

DIN EN 13757-1:2015-01 (E)

Communication systems for meters - Part 1: Data exchange

Contents		Page
Foreword		9
Introduction		10
1	Scope	11
2	Normative references	11
3	Terms and definitions	13
4	General description and security	15
4.1	Basic vocabulary	15
4.2	Layered protocols	15
4.2.1	General	15
4.2.2	7 Layer Protocol	15
4.2.3	IP Protocol	16
4.2.4	3 Layer Protocol	17
4.3	Security	18
4.3.1	General	18
4.3.2	Security Requirement Analysis/ Threat Analysis	19
4.3.3	Key Management	19
4.3.4	COSEM Upper Layer Security	20
4.3.5	Lower Layer Security	21
5	Network Architecture	22
5.1	M/441 Mandate	22
5.2	General	23
5.3	Basic architecture	23
5.4	Metering Architecture	24
5.5	One unique access point at any time: a tree structure	26
5.6	Self-configurable network	26
5.7	Hand Held Unit for local access	26
5.8	Network layers	26
5.9	Multiple access	26
6	Application Layers for Metering	27
6.1	General	27
6.2	COSEM Application Layer for Metering	27
6.3	Companion Specification	27
6.4	COSEM Basic Principles	28
6.5	Management of a COSEM Device	29
6.6	Lower layers	29
7	Data Exchange	30
7.1	General	30
7.2	Data exchange using direct local connection	30
7.2.1	General	30
7.2.2	Security	31
7.2.3	Physical layer	31
7.2.4	Link Layer	31
7.3	Data exchange using wired local area network (LAN)	31
7.3.1	General	31

7.3.2	Twisted pair, baseband signalling	32
7.3.3	Twisted pair, baseband limited systems	32
7.3.4	Twisted pair, carrier signalling	32
7.4	Data exchange using wide area network (WAN)	32
7.4.1	General	32
7.4.2	PSTN based connection	32
7.4.3	IP connection	36
7.5	Data exchange using M-Bus radio communication	37
7.5.1	General	37
7.5.2	Basic M- Bus radio networks	38
7.5.3	Routed M-Bus radio networks	38
7.6	Data Exchange using HDLC for some innovative communications technologies and local interfaces	38
7.6.1	General	38
7.6.2	Security	38
7.6.3	Physical layer	38
7.6.4	Link Layer	39
8	Upper Layer Protocols	39
8.1	Introduction	39
8.2	Transport sub-layer	39
8.2.1	Introduction	39
8.2.2	EN 62056-46 related Transport sub-layer	40
8.2.3	EN 62056-47 related Transport sub-layer	40
8.2.4	Transport sub-layer	40
8.3	Application sub-layer	42
8.3.1	Introduction	42
8.3.2	Application layer structure	42
8.3.3	Service specification	42
8.3.4	Protocol specification	43
9	Cross-application data handling	43
9.1	General	43
9.2	Data tunnelling	43
9.2.1	General	43
9.2.2	M-Bus Application Layer transferred by DLMS	44
9.3	Data translation	48
10	Extensions to COSEM	49
10.1	Introduction	49
10.2	Dedicated Interface classes	49
10.3	Specific object types -- Error reporting object	56
10.3.1	Introduction	56
10.3.2	General error object	57
10.3.3	Media specific error object	58
10.3.4	Manufacturer specific error object	58
11	Object Identification System (OBIS)	58
11.1	Object Identification System (Variable naming rules)	58
11.1.1	Introduction	58
11.1.2	Structure	58
11.1.3	Manufacturer, utility, consortia and country specific codes	59
11.1.4	Common value groups	60
11.2	Abstract Objects (A = 0)	63
11.2.1	Abstract objects, general service entries	63
11.2.2	Error registers, alarm registers and alarm filters - Abstract	68
11.2.3	List objects - Abstract	68
11.2.4	Register table objects - Abstract	69
11.2.5	Data profile objects - Abstract	69
11.3	Media specific value groups	69
11.3.1	General	69
11.3.2	Value groups specific to Heat Cost Allocators	69

11.3.3	Value groups specific to Heat or Cooling Meters	73
11.3.4	Value groups specific to Gas Meters	79
11.3.5	Value groups specific to Water Meters (A = 8 and A = 9)	108
11.4	Other media (Value group A = F)	111
11.4.1	General	111
11.4.2	Value group C codes - Other media	112
11.4.3	Value group D codes - Other media	112
11.4.4	Value group E codes - Other media	112
11.4.5	Value group F codes - Other media	112
11.5	Code presentation	112
11.5.1	Reduced ID codes (e.g. for EN 62056-21)	112
11.5.2	Display	113
11.5.3	Special handling of value group F	113
Annex A (normative) Basic class meters		115
A.1	General	115
A.2	Basic requirements for Heat Cost Allocators	115
A.3	Basic requirements for Heat/ Cooling meters	116
A.4	Basic requirements for Gas meters	116
A.5	Basic requirements for Cold/ Hot water meters	117
Annex B (informative) DLMS Glossary		118
B.1	Introduction	118
B.2	Activation mask	118
B.3	Activity calendar	118
B.4	Association LN	118
B.5	Association SN	118
B.6	Automatic capturing	118
B.7	Billing Period in COSEM	118
B.8	Capture	119
B.9	Channel	119
B.10	Clock	119
B.11	Current and last average value objects	120
B.12	Date and time	120
B.13	Daylight saving	120
B.14	Demand Register	120
B.15	Device ID	122
B.16	Error values	122
B.17	High level security	123
B.18	Interface modelling	123
B.19	I/O Control Signals	123
B.20	Interoperability	123
B.21	Logical device	123
B.22	Logical name referencing	124
B.23	Low level security	124
B.24	Manufacturer defined ID-s	124
B.25	Manufacturer specific abstract objects	124
B.26	Manufacturer specific class id	124
B.27	Manufacturer specific data and parameters	124
B.28	Manufacturer specific OBIS codes	125
B.29	Maximum and minimum value objects	125
B.30	Measurement of different media	125
B.31	Measurement method and tariffs	125
B.32	Measurement values series	125
B.33	Missing measurement values	125
B.34	Node	125
B.35	Password	126
B.36	Physical device	126
B.37	Power failure handling	126
B.38	Power failure monitoring	126

B.39	Preferred readout-values	127
B.40	Profile objects	127
B.41	Profile for billing periods	127
B.42	Profile generic interface class	127
B.43	Register interface class	127
B.44	Reset, IC Demand register	127
B.45	Reset, IC Extended register	128
B.46	Reset, IC Profile generic	128
B.47	Reset, IC Register	128
B.48	Reset, indication of source	128
B.49	Scaler	128
B.50	Scaler-unit	128
B.51	Schedule	128
B.52	Script	128
B.53	Script table interface class	129
B.54	Season	129
B.55	Selective access	129
B.56	Set date	129
B.57	Short name referencing	129
B.58	Special days table interface class	129
B.59	Standard readout definitions	129
B.60	Tariff	129
B.61	Tariffication	129
B.62	Threshold	130
B.63	Time integral value objects	130
B.64	Time setting, in relation with IC Schedule	130
B.64.1	General	130
B.64.2	Time setting forward	130
B.64.3	Time setting backward	130
B.64.4	Time synchronization	131
B.64.5	Daylight Saving	131
B.65	Time stamps (in relation with IC PSTN Auto dial)	131
B.66	Time stamp (in relation with billing periods)	131
B.67	Time synchronization	131
B.68	Unique identifier	131
B.69	Unit	131
B.70	Utility tables	134
Annex C (informative) Gas Volume Conversion		135
C.1	Introduction	135
C.2	Foreword to abstract data model of gas volume converter	135
C.3	Abstract data model of gas volume converter -- Common objects in gas conversion and energy calculation	136
C.4	Principle of measurement for volume conversion and energy calculation	137
C.5	Data flow in volume conversion and energy calculation	139
Annex D (normative) Country specific identifiers		140
Bibliography		142
Tables Table 1 -- Typical Client Access Levels		21
Table 2 -- M-Bus Port Setup Object		44
Table 3 -- Description of Class ID "Data"		45
Table 4 -- Tunnelling, Value group E		46
Table 5 -- M-Bus slave port setup		49
Table 6 -- M-Bus client		51

Table 8 — M-Bus master port setup	56
Table 9 — OBIS code structure and use of value groups	59
Table 10 — Reserved OBIS codes	60
Table 11 — Value group A	61
Table 12 — Value group B	61
Table 13 — Value group C codes where A = 0 (abstract objects).....	62
Table 14 — Abstract objects, general service entries	64
Table 15 — Codes for error registers, alarm registers and alarm filters – Abstract.....	68
Table 16 — OBIS codes for list objects – Abstract	68
Table 17 — OBIS codes for register table objects – Abstract.....	69
Table 18 — OBIS codes for data profile objects – Abstract.....	69
Table 19 — Value group C codes where A = 4 (HCA objects).....	70
Table 20 — Value group D codes where A = 4, C < > 0, 96 .. 99 (HCA objects).....	71
Table 21 — OBIS codes for general and service entry objects – HCA.....	71
Table 22 — OBIS codes for error register objects – HCA.....	72
Table 23 — OBIS codes for data profile objects – HCA.....	73
Table 24 — OBIS codes for HCA related objects (examples)	73
Table 25 — Value group C codes where A = 5 or A = 6 (Heat/cooling objects)	74
Table 26 — Value group D codes where A = 5 or A = 6 and C < > 0, 96...99 (Heat/cooling objects)	75
Table 27 — OBIS codes for general and service entry objects – Heat/cooling.....	76
Table 28 — OBIS codes for error register objects – Heat/ cooling.....	78
Table 29 — OBIS codes for data profile objects – Heat/ cooling	78
Table 30 — OBIS codes for heat/ cooling related objects (examples)	79
Table 31 — Value group C codes where A = 7 – Gas	81
Table 32 — Value group D codes for Gas – Indexes and index differences (A = 7, C = 1...8, 11...16, 21...26, 31...36, 61...66)	84
Table 33 — Value group D codes – Gas – Flow rate: A = 7, C = 43	88
Table 34 — Value group D codes – Gas – Process values (A = 7, C = 41, 42, 44...49)	90
Table 35 — Value group D codes – Gas – Correction, conversion and compressibility values (A = 7, C = 51...55).....	93
Table 36 — Value group D codes – Gas – Natural gas analysis values (A = 7, C = 70).....	93
Table 37 — Value group E codes – Gas – Indexes and index differences – Tariff rates for A = 7, C = 1...8, 11...16, 21...26, 31...36, 61...66, D = 0...3, 6...98	95
Table 38 — Value group E codes – Gas – Correction, conversion and compressibility values – Averages: A = 7, C = 51...55, D = 0, 2, 3, 10, 11	95
Table 39 — Value group E codes – Gas – Calculation methods A = 7, C = 51...55, D = 12	97

Table 40 — Value group E codes – Gas – Natural gas analysis values – Averages: A = 7, C = 70, D = 8...20, 60...84	98
Table 41 — OBIS codes for general and service entry objects – Gas	99
Table 42 — OBIS codes for error register objects – Gas	106
Table 43 — OBIS codes for list objects - Gas.....	107
Table 44 — OBIS codes for data profile objects – Gas	108
Table 45 — Value group C codes where A = 8 or A = 9 (Water volume objects)	109
Table 46 — Value group D codes where A = 8 or A = 9, C < > 0, 96...99 (Water volume objects).....	109
Table 47 — OBIS codes for general and service entry objects – Water	110
Table 48 — OBIS codes for error register objects – Water	111
Table 49 — OBIS codes for data profile objects – Water	111
Table 50 — OBIS codes for water related objects (examples).....	111
Table 51 — Value group C codes – Other media.....	112
Table 52 — Example of display code replacement – Value group C.....	113
Table 53 — Value group F – Billing periods	114
Table A.1 — Basic requirements for Heat Cost Allocators	115
Table A.2 — Basic requirements for Heat/ Cooling meters	116
Table A.3 — Basic requirements for Gas meters	116
Table A.4 — Basic requirements for Cold/ Hot water meters	117
Table B.1 — Enumerated values for physical units	132
Table C.1 — OBIS-Value group A = 7, B = X, E = 0, F = FF.....	136
Table D.1 — Value group D codes — Country specific identifiers C = 94	140

Figures

Figure 1 — The OSI 7-layer model	16
Figure 2 — Connection method independent Application Layers	17
Figure 3 — IEC 3-layer model.....	17
Figure 4 — Link and Physical layers in the 3 layer model	18
Figure 5 — Network Architecture — The architecture diagram in CEN/CLC/ETSI TR 50572	22
Figure 6 — System and physical architecture.....	24
Figure 7 — Basic Metering architecture.....	25
Figure 8 — Scope of Companion Specifications	27
Figure 9 — Companion Specification in relation to lower layers (3 layer model)	28
Figure 10 — An interface class and its instances.....	29
Figure 11 — Full protocol stack	30
Figure 12 — Typical PSTN configuration.....	33
Figure 13 — The location of the Physical Layer.....	34
Figure 14 — COSEM over IP.....	36
Figure 15 — EN 60870-5-2-related Transport PDU format.....	40

Figure 16 — CI field format 41
Figure 17 — The structure of the COSEM Application Layers..... 42
Figure 18 — Transporting DLMS/COSEM APDU's via M-Bus 44
Figure 19 — Reduced ID code presentation 113
Figure B.1 — The generalized time concept 119
Figure B.2 — The attributes when measuring sliding demand..... 120
Figure B.3 — Attributes when measuring current_average_value if number of periods is 1..... 121
Figure B.4 — The attributes if number of periods is 3..... 122
Figure B.5 — The COSEM server model..... 126
Figure C.1 — Energy Conversion Calculation flow chart 139