

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

## Communication systems for meters - Part 1: Data exchange

---

<b>Contents</b>		<b>Page</b>
Foreword .....		9
Introduction .....		10
<b>1</b>	<b>Scope .....</b>	<b>11</b>
<b>2</b>	<b>Normative references .....</b>	<b>11</b>
<b>3</b>	<b>Terms and definitions .....</b>	<b>13</b>
<b>4</b>	<b>General description and security .....</b>	<b>15</b>
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
<b>5</b>	<b>Network Architecture .....</b>	<b>22</b>
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
<b>6</b>	<b>Application Layers for Metering .....</b>	<b>27</b>
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
<b>7</b>	<b>Data Exchange .....</b>	<b>30</b>
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
<b>Annex A (normative) Basic class meters .....</b>		<b>115</b>
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
<b>Annex B (informative) DLMS Glossary .....</b>		<b>118</b>
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**