 Device scheduling flags codes 433
F.2.37 Network optimization flags codes 433
F.2.38 Wireless capabilities codes 434
F.2.39 CCA mode codes 434
F.2.40 Wireless device connection status 434
F.2.41 Wireless device health status 434
F.2.42 Change key flag codes 435
F.2.43 Join key mode code 435
Annex G (informative) Application of publish data mode and event commands 436
G.1 Publish data mode operation 436
G.1.1 Overview 436
G.1.2 Configuring a device for publish data mode operation 436
G.1.3 Response for publish data mode operation 437
G.1.4 Publish data mode update periods 437
G.2 Event notification operation 438
G.2.1 Overview 438
G.2.2 Configuring a device event notification operation 438
G.2.3 Handling of Event Notification in a Device 438

Annex H (informative) Network redundancy 440
Annex I (informative) Network manager implementation 441
I.1 Overview 441
I.2 Network manager model 441
I.2.1 General 441
I.2.2 Initializing the network manager 443
I.2.3 Types of network devices 443
I.2.4 Network routing 444
I.2.5 Network schedule 445
I.2.6 Security manager 449
I.2.7 Detailed model of the network manager 449
I.3 Routing 451
I.3.1 General 451
I.3.2 Routing requirements 451
I.3.3 Routing strategy 451
I.4 Scheduling 452
I.4.1 General 452
I.4.2 Scheduling requirements 452
I.4.3 Scheduling strategy 453
I.4.4 Networking scheduling example 454
I.5 Network manager interface 459
I.5.1 General 459
I.5.2 Initializing a wireless network 460
I.5.3 Allocating communication resources 461
I.5.4 Adjusting network schedule 462
I.5.5 Health reports 463
Annex J (informative) Gateway implementation 464
J.1 Overview 464
J.2 Gateway model 464
J.2.1 General 464
J.2.2 Host interface 465
J.2.3 Logical network device 465
J.2.4 Physical network device 466
J.2.5 Communication interface 466
J.2.6 Cached response messages 467
J.3 Gateway management 468
J.3.1 Addressing 468
J.3.2 Retry mechanisms 468
J.3.3 Power-on-reset 468
J.3.4 Network access point reset 469
J.3.5 Gateway reset 469
J.3.6 Re-build publish data periodic data 469
J.3.7 Gateway self test 470
J.3.8 Adding new network device 470
J.3.9 Device configuration change status notifications 470
J.4 Gateway superframe 470
J.5 Gateway change notification services 470
J.6 HART™ commands interface 472
J.6.1 General 472

J.6.2 Host to gateway command request and response 472
J.6.3 Pass-through of HART™ command request and response 473
J.6.4 Caching publish data command response messages 473
J.6.5 Gateway status error flag bits 473
J.6.6 Gateway additional status flags 473
J.6.7 Gateway capacities 474
J.6.8 Gateway commands 474
Annex K (informative) Handheld device 475
K.1 Overview 475
K.2 Maintenance port connection 475
K.3 Network device connection 475
K.3.1 General 475
K.3.2 Install session keys 476
K.3.3 View network diagnostics and health reports 476
K.4 Network connection as a maintenance device 476
Annex L (informative) Application of WirelessHART Commands 477
L.1 Provisioning 477
L.1.1 General 477
L.1.2 Basic Provisioning 477
L.1.3 Joining 477
L.1.4 Enabling Faster Network Detection and Joining 478
L.1.5 Adjusting Transmit Power 478
L.2 Managing Superframes and Links 478
L.3 WirelessHART Handheld Support 479
L.4 Specifying and Managing Routes 480
L.5 Security 481
L.5.1 General 481
L.5.2 TDMA Data-Link Key Management 481
L.5.3 Session Key Management 481
L.5.4 Access Control 482
L.5.5 Simple Key Management 483
L.6 Device Lists 483
L.7 Network Management Commands 484
L.7.1 General 484
L.7.2 Bandwidth Management 484
L.7.3 Network Maintenance 485
L.7.4 Coexistence 486
L.7.5 Device Management 486
L.8 Network Health Reporting and Status 487
L.9 Gateway Commands 488
L.9.1 General 488
L.9.2 Device Identification 488
L.9.3 Network Information and Statistics 488
L.9.4 Network Management 489
L.9.5 Cache Management 489
Annex M (informative) Regional modification for compliance with ETSI standards 491
M.1 General 491
M.2 Compliance with EN 300 440-2 491
M.3 Compliance with EN 300 328 491

M.3.1 General 491
M.3.2 Adaptive 492
M.3.3 Non-Adaptive 492
Bibliography 496

Figure 1 – Superframe class example 49
Figure 2 – Inheritance example 50
Figure 3 – Basic aggregation example 50
Figure 4 – Composition aggregation example 51
Figure 5 – Physical layer service sequences 53
Figure 6 – Message service error-free sequences 59
Figure 7 – Message service sequences with errors 60
Figure 8 – Receive only message service 60
Figure 9 – NLL Data transfer service sequences 68
Figure 10 – Data transfer service error-free sequences 74
Figure 11 – Data transfer service sequences with errors 74
Figure 12 – A TDMA slot and superframe 80
Figure 13 – Channel hopping 81
Figure 14 – Wireless network 83
Figure 15 – DLPDU Structure 84
Figure 16 – Address specifier 85
Figure 17 – Construction of 8-octet EUI-64 Address 86
Figure 18 – DLPDU specifier 86
Figure 19 – Slot timing details 96
Figure 20 – DLE tables and relationship 98
Figure 21 – Relationships used for link scheduling 105
Figure 22 – MAC components 108
Figure 23 – TDMA state machine 109
Figure 24 – XMIT state machine 113
Figure 25 – RECV state machine 115
Figure 26 – ACK transmission state machine 117
Figure 27 – Graph routing 121
Figure 28 – Source routing 122
Figure 29 – NPDU Structure 123
Figure 30 – NPDU control octet 123
Figure 31 – Security control octet 124
Figure 32 – NLE tables and relationship 130
Figure 33 – NLE state machine 133
Figure 34 – Routing decision of the NPDU 137
Figure 35 – TPDU Structure 139
Figure 36 – TPDU control octet 140
Figure 37 – Transition diagram of the client data transfer state machine 144
Figure 38 – Transition diagram of the client data exchange state machine 145

Figure 39 – Transition diagram of the server state machine 146
Figure 40 – Data type class hierarchy 149
Figure 41 – Request APDU format from master to slave 235
Figure 42 – Normal response APDU format from slave to master 236
Figure 43 – Command error response APDU format from slave to master 236
Figure 44 – Aggregated command APDU 237
Figure 45 – Windowed trigger mode 250
Figure 46 – Windowed trigger mode with maximum update time expired 250
Figure 47 – Level trigger mode 251
Figure 48 – Coding without identification 346
Figure 49 – Coding of Integer type data 346
Figure 50 – Coding of Unsigned type data 347
Figure 51 – Coding of single precision floating point type data 347
Figure 52 – Coding of double precision floating point type data 348
Figure 53 – Coding of Date type data 348
Figure 54 – Normal DR operation 352
Figure 55 – Command responses during DR processing 353
Figure 56 – Slaves with multiple DR buffers 354
Figure 57 – State transition diagram of FSPM 355
Figure 58 – State transition diagram of the client ARPM 361
Figure 59 – State transition diagram of the server ARPM 362
Figure 60 – State transition diagram of TMPM 363
Figure 61 – Wireless network components 367
Figure A.1 – Join sequence 388
Figure A.2 – Network layer join procedure 392
Figure A.3 – Data-link layer join procedure 394
Figure A.4 – Network Key change operation 397
Figure B.1 – Neighbor Discovery 400
Figure B.2 – Path failure 401
Figure B.3 – Device leaving the network 402
Figure C.1 – Network manager in wireless network 403
Figure D.1 – Single network access point with clock 407
Figure D.2 – Multiple network access points with clocks 407
Figure D.3 – Network access point not providing clock 408
Figure G.1 – Enabling or disabling publishing sequence 437
Figure H.1 – Network routing 440
Figure I.1 – General model for network manager 442
Figure I.2 – Device type data model 443
Figure I.3 – Network routing 444
Figure I.4 – Network schedule 446
Figure I.5 – Example of a three-slot superframe 447
Figure I.6 – Multiple superframes in a network 447
Figure I.7 – Security manager 449

Figure I.8 – Detailed model of the network manager 450
Figure I.9 – Four network device wireless network 455
Figure I.10 – APDU sequences 459
Figure I.11 – Initializing a wireless network 461
Figure I.12 – Allocating and using network resources 462
Figure I.13 – Adjusting network schedule 463
Figure I.14 – Health reports 463
Figure J.1 – General model for gateway 465
Figure J.2 – Logical network device 466
Figure J.3 – Physical network device 466
Figure J.4 – Managing notification services 471
Figure M.1 – Consecutive Transmit Sequence 494
Figure M.2 – ACK-Transmit Sequence 495

Table 1 – Conventions used for state machines 47
Table 2 – Class relationship notation 49
Table 3 – Multiplicity notation 51
Table 4 – PH-ENABLE primitives and parameters 53
Table 5 – PH-CCA primitives and parameters 54
Table 6 – PH-DATA primitives and parameters 54
Table 7 – PHM-SET primitive and parameters 55
Table 8 – PHM-GET primitive and parameters 56
Table 9 – DL-Transmit primitives and parameters 61
Table 10 – DL-RECEIVE primitive and parameters 62
Table 11 – DL-DISCONNECT primitive and parameters 63
Table 12 – DL-PATH-FAILURE primitive and parameters 63
Table 13 – DL-ADVERTISE primitive and parameters 64
Table 14 – DL-NEIGHBOR primitive and parameters 64
Table 15 – DLM-SET primitive and parameters 65
Table 16 – DLM-GET primitive and parameters 65
Table 17 – DLM-ACTION primitive and parameters 66
Table 18 – NL-TRANSMIT primitives and parameters 69
Table 19 – NLM-SET primitive and parameters 70
Table 20 – NLM-GET primitive and parameters 71
Table 21 – NLM-ACTION primitive and parameters 71
Table 22 – TL-DATA-TRANSFER primitives and parameters 75
Table 23 – TL-DATA-EXCHANGE primitives and parameters 76
Table 24 – TLM-Set primitive and parameters 78
Table 25 – TLM-Get primitive and parameters 79
Table 26 – Network_ID Allocation 85
Table 27 – Contents of the ACK DLPDU payload 88
Table 28 – ACK response-code 89
Table 29 – Contents of the Advertise DLPDU payload 90

Table 30 – Beginning of the superframe 90
Table 31 – The next field after the last superframe size 90
Table 32 – Repeated for each link 91
Table 33 – Channel and frequency assignments 91
Table 34 – Slot timing definitions and values 96
Table 35 – Minimum DLE Table and buffer space requirement 98
Table 36 – Superframe attributes 99
Table 37 – Link attributes 100
Table 38 – Neighbor attributes and variables 101
Table 39 – Graph attributes 103
Table 40 – Packet record 103
Table 41 – Example Backoff_cntr selection sets 106
Table 42 – TDMA state machine 110
Table 43 – XMIT state transitions 113
Table 44 – RECV state machine 116
Table 45 – ACK transmission state machine 118
Table 46 – DL attributes 119
Table 47 – DL actions 119
Table 48 – Counter value 125
Table 49 – Session attributes 126
Table 50 – NPDU nonce 128
Table 51 – Minimum NLE Table space requirement 131
Table 52 – Route attributes 131
Table 53 – Source route attributes 132
Table 54 – TimeTable attributes 132
Table 55 – NLE states 133
Table 56 – NPDU construction 135
Table 57 – Routing actions 137
Table 58 – NL attributes 138
Table 59 – NL actions 139
Table 60 – Transport pipe attributes 141
Table 61 – Transport control encoding for TL-DATA-TRANSFER request 141
Table 62 – Transport control encoding for TL-DATA-EXCHANGE request 142
Table 63 – Transport control encoding for TL-DATA-EXCHANGE response 143
Table 64 – Client data transfer state table 145
Table 65 – Client data exchange state table 146
Table 66 – Server state table 147
Table 67 – Data type summary 156
Table 68 – Response code values 157
Table 69 – Read service parameters 160
Table 70 – Write service parameters 162
Table 71 – Information report service parameters 163
Table 72 – Action service parameters 165

Table 73 – AR get attributes service parameters 232
Table 74 – AR set attributes service parameters 232
Table 75 – Class summary 233
Table 76 – Confirmed services by AREP class 233
Table 77 – Unconfirmed services by AREP class 233
Table 78 – Response code values 234
Table 79 – Extended status values 235
Table 80 – Reset configuration changed flags value field 239
Table 81 – Reset configuration changed flag command specific Response codes 239
Table 82 – Perform self test command specific Response codes 240
Table 83 – Perform device reset command specific Response codes 240
Table 84 – Read additional device status value field 241
Table 85 – Read additional device status command specific Response codes 241
Table 86 – Read additional device status value field 242
Table 87 – Read additional device status command specific Response codes 242
Table 88 – Read device variable information value field 243
Table 89 – Read device variable information response value field 243
Table 90 – Read device variable information command specific Response codes 244
Table 91 – Write device variable value field 244
Table 92 – Write device variable command specific response codes 244
Table 93 – Read Sub-Device Identity Summary value field 245
Table 94 – Read Sub-Device Identity Summary command specific response codes 246
Table 95 – Read real-time clock value field 246
Table 96 – Read real-time clock command specific response codes 247
Table 97 – Write publish data period value field 247
Table 98 – Write publish data period command specific response codes 247
Table 99 – Write publish data trigger field 248
Table 100 – Write publish data trigger command specific response codes 249
Table 101 – Publish data message trigger source 249
Table 102 – Read publish data mode configuration request value field 251
Table 103 – Read publish data mode configuration response value field 252
Table 104 – Read publish data mode configuration command specific response codes 252
Table 105 – Flush delayed responses command specific Response codes 253
Table 106 – Write publish data mode configuration value field 253
Table 107 – Write publish data device variables command specific response codes 254
Table 108 – Write publish data mode command number value field 254
Table 109 – Write publish data mode command number value field 255
Table 110 – Write publish data mode command number command specific response codes 255
Table 111 – Write publish data mode control value field 256
Table 112 – Write publish data mode control command specific response codes 256
Table 113 – Read event notification summary request value field 257
Table 114 – Read event notification summary response value field 258

Table 115 – Read event notification summary command specific response codes 258
Table 116 – Write event notification bit mask value field 259
Table 117 – Write event notification bit mask command specific response codes..... 259
Table 118 – Write event notification timing value field..... 260
Table 119 – Write event notification timing command specific response codes 260
Table 120 – Write event notification control value field..... 261
Table 121 – Write event notification control command specific response codes 261
Table 122 – Write event notification acknowledgement value field..... 262
Table 123 – Write event notification acknowledgement command specific response codes 262
Table 124 – Write Join_key value field 263
Table 125 – Write Join_key command specific response codes..... 263
Table 126 – Read join status value field 264
Table 127 – Read join status command specific response codes..... 264
Table 128 – Write Active_search_shed_time request value field 264
Table 129 – Write Active_search_shed_time response value field..... 265
Table 130 – Write Active_search_shed_time command specific response codes 265
Table 131 – Write Join mode configuration value field 265
Table 132 – Write Join mode configuration command specific response codes..... 266
Table 133 – Read Join mode configuration response value field 266
Table 134 – Read Join mode configuration command specific response codes..... 267
Table 135 – Write network_ID value field request value field..... 267
Table 136 – Write network_ID value field response value field 267
Table 137 – Write network_ID command specific response codes 267
Table 138 – Read network_ID value field..... 268
Table 139 – Read network_ID command specific response codes 268
Table 140 – Write Network_tag value field..... 269
Table 141 – Write Network_tag command specific Response codes..... 269
Table 142 – Read Network_tag response value field..... 269
Table 143 – Read Network_tag command-specific response codes..... 270
Table 144 – Read wireless device capabilities value field 270
Table 145 – Read wireless device capabilities command specific response codes..... 270
Table 146 – Read battery life response value field..... 271
Table 147 – Read battery life command-specific response codes..... 271
Table 148 – Report device health response value field 272
Table 149 – Report device health command specific response codes..... 272
Table 150 – Read neighbor health list request value field 272
Table 151 – Read neighbor health list response value field..... 273
Table 152 – Read neighbor health list command specific response codes 273
Table 153 – Read device nickname response value field 274
Table 154 – Read device nickname command-specific response codes..... 274
Table 155 – Read session list request value field 274
Table 156 – Read session list response value field..... 275

Table 157 – Read session list command specific response codes 275
Table 158 – Read superframe list request value field 275
Table 159 – Read superframe list response value field 276
Table 160 – Read superframe list command specific response codes 276
Table 161 – Read link list request value field 276
Table 162 – Read link list response value field 277
Table 163 – Read link list command specific response codes 277
Table 164 – Read graph list request value field 277
Table 165 – Read graph list response value field 278
Table 166 – Read graph list command specific response codes 278
Table 167 – Read neighbor attribute flag request value field 278
Table 168 – Read neighbor attribute flag response value field 278
Table 169 – Read neighbor attribute flag command specific response codes 279
Table 170 – Read neighbor signal level request value field 279
Table 171 – Read neighbor signal level response value field 279
Table 172 – Read neighbor signal level command specific response codes 279
Table 173 – Report path down alarm response value field 280
Table 174 – Report path down alarm command specific response codes 280
Table 175 – Report source route failed alarm response value field 281
Table 176 – Report source route failed alarm command specific response codes 281
Table 177 – Report graph route failed alarm response value field 281
Table 178 – Report graph route failed alarm command specific response codes 281
Table 179 – Report transport layer failed alarm response value field 282
Table 180 – Report transport layer failed alarm command specific response codes 282
Table 181 – Write UTC time mapping value field 282
Table 182 – Write UTC time mapping command specific response codes 282
Table 183 – Read UTC time mapping response value field 283
Table 184 – Read UTC time mapping command specific response codes 283
Table 185 – Write timer interval value field 283
Table 186 – Write timer interval command specific response codes 283
Table 187 – Read timer interval request value field 284
Table 188 – Read timer interval response value field 284
Table 189 – Read timer interval command specific response codes 285
Table 190 – Write radio power output value field 285
Table 191 – Write radio power output command specific response codes 285
Table 192 – Read radio power output response value field 286
Table 193 – Read radio power output command specific response codes 286
Table 194 – Request TimeTable value field 286
Table 195 – Response TimeTable value field 287
Table 196 – Request TimeTable command specific response codes 287
Table 197 – Read TimeTable list request value field 288
Table 198 – Read TimeTable list response value field 288
Table 199 – Read TimeTable list command specific response codes 289

Table 200 – Delete TimeTable request value field 289
Table 201 – Delete TimeTable response value field 289
Table 202 – Delete TimeTable command specific response codes 290
Table 203 – Read route list request value field 290
Table 204 – Read route list response value field 290
Table 205 – Read route list command specific response codes 291
Table 206 – Read source route request value field 291
Table 207 – Read source route response value field 291
Table 208 – Read source route command specific response codes 291
Table 209 – Read CCA mode response value field 292
Table 210 – Read CCA mode command specific response codes 292
Table 211 – Write CCA mode value field 292
Table 212 – Write CCA mode command specific response codes 293
Table 213 – Read handheld superframe response value field 293
Table 214 – Read handheld superframe command specific response codes 293
Table 215 – Write handheld superframe value field 294
Table 216 – Write handheld superframe command specific response codes 294
Table 217 – Read packet hop-to-live response value field 294
Table 218 – Read packet hop-to-live command specific response codes 295
Table 219 – Write packet hop-to-live value field 295
Table 220 – Write packet hop-to-live command specific response codes 295
Table 221 – Read Join_priority response value field 296
Table 222 – Read Join_priority command specific response codes 296
Table 223 – Write Join_priority value field 296
Table 224 – Write Join_priority command specific response codes 296
Table 225 – Read receive Priority_threshold response value field 297
Table 226 – Read receive Priority_threshold command specific response codes 297
Table 227 – Write receive Priority_threshold value field 297
Table 228 – Write receive Priority_threshold command specific response codes 298
Table 229 – Read device list request value field 298
Table 230 – Read device list response value field 298
Table 231 – Read device list command specific response codes 298
Table 232 – Add device list entry request value field 299
Table 233 – Add device list entry response value field 299
Table 234 – Add device list entry command specific response codes 300
Table 235 – Delete device list entry request value field 300
Table 236 – Delete device list entry response value field 300
Table 237 – Delete device list entry command specific response codes 301
Table 238 – Read channel blacklist response value field 301
Table 239 – Read channel blacklist command specific response codes 301
Table 240 – Write channel blacklist value field 302
Table 241 – Write channel blacklist command specific response codes 302
Table 242 – Read back-off exponent response value field 303

Table 243 – Read back-off exponent command specific response codes 303
Table 244 – Write back-off exponent value field 303
Table 245 – Write back-off exponent command specific response codes 303
Table 246 – Write network access mode value field 304
Table 247 – Write network access mode command specific response codes 304
Table 248 – Read network access mode response value field 305
Table 249 – Read network access mode command specific response codes 305
Table 250 – Request Session request value field 305
Table 251 – Request Session response value field 306
Table 252 – Request Session command specific response codes 306
Table 253 – Read network device identity request value field 306
Table 254 – Read network device identity response value field 306
Table 255 – Read network device identity command specific response codes 307
Table 256 – Read device’s neighbor health request value field 307
Table 257 – Read device’s neighbor health response value field 307
Table 258 – Read device’s neighbor health command specific response codes 308
Table 259 – Read network topology information request value field 308
Table 260 – Read network topology information response value field 308
Table 261 – Read network topology information command specific response codes 309
Table 262 – Read publish data message list request value field 309
Table 263 – Read publish data message list response value field 309
Table 264 – Read publish data message list command specific response codes 309
Table 265 – Flush cached value field 310
Table 266 – Flush cached responses command specific response codes 310
Table 267 – Read network device statistics request value field 310
Table 268 – Read network device statistics response value field 311
Table 269 – Read network device statistics command specific response codes 311
Table 270 – Read network device identity request value field 312
Table 271 – Read network device identity response value field 312
Table 272 – Read network device identity command specific response codes 312
Table 273 – Write network device's scheduling flags value field 313
Table 274 – Write network device's scheduling flags command specific response codes 313
Table 275 – Read network device's scheduling flags request value field 313
Table 276 – Read network device's scheduling flags response value field 314
Table 277 – Read network device's scheduling flags command specific response codes 314
Table 278 – Read network constraints value field 314
Table 279 – Read network constraints command specific response codes 314
Table 280 – Write network constraints value field 315
Table 281 – Write network constraints command specific response codes 315
Table 282 – Read network statistics response value field 316
Table 283 – Read network command specific response codes 316
Table 284 – Transfer network list to white list response value field 316
Table 285 – Transfer network list to white list command specific response codes 316

Table 286 – Generate key request value field 317
Table 287 – Generate key response value field 317
Table 288 – Generate key command specific response codes 317
Table 289 – Read device join key request value field 318
Table 290 – Read device join key response value field 318
Table 291 – Read device join key command specific response codes 318
Table 292 – Write device join key 319
Table 293 – Write device join key command specific response codes 319
Table 294 – Change key now request value field 319
Table 295 – Change key now response value field 320
Table 296 – Change key now command specific response codes 320
Table 297 – Change key now response value field 320
Table 298 – Change key now command specific response codes 321
Table 299 – Write stale data timer response value field 321
Table 300 – Write stale data timer command specific response codes 321
Table 301 – Write stale data count request value field 322
Table 302 – Write stale data count command specific response codes 322
Table 303 – Read session extended request value field 323
Table 304 – Read session extended response value field 323
Table 305 – Read session extended command specific response codes 323
Table 306 – Read device suspend settings response value field 324
Table 307 – Read device suspend settings command specific response codes 324
Table 308 – Read security level advertised response value field 324
Table 309 – Read security level advertised command specific response codes 324
Table 310 – Reset availability statistics request value field 325
Table 311 – Reset availability statistics command specific response codes 325
Table 312 – Read active advertising status response value field 325
Table 313 – Read active advertising status command specific response codes 325
Table 314 – Read join key mode response value field 326
Table 315 – Read join key mode command specific response codes 326
Table 316 – Write join key mode request value field 326
Table 317 – Write join key mode command specific response codes 327
Table 318 – Read Timetable by ID request value field 327
Table 319 – Read Timetable by ID response value field 327
Table 320 – Read Timetable by ID command specific response codes 328
Table 321 – Disconnect device value field 328
Table 322 – Disconnect device command specific response codes 328
Table 323 – Write network key value field 329
Table 324 – Write network key command specific response codes 329
Table 325 – Write device nickname value field 329
Table 326 – Write device nickname command specific response codes 330
Table 327 – Write session request value field 330
Table 328 – Write session response value field 330

Table 329 – Write session command specific response codes 331
Table 330 – Delete session request value field 331
Table 331 – Delete session response value field 331
Table 332 – Delete session command specific response codes 332
Table 333 – Write superframe request value field 332
Table 334 – Write superframe response value field 332
Table 335 – Write superframe command specific response codes 333
Table 336 – Delete superframe request value field 333
Table 337 – Delete superframe response value field 333
Table 338 – Delete superframe command specific response codes 334
Table 339 – Write link request value field 334
Table 340 – Write link response value field 334
Table 341 – Write link command specific response codes 335
Table 342 – Delete link request value field 335
Table 343 – Delete link response value field 336
Table 344 – Delete link command specific response codes 336
Table 345 – Write graph connection request value field 336
Table 346 – Write graph connection response value field 337
Table 347 – Write graph connection command specific response codes 337
Table 348 – Delete graph connection request value field 337
Table 349 – Delete graph connection response value field 338
Table 350 – Delete graph connection command specific response codes 338
Table 351 – Write neighbor attribute flag value field 338
Table 352 – Write neighbor attribute command specific response codes 338
Table 353 – Write network suspend value field 339
Table 354 – Write network suspend command specific response codes 339
Table 355 – Write TimeTable request value field 340
Table 356 – Write TimeTable response value field 340
Table 357 – Write TimeTable command specific response codes 340
Table 358 – Write route request value field 341
Table 359 – Write route response value field 341
Table 360 – Write route command specific response codes 341
Table 361 – Delete route request value field 342
Table 362 – Delete route response value field 342
Table 363 – Delete route command specific response codes 342
Table 364 – Write source route request value field 343
Table 365 – Write source route response value field 343
Table 366 – Write source route command specific response codes 343
Table 367 – Delete source route request value field 344
Table 368 – Delete source route response value field 344
Table 369 – Delete source route command specific response codes 344
Table 370 – Write status counter mode request value field 344
Table 371 – Write status counter mode command specific response codes 345

Table 372 – Write security level supported request value field 345
Table 373 – Write security level supported command specific response codes 345
Table 374 – Coding of Integer16 type data 346
Table 375 – Coding of Unsigned16 type data 347
Table 376 – Coding for Date type 348
Table 377 – Coding of 1-octet Bit Field type data 349
Table 378 – Coding of 2-octet Bit Field type data 349
Table 379 – Packed ASCII character set 350
Table 380 – Subset of ISO Latin-1 characters 350
Table 381 – DRM related response codes 351
Table 382 – FSPM state Table – client transactions 355
Table 383 – FSPM state Table – server transactions 357
Table 384 – Function TransportType () 357
Table 385 – Function PriorityType () 357
Table 386 – Function FormReqApdu () 357
Table 387 – Function FormRspApdu () 358
Table 388 – Function RetrieveCommand () 358
Table 389 – Function CommandErr () 358
Table 390 – Function ResponseCode () 358
Table 391 – Function DeviceStat () 358
Table 392 – Function Value () 358
Table 393 – Parameters used with primitives exchanged between FSPM and ARPM 359
Table 394 – Client ARPM states 361
Table 395 – Client ARPM state table 361
Table 396 – Server ARPM states 362
Table 397 – Server ARPM state table 362
Table 398 – Primitives issued from ARPM to TMPM 363
Table 399 – Primitives issued by TMPM to ARPM 363
Table 400 – TMPM state descriptions 363
Table 401 – TMPM state Table – Client transactions 364
Table 402 – TMPM state Table – Server transactions 364
Table 403 – Primitives exchanged between network layer and TMPM 365
Table 404 – CPF 9: overview of profile sets 365
Table 405 – CP 9/2: PhL selection 371
Table 406 – CP 9/2: PhL protocol selection 371
Table 407 – Transceiver Specifications 372
Table 408 – Frequency assignments 372
Table 409 – PHY PIB attributes 373
Table 410 – CP 9/2: DLL service selection 374
Table 411 – CP 9/2: DLL protocol selection 374
Table 412 – CP 9/2: AL service selection 375
Table 413 – CP 9/2: Device application service selection 376
Table 414 – CP 9/2: Layer management service selection 377

Table 415 – CP 9/2: Gateway and network manager service selection 378
Table 416 – CP 9/2: Network management configuration service selection 379
Table 417 – CP 9/2: AL protocol selection 380
Table 418 – Application process status values 380
Table 419 – CP 9/2: Device application service-specific APDU selection 381
Table 420 – CP 9/2: Layer management service-specific APDU selection 382
Table 421 – CP 9/2: Gateway and network manager service-specific APDU selection 383
Table 422 – CP 9/2: Network management configuration service-specific APDU selection 384
Table C.1 – Network manager requirements 404
Table D.1 – Cached Response Messages 410
Table E.1 – Response code values 411
Table F.1 – Reserved values 420
Table F.2 – Publish mode control codes 421
Table F.3 – Write device variable codes 422
Table F.4 – Device variable family codes 422
Table F.5 – Device variable classification codes 422
Table F.6 – Analog channel saturated codes 424
Table F.7 – Analog channel fixed codes 424
Table F.8 – Standardized status 0 codes 424
Table F.9 – Standardized status 1 codes 425
Table F.10 – Standardized status 2 codes 425
Table F.11 – Standardized status 3 codes 425
Table F.12 – Publish trigger mode codes 426
Table F.13 – Event notification control codes 426
Table F.14 – Event status codes 426
Table F.15 – TimeTable request codes 427
Table F.16 – TimeTable application domain codes 427
Table F.17 – Synchronous action control codes 427
Table F.18 – Real-time clock flags codes 427
Table F.19 – Wireless timer codes 428
Table F.20 – Device power source codes 428
Table F.21 – Link_type codes 428
Table F.22 – Link option flags codes 429
Table F.23 – Superframe mode flags codes 429
Table F.24 – Session_type codes 429
Table F.25 – TimeTable deletion reason codes 429
Table F.26 – Disconnect cause codes 429
Table F.27 – Wireless operation codes 430
Table F.28 – Join process status codes 430
Table F.29 – Security type codes 431
Table F.30 – Device list codes 431
Table F.31 – Network access mode codes 432

Table F.32 – Device profile codes 432
Table F.33 – Device power status codes 432
Table F.34 – Neighbor flags codes 433
Table F.35 – Notification mask codes 433
Table F.36 – Join mode codes 433
Table F.37 – Device scheduling flags codes 433
Table F.38 – Network optimization flags codes 434
Table F.39 – Wireless capabilities codes 434
Table F.40 – CCA mode codes 434
Table F.41 – Wireless device connection status 434
Table F.42 – Wireless device health status 435
Table F.43 – Change key flags codes 435
Table F.44 – Join key mode code 435
Table I.1 – Routing requirements 451
Table I.2 – Scheduling requirements 452
Table I.3 – Superframe ID 1: 1 s update rate, superframe length 100 455
Table I.4 – Superframe ID 4: 4 s update rate, superframe length 400 456
Table I.5 – Superframe ID 0: management superframe 456
Table I.6 – Join request (shared with management responses) 456
Table I.7 – Join response (shared with management requests) 456
Table I.8 – Commands 457
Table I.9 – Command responses 457
Table I.10 – Device A 457
Table I.11 – Device B 458
Table I.12 – Device C 458
Table I.13 – Device D 458
Table I.14 – Network manager universal commands 460
Table J.1 – Required command responses 471
Table J.2 – Gateway status flags 473
Table J.3 – Gateway capacity guidelines 474
Table M.1 – Applicable EN 300 440-2 requirements list 491
Table M.2 – Applicable EN 300 328 requirements list for adaptivity 492
Table M.3 – Applicable EN 300 328 requirements list for non-adaptivity 493

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INDUSTRIAL NETWORKS – WIRELESS COMMUNICATION NETWORK AND COMMUNICATION PROFILES – WirelessHART™

FOREWORD

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International Standard IEC 62591 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

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

- enhancements to the performance statistics using key performance indicators (KPI). These improvements result in expansion of statistics provided by Gateways. For example Read network device statistics service was expanded and Read network statistics service was added to provide a summary of network performance;
- "Stale Data" detection was added (see services Read stale data setpoints, Write stale data timer and Write stale data count setpoint). These standardize Gateway reporting should process data or events fail to arrive at the Gateway in a timely fashion. For

example, Host Applications will receive the "Update Failure" Response Code should the process data in the command response be stale;

- gateway commands were added;
- a Quarantined State was added;
- CCA Modes were extended to be more in-line with IEEE 802.15.4;
- clarifications on whitelist and blacklist management were added;
- clarifications on join (e.g. only require a single neighbor) were added;
- clarifications on use of join links, table management, and defaults were added;
- corrections and updates were made.

The reader's attention is drawn to the fact that Annex M lists all of the “in-some-country” clauses on differing practices of a less permanent nature relating to the subject of this standard.

The text of this standard is based on the following documents:

FDIS	Report on voting
65C/835/FDIS	65C/842/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This International standard provides the specification, definitions, and profile for a Wireless communication network. It supplements IEC 61158-5-20, IEC 61158-6-20 where some services and commands are specified and it supplements IEC 61784-1 where a Communication Profile CP 9/1, universal command, is specified.

This document follows the structure and conventions of IEC 61158 series (for example separation of DL-service definitions and DL-protocol specification) and conventions of IEC 61784-1. IEC 61158 series specify different communication networks. These are structured in different Types. The Type 20 is assigned to technologies of Hart™[1] Communication Foundation (HCF). For other assignments of Type numbers see IEC 61158-1.

IEC 61784-1, and IEC 61784-2 provide Communication Profile Families (CPF), and, within a family, one to n Communication Profiles. The assigned CPF number for technologies of the HCF is CPF 9. For other assignments of CPF numbers see IEC 61158-1.

A new project number IEC 62591 was assigned to the Type 20 enhancements and the associated CP 9/2, so that this document contains the Type 20 specific equivalent to the IEC 61158 series and of CPF 9 specific profile using the same conventions as used in IEC 61784-1. The equivalent of 4 Type specific subparts and the profile are organized in this document in different clauses.

The Type 20 protocol supports two way digital communications for process measurement and control devices. Applications include remote process variable interrogation, cyclical access to process data, parameter setting and diagnostics. This document defines the specification that comprises the Type 20 field communications protocol for wireless devices. Specification of the Type 20 protocol is based largely on the OSI 7-layer Communication Model.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning the claims of the patents listed below given in the normative clauses.

US 8676219 [HCF]	Combined Wired and Wireless Communications with Field Devices in a Process Control Environment
US 8798084 [HCF]	Increasing Reliability and Reducing Latency in a Wireless Network
US 8325627 [HCF]	Adaptive Scheduling in a Wireless Network
US 8660108 [HCF]	Synchronizing Timeslots in a Wireless Communication Protocol
US 8169974 [HCF]	Suspending Transmissions in a Wireless Communication Network
US 8670746 [HCF]	Enhancing Security in a Wireless Network
US 8670749 [HCF]	Enhancing Security in a Wireless Network
US 8451809 [HCF]	Wireless Gateway in a Process Control Environment Supporting a Wireless Communication Protocol
US 8570922 [HCF]	Efficient Addressing in Wireless HART Protocol
US 8942219 [HCF]	Support for Network Management and Device Communications in a Wireless Network

[1] HART™ and WirelessHART™ are the trade names of FieldComm Group. The FieldComm Group is a non-profit trade organization to support the HART™ Communication. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade name holder or any of its products. Compliance to this document does not require use of the trade name. Use of the trade name HART™ and WirelessHART™ requires permission of the trade name holder, see http://www.fieldcommgroup.org.

US 8406248 [HCF]	Priority Based Scheduling and Routing in a Wireless Network
US 8892769 [HCF]	Routing Packets on a Network Using Directed Graphs
US 8230108 [HCF]	Routing Packets on a Network Using Directed Graphs
US 8356431 [HCF]	Scheduling Communication Frames in a Wireless Network

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

The holder of these patent rights has assured IEC that she/he is willing to negotiate licenses either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of these patent rights is registered with IEC. Information may be obtained from:

[HCF] FieldComm Group
9430 Research Boulevard
Suite 1-120
Austin TX 78759, USA

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

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

INDUSTRIAL NETWORKS – WIRELESS COMMUNICATION NETWORK AND COMMUNICATION PROFILES – WirelessHART™

1 Scope

This International Standard specifies a wireless communication network in addition to the Type 20 in IEC 61158-3-20, IEC 61158-4-20, IEC 61158-5-20, IEC 61158-6-20 and a Communication Profile CP 9/2 in addition to IEC 61784-1, CPF 9.

This standard specifies the following:

- Physical layer service definition and protocol specification,
- Data-link layer service and protocol,
- Application layer service and protocol,
- Network management,
- Security,
- Communication profile,
- Wireless procedures and
- Gateway.

2 Normative references

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

IEC 61158-1:2014, *Industrial communication networks – Fieldbus specifications – Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series*

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

IEC 61158-3-20:2014, *Industrial communication networks – Fieldbus specifications – Part 3-20: Data-link layer service definition – Type 20 elements*

IEC 61158-4-20:2014, *Industrial communication networks – Fieldbus specifications – Part 4-20: Data-link layer protocol specification – Type 20 elements*

IEC 61158-5-20:2014, *Industrial communication networks – Fieldbus specifications – Part 5-20: Application layer service definition – Type 20 elements*

IEC 61158-6-20:2014, *Industrial communication networks – Fieldbus specifications – Part 6-20: Application layer protocol specification – Type 20 elements*

IEC 61784-1:2014, *Industrial Communication Networks – Profiles – Part 1: Fieldbus profiles*

IEC 61784-2:2014, *Industrial Communication Networks – Profiles – Part 2: Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC 8802-3*

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

ISO/IEC 7498-3, *Information technology – Open Systems Interconnection – Basic Reference Model: Naming and addressing*

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

ISO/IEC 8824 (all parts), *Information Technology – Abstract Syntax Notation One (ASN.1)*

ISO/IEC 8859-1, *Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1*

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

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

IEEE Std 802-2001, *IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture*

IEEE Std 802.15.4-2011, *IEEE Standard for Local and metropolitan area networks – Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs)*

IEEE Std 802.15.4e:2012, *IEEE Standard for Local and metropolitan area networks – Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs) – Amendment 1: MAC sublayer*

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