

EXCERPT FROM

Companion Specification
for Energy Metering

DLMS/COSEM

**Conformance
Testing Process**

DLMS User Association



Table of Contents

Foreword to Excerpt	5
Foreword.....	5
1 Scope	6
2 Referenced documents	6
3 Terms, definitions and abbreviations	6
3.1 Terms and definitions.....	6
3.2 Abbreviations	12
4 Conformance testing – overview	13
4.1 OSI conformance testing	13
4.2 The DLMS/COSEM conformance testing scheme	13
4.2.1 Overview.....	13
4.3 The elements of the DLMS/COSEM certification scheme	14
4.4 Main characteristics	15
4.5 Self testing and third party testing	15
5 The conformance test plans	15
5.1 Scope of testing	15
5.2 The CTT and the IUT	17
5.3 Structure of the abstract test plans	17
5.4 Abstract test cases.....	18
5.5 Outcomes and verdicts	19
5.6 The HDLC based data link layer ATS.....	20
5.7 The DLMS/COSEM application layer ATS	20
5.8 The COSEM interface objects ATS	21
5.9 The Security Suite 0 (SYMSEC_0) ATS.....	21
5.10 The Security Suite 1 and 2 (PUBSEC_1_2) ATS	22
5.11 The COSEM Data protection ATS	22
5.12 The General Block Transfer ATS.....	22
5.13 Executable test suites and test cases.....	23
6 The DLMS/COSEM conformance test tool	23
6.1 Overview	23
6.2 CTT versions and editions	23
6.3 Licensing the CTT	24
6.4 Installing the CTT	24
6.5 Operating system and hardware requirements.....	25
7 The conformance assessment process	25
7.1 Overview	25
7.2 Implementation Under Test (IUT, meter)	26
7.3 Preparation of the IUT for testing.....	26
7.4 Starting the CTT: the CTT user interface.....	27
7.5 Preparation of the conformance test information.....	27
7.5.1 General.....	27
7.5.2 Preparation of the CTI file	28
7.5.3 Information taken from the IUT.....	30

7.6	Selection of the CTI file	30
7.7	Selection of the communication parameters.....	31
7.8	The COSEM object definition file	32
7.9	Miscellaneous settings	34
7.10	Connecting the IUT to CTT	34
7.11	Selection of the test cases	34
7.12	Test sessions	35
7.13	Observing the progress of testing.....	36
7.13.1	General.....	36
7.13.2	The line traffic.....	36
7.13.3	The log.....	38
7.14	Saving the test result	44
7.15	Repeatability of results.....	44
7.16	Requirements for test laboratories.....	44
8	The conformance certification process	44
8.1	General	44
8.2	Initiation of the certification process.....	44
8.3	Submission of conformance test documents	45
8.4	Examination of the test results.....	45
8.5	The Certification	45
8.6	Scope and validity of the Certification.....	46
8.7	Re-testing with a new version of the CTT	47
8.8	Manufacturer name change	47
8.9	Disclaimer	47
9	The quality program	47
9.1	General	47
9.2	Validation of the Abstract Test Suites and CTT.....	47
9.3	Support provided to users.....	48
9.4	Maintenance	48
9.5	Use cases	48
9.5.1	Use case 1 – introducing a new standard OBIS code	48
9.5.2	Use case 2 – modification of an existing test	48
9.5.3	Use case 3 – adding a test for a new standard feature	49
9.5.4	Use case 4 – revision of the specification	49
	Annex A Certification template (with sample data) (informative)	50
	Annex B (normative) Conformance Test Plans	52
	Annex C (informative) Bibliography.....	53
	Annex D Test Plan Documents	55

List of Figures

Figure 1 – DLMS/COSEM conformance testing scheme.....	14
Figure 2 – DLMS/COSEM interface object model and communication profiles.....	16
Figure 3 – Test suite structure.....	18
Figure 4 – Structure of the HDLC based data link layer ATS.....	20
Figure 5 – Structure of the DLMS/COSEM application layer ATS	20

Figure 6 – Structure of the COSEM interface objects ATS 21

Figure 7 – Structure of the Security Suite 0 (SYMSEC_0) ATS..... 21

Figure 8 – Structure of the Security Suite 1 and 2 (PUBSEC_1_2) ATS 22

Figure 9 – Structure of the COSEM Data protection ATS 22

Figure 10 – Structure of the General Block Transfer ATS 23

Figure 11 – Conformance assessment process overview 25

Figure 12 – CTT 3.0 CTI template (fragment, illustration)..... 29

Figure 13 – CTT 3.1 CTI example (fragment) 30

Figure 14 – Communication settings..... 31

Figure 15 – COSEM object definition file cover sheet..... 33

Figure 16 – Miscellaneous settings (CTT 3.0)..... 34

Figure 17 – Selection of the test cases (CTT 3.1)..... 35

Figure 18 – The Traffic window (TCP-IP profile, fragment)..... 37

Figure 19 – Basic log example: APPL_OPEN_1 test case 39

Figure 20 – Extended log example: APPL_OPEN_1 test case..... 41

Figure 21 – Fragment of a sample test report 43

Figure 22 – The DLMS/COSEM compliant logo..... 46

List of Tables

Table 1 – Template for test cases 19

Foreword to Excerpt

This Excerpt has been abstracted from the full technical report to give potential users a flavour of the content of the Yellow Book. It is not intended to provide sufficient information to allow a developer to implement or test real implementations.

Foreword

Copyright

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The copyright is enforced by national and international law. The "Berne Convention for the Protection of Literary and Artistic Works", which is signed by 176 countries worldwide and other treaties apply.

Acknowledgement

The actual document has been established by the DLMS UA Maintenance Working Group Conformance Testing Task Force.

1 Scope

This document specifies the DLMS UA conformance testing scheme for testing and certifying servers implementing the DLMS/COSEM specification as specified in the Blue Book DLMS_UA_1000_1 and in the Green Book DLMS_UA_1000_2.

This document focuses on compliance to the DLMS/COSEM specification. Testing of functional and performance aspects are outside the scope of this document.

This Edition 6.1 applies to:

- CTT 3.0, in line with Blue Book Edition 11 and Green Book Edition 7.0, + Amendment 3; as well to
- CTT 3.1, in line with Blue Book Edition 12.2 and Green Book Edition 8.3.

It cancels and replaces Edition 6.0, published in 2017.

2 Referenced documents

Reference No.	Title
DLMS UA 1000-1 Ed. 11.0: 2013	COSEM Interface Classes and OBIS Identification System, the Blue Book
DLMS UA 1000-1 Ed. 12.2: 2017	
DLMS UA 1000-2 Ed. 7.0:2009 Amendment 3:2013	DLMS/COSEM Architecture and Protocols, the Green Book
DLMS UA 1000-2 Ed. 8.3: 2017	
DLMS UA 1002 Ed. 1.0:2003	Glossary of terms, the White Book
DLMS UA 1001-3: ATS_DL V 5 Released: 2010-12-15	DLMS/COSEM conformance testing – Conformance test plans – Data link layer using HDLC protocol
DLMS UA 1001-6 V 1.5 Released 2017-05-29	DLMS/COSEM conformance testing – Abstract Test Plans for CTT 3.0 – DLMS/COSEM application layer – COSEM interface objects – Symmetric key security suite 0
DLMS UA 1001-8 V 2.2 Released 2018-03-13	DLMS/COSEM conformance testing – Abstract Test Plans for CTT 3.1 – DLMS/COSEM application layer – COSEM interface objects – Symmetric key Security Suite 0 – Public key Security Suite 1 and 2 – Data protection – General Block Transfer
DLMS UA 1001-7	COSEM conformance testing – Object definition tables
IEC 62056-21	Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange
ITU-T X.290 (11/1998)	OSI conformance testing methodology and framework for protocol recommendations for ITU-T applications – General concepts

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document the following definitions apply:

NOTE Most of the following definitions have been taken from ITU-T Recommendation ITU-T X.290. Some definitions have been modified to better adapt to the DLMS/COSEM conformance assessment process.

3.1.1

abstract test case

A complete and independent specification of the actions required to achieve a specific test purpose, defined at the level of abstraction of a particular abstract test method. It includes a Preamble and a

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	6/57
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Postamble to ensure starting and ending in a stable state (i.e., a state which can be maintained almost indefinitely, such as the “idle” state or “data transfer” state) and involves one or more consecutive or concurrent connections.

NOTE 1 – The specification should be complete in the sense that it is sufficient to enable a verdict to be assigned unambiguously to each potentially observable outcome (i.e., sequence of test events).

NOTE 2 – The specification should be independent in the sense that it should be possible to execute the derived executable test case in isolation from other such test cases (i.e., the specification should always include the possibility of starting and finishing in the “idle” state – that is without any existing connections except permanent ones). For some test cases, there may be pre-requisites in the sense that execution might require some specific capabilities of the IUT, which should have been confirmed by results of the test cases executed earlier.

[ITU-T X.290 3.6.3]

3.1.2

abstract test suite (ATS)

A test suite composed of abstract test cases. [ITU-T X.290 3.6.16]

3.1.3

basic interconnection test (BIT)

Limited testing of an IUT to determine whether or not there is sufficient conformance to the main features of the relevant protocol(s) for interconnection to be possible, without trying to perform thorough testing. [ITU-T X.290 3.5.5]

3.1.4

behaviour testing

Testing the extent to which the dynamic conformance requirements are met by the IUT. [ITU-T X.290 3.5.8]

3.1.5

capabilities of an IUT

That set of functions and options in the relevant protocol(s) and, if appropriate, that set of facilities and options of the relevant service definition which are supported by the IUT. [ITU-T X.290 3.4.5]

3.1.6

capability testing

Testing to determine the capabilities of an IUT.

NOTE This involves checking all mandatory capabilities and those optional ones that are stated in the CTI as being supported, but not checking those optional ones which are stated in the CTI as not supported by the IUT.

[ITU-T X.290 3.5.6, modified]

3.1.7

conformance assessment process

The complete process of accomplishing all conformance testing activities necessary to enable the conformance of an implementation to one or more OSI* Recommendations* to be assessed. It includes the production of the CTI documents, preparation of the real tester and the IUT, the execution of one or more test suites, the analysis of the results and the production of the appropriate protocol conformance test reports. [ITU-T X.290 3.5.10, modified]

3.1.8

conformance log

A record of sufficient information necessary to verify verdict assignments as a result of conformance testing. [ITU-T X.290 3.7.15]

3.1.9

conformance test information (CTI)

A statement made by the supplier or implementor of an IUT stating the capabilities and options that have been implemented and additional information necessary to select and parameterize the executable test cases.

NOTE 1 Part of this information on the implementation may be taken from the IUT itself.

NOTE 2 X.290 uses the terms Protocol Implementation Conformance Statement (PICS) and Protocol Implementation Extra Information for Testing (PIXIT).

3.1.10

conformance testing

Testing the extent to which an IUT is a conforming implementation. [ITU-T X.290 3.5.9]

3.1.11

conforming implementation

An IUT, which is shown to satisfy conformance requirements, consistent with the capabilities stated in the CTI.

NOTE In case of DLMS/COSEM, the capabilities are partly declared in the CTI and they are partly provided by the IUT.

[ITU-T X.290 3.4.10, modified]

3.1.12

executable test case

A realization of an abstract test case. [ITU-T X.290 3.6.4]

3.1.13

executable test case error

A test case error in the realization of an abstract test case.

3.1.14

executable test suite (ETS)

A test suite composed of executable test cases. [ITU-T X.290 3.6.17]

3.1.15

“fail” verdict

A verdict given when the observed outcome is syntactically invalid or inopportune with respect to the relevant Recommendation(s)* or the CTI. [ITU-T X.290 3.7.13, modified]

3.1.16

foreseen outcome

An outcome identified or categorized in the abstract test case specification. [ITU-T X.290 3.7.4]

3.1.17

idle testing state

A stable testing state in which there is no established connection of the relevant protocol(s) and in which the state of the IUT is independent of any previously executed test cases.

3.1.18

implementation under test (IUT)

That part of a real open system which is to be studied by testing, which should be an implementation of one or more OSI* protocols in an adjacent user/provider relationship.

NOTE In DLMS/COSEM IUT are DLMS/COSEM servers.

[ITU-T X.290 3.4.1]

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	8/57
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3.1.19

“inapplicable” test

A test case, which cannot be performed because the necessary conditions are not available.

3.1.20

“inconclusive” verdict

A verdict given when the observed outcome is valid with respect to the relevant Recommendation(s)* but prevents the test purpose from being accomplished. [ITU-T X.290 3.7.14]

3.1.21

initial testing state

The testing state in which a test body starts.

NOTE This may be either a stable testing state or a transient state.

3.1.22

inopportune test event

A test event which, although syntactically correct, occurs or arrives at a point in an observed outcome when not allowed to do so by the protocol Recommendation*. [ITU-T X.290 3.7.11]

3.1.23

means of testing (MOT) (IUTs)

The combination of equipment and procedures that can perform the derivation, selection, parameterization and execution of test cases, in conformance with a reference standardized ATS, and can produce a conformance log.

3.1.24

negative test

Test to verify the correct response of the IUT on:

- DLMS/COSEM conformant information and services, which are not implemented;
- non conformant communication traffic.

3.1.25

outcome

A sequence of test events together with the associated input/output, either identified by an abstract test case specifier, or observed during test execution. [ITU-T X.290 3.7.3]

3.1.26

parameterized executable test case

An executable test case, in which all appropriate parameters have been supplied with values in accordance with a specific CTI. [ITU-T X.290 3.6.23, modified]

3.1.27

“pass” verdict

A verdict given when the observed outcome satisfies the test purpose and is valid with respect to the relevant Recommendation(s)* and with respect to the CTI. [ITU-T X.290 3.7.12, modified]

3.1.28

positive test

test to ensure the correct implementation of the capabilities of the IUT as defined by the supplier. A positive test has a described and defined response.

3.1.29

postamble

The test steps needed to define the paths from the end of the test body up to the finishing stable state for the test case. [X.290 3.6.9]

3.1.30

preamble

The test steps needed to define the path from the starting stable state of the test case up to the initial state from which the test body will start. [ITU-T X.290 3.6.7]

3.1.31

protocol conformance test report (PCTR)

A document written at the end of the conformance assessment process, giving the details of the testing carried out for a particular protocol, including the identification of the abstract test cases for which corresponding executable test cases were run and for each test case the test purpose and verdict. [ITU-T X.290 3.7.8]

3.1.32

repeatability (of results)

Characteristic of a test case, such that repeated executions on the same IUT lead to the same verdict, and by extension a characteristic of a test suite. [ITU-T X.290 3.7.1]

3.1.33

semantically invalid test event

A test event which is neither inopportune nor syntactically invalid, but which contains a semantic error with respect to the relevant protocol specification (e.g. a PDU containing a parameter value outside the negotiated range for that parameter).

3.1.34

stable testing state

A testing state which can be maintained, without prescribed Lower Tester behaviour, sufficiently long to span the gap between one test case and the next in a test session.

3.1.35

static conformance review

A review of the extent to which the static conformance requirements are met by the IUT, by comparing the static conformance requirements expressed in the relevant Recommendation(s)* with the PICS and the results of any associated capability testing. [ITU-T X.290 3.5.7 modified]

3.1.36

syntactically invalid test event

A test event which syntactically is not allowed by the protocol Recommendation*. [ITU-T X.290 3.7.10]

3.1.37

test body

The set of test steps that are essential in order to achieve the test purpose and assign verdicts to the possible outcomes. [ITU-T X.290 3.6.8]

3.1.38

test case

A generic, abstract or executable test case. [ITU-T X.290]

3.1.39

test case error

The term used to describe the result of execution of a test case when an error is detected in the test case itself.

3.1.40

test event

An indivisible unit of test specification at the level of abstraction of the specification (e.g. sending or receiving a single PDU). [ITU-T X.290 3.6.11]

3.1.41

test group

A named set of related test cases. [ITU-T X.290 3.6.14]

3.1.42

test group objective

A description of the common objective which the test purposes within a specific test group are designed to achieve.

3.1.43

test laboratory

An organization that carries out conformance testing. This can be a third party, a user organization, an Administration*, or an identifiable part of the supplier organization. [ITU-T X.290 3.4.13]

3.1.44

test purpose

A description of the objective which an abstract test case is designed to achieve. [ITU-T X.290 3.6.5]

3.1.45

test step (sub-test)

A named subdivision of a test case, constructed from test events and/or other test steps, and used to modularize abstract test cases. [ITU-T X.290 3.6.10, modified]

3.1.46

test session

The process of executing the Parameterized Executable Test Suite for a particular IUT and producing the conformance log.

3.1.47

test suite

A complete set of test cases, possibly combined into nested test groups, that is necessary to perform conformance testing or basic interconnection testing for an IUT or protocol within an IUT [ITU-T X.290 3.6.12]

3.1.48

unforeseen test outcome

An outcome not identified or categorized in the abstract test case specification. [ITU-T X.290 3.7.5]

3.1.49

valid test event

A test event which is allowed by the protocol Recommendation*, being both syntactically correct and occurring or arriving in an allowed context in an observed outcome. [ITU-T X.290 3.7.9]

3.1.50

verdict

Statement of “pass”, “fail” or “inconclusive” concerning conformance of an IUT with respect to a test case that has been executed and which is specified in the abstract test suite. [ITU-T X.290 3.7.6]

3.2 Abbreviations

Abbreviation	Explanation
AA	Application Association
APDU	Application Protocol Data Unit
ATS	Abstract Test Suite
COSEM	Companion Specification for Energy Metering
COSEM object	An instance of an interface class
CO	Connection oriented
CTI	Conformance Test Information
CTT	Conformance Test Tool
DLMS	Device Language Message Specification
ETS	Executable Test Suite
GBT	General Block Transfer (a DLMS/COSEM application layer mechanism)
HDLC	High-level Data Link Control
IEC	International Electrotechnical Commission
IP	Internet Protocol
ITU	International Telecommunication Union
IUT	Implementation Under Test
LD	Logical Device
MOT	Means of Testing
OBIS	OBject Identification System
OSI	Open System Interconnection
PDU	Protocol Data Unit
SAP	Service Access Point
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

4 Conformance testing – overview

4.1 OSI conformance testing

The concept and methodology of OSI conformance testing is described in the Recommendation ITU-T X.290.

The objective of conformance testing is to establish whether the Implementation Under Test (IUT) conforms to the relevant specification(s).

Practical limitations make it impossible to be exhaustive, and economic considerations may restrict testing still further.

The primary purpose of conformance testing is to increase the probability that different implementations are able to interwork. While conformance is a necessary condition, it is not on its own a sufficient condition to guarantee interworking capability. Even if two implementations conform to the same protocol specification, they may fail to interwork fully.

What conformance testing does do is give confidence that an implementation has the required capabilities and that its behaviour conforms consistently in representative instances of communication.

4.2 The DLMS/COSEM conformance testing scheme

4.2.1 Overview

Correct implementation of the DLMS/COSEM specification is an important prerequisite of achieving interoperability.

To this end, the DLMS User Association provides a conformance certification scheme for DLMS/COSEM servers.

NOTE 1 Conformance testing for DLMS/COSEM clients is currently not available from DLMS UA.

The DLMS UA reserves the exclusive right to issue Certifications that entitle the manufacturer to place the “DLMS/COSEM compliant” logo on their products.

The purpose of the DLMS/COSEM conformance certification scheme is to validate that the Implementation Under Test (IUT) correctly implements the features selected from the features available in the DLMS/COSEM specification.

It is not the objective to ascertain that all the features required for a given application – generally specified in project specific Companion Specifications – are present in the IUT.

The DLMS/COSEM conformance certification scheme is available for all Full Member and Adopter Members of the DLMS User Association, meaning that:

- any Full Member or Adopter Member can purchase licences for the CTT. The licences can be used by the member proper and its Affiliates registered with the DLMS UA. See also 6.3;
- any licence owner can perform tests on its own products (self testing) or on products manufactured by another Adopter Member or Full Member and their Affiliates (third party testing). See also 4.5;
- any Full Member and Adopter Member and its Affiliates can obtain “DLMS/COSEM Compliant” Certification for their products.

NOTE 2 For meaning of Affiliates, see Article 8 of the DLMS UA Full / Adopter Membership Agreement.

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	13/57
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The DLMS UA reserves the exclusive right to issue Certifications that entitle the manufacturer to place the “DLMS/COSEM compliant” logo on the products.

4.3 The elements of the DLMS/COSEM certification scheme

The DLMS/COSEM conformance testing scheme comprises the following elements, see Figure 1:

- the conformance test plans, i.e. the Abstract Test Suites (ATSs);
- the Conformance Test Tool (CTT);
- the conformance assessment process;
- the conformance certification process;
- the quality program.

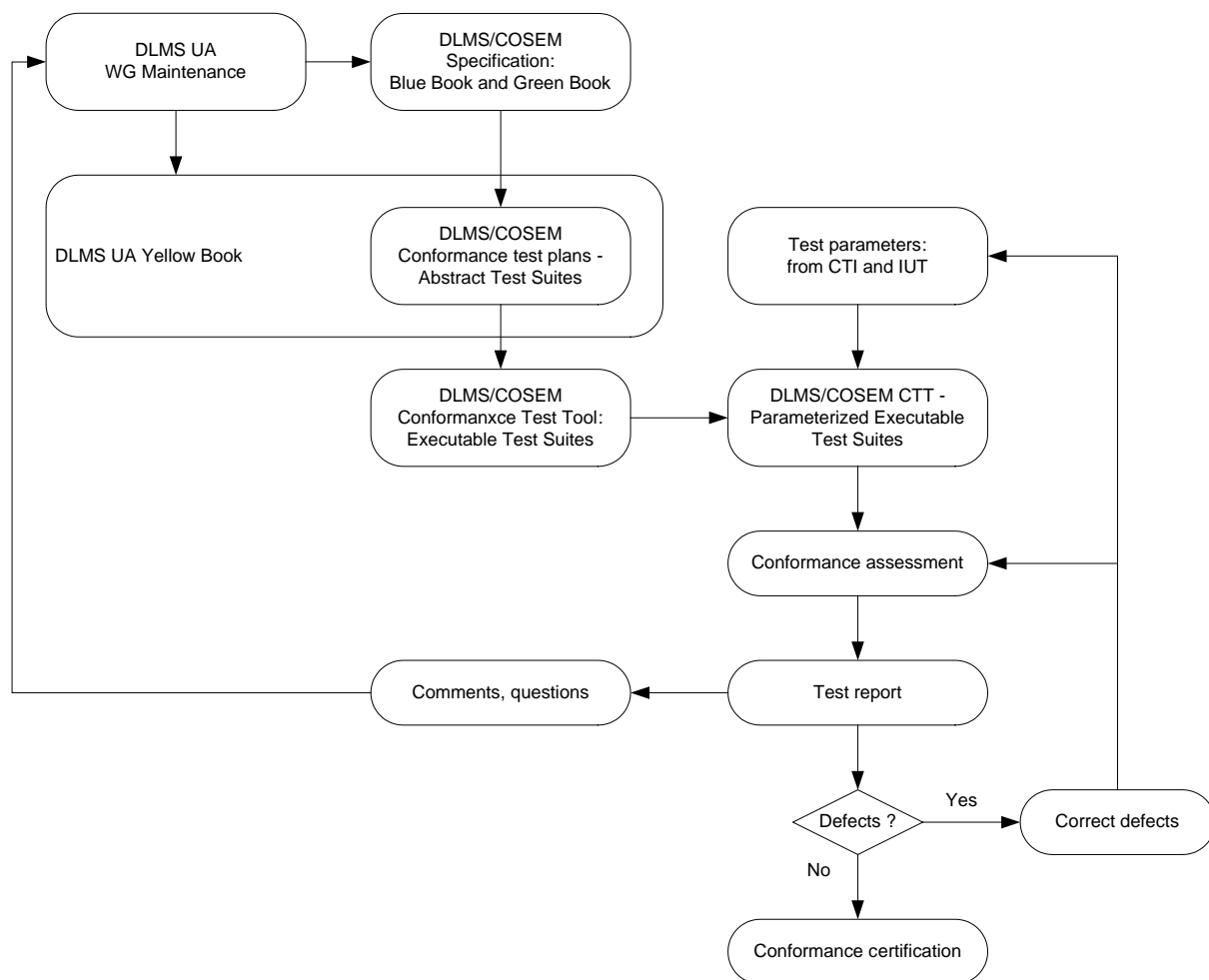


Figure 1 – DLMS/COSEM conformance testing scheme

The conformance test plans i.e. the Abstract Test Suites (ATS) describe, at the level of abstraction, the tests to be performed. See Clause 5.

The DLMS/COSEM Conformance Test Tool (CTT) implements the ATSs in the form of Executable Test Suites. See Clause 6.

The conformance assessment process consists of the phases of preparation for testing, test operations and the production of the conformance test results. See Clause 7.

The conformance certification process consists of examining the conformance test results and the publication of the Certifications. See Clause 8.

The quality program includes handling comments and questions and, when necessary, initiating the maintenance of the DLMS/COSEM specification, the ATs and/or the CTT as needed. See Clause 9.

4.4 Main characteristics

The main characteristics of the DLMS/COSEM conformance testing and certification scheme are summarized below:

- it covers DLMS/COSEM servers implementing the COSEM interface object model and the DLMS/COSEM application layer, including the security suites. Conformance testing is limited to the server's functionality as presented at the communication interface(s). Other functions of the server are out of Scope;
- testing can be performed using either the 3-layer, CO, HDLC based profile or using the TCP/IP based profile. When the 3-layer, CO, HDLC based profile is used with direct HDLC connection, the implementation of the HDLC data link layer is also tested;
- the CTT can be used for self-testing or third party testing. See 4.5;
- to obtain a Certification, the manufacturer of the IUT shall possess a registered three-letter manufacturer ID; see <http://dlms.com/organization/flagmanufacturesids/index.html>;
- the CTT automatically generates the Test Result necessary for the Certification, see 7.14;
- the Certification is issued by the DLMS UA to the manufacturer, see Clause 8;
- the DLMS UA operates a Quality program to maintain the test plans and the CTT; see Clause 9.

4.5 Self testing and third party testing

The DLMS UA recognises two types of testing: Self-Testing and Third-Party testing:

- Self-testing: Test performed by the CTT licensee on its own products or on products manufactured by one of its Affiliates registered with the DLMS UA;
- Third party testing: Test performed by the CTT licensee on a product of a third party. Any CTT licensee may act as a third party tester.

See also 8.2.

5 The conformance test plans

5.1 Scope of testing

The communication model of DLMS/COSEM servers to be tested is shown in Figure 2.

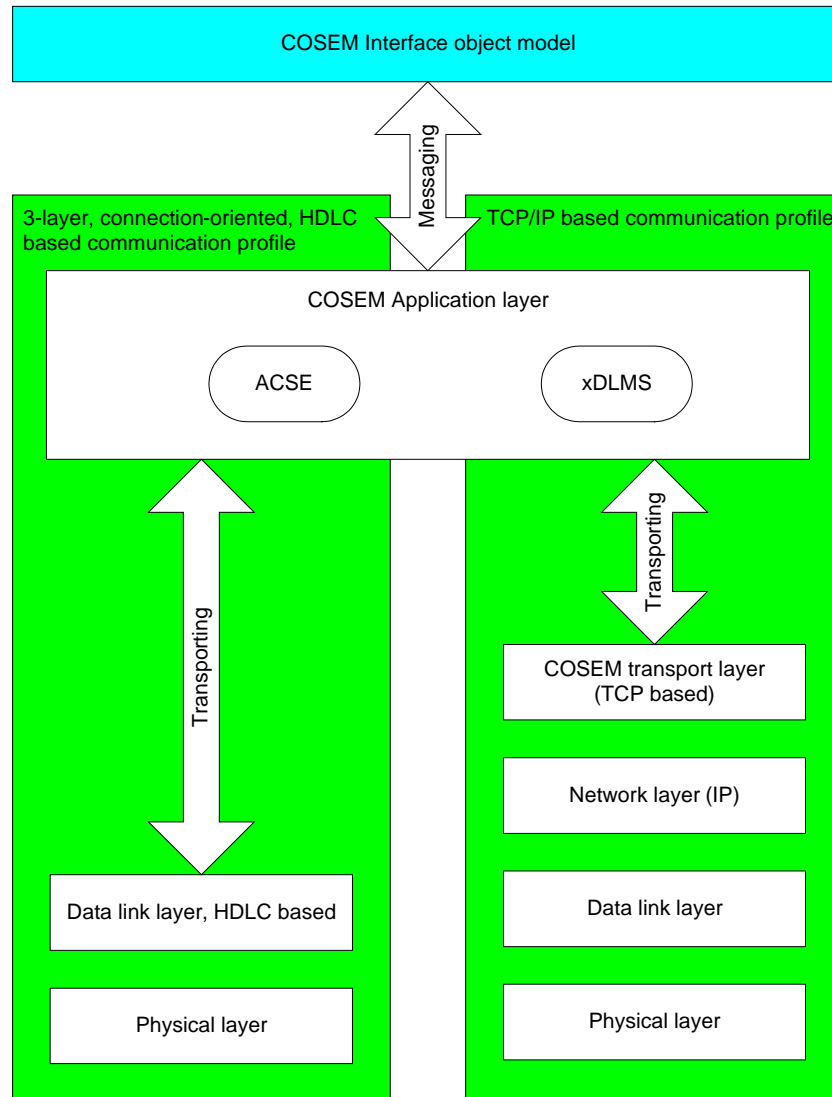


Figure 2 – DLMS/COSEM interface object model and communication profiles

The COSEM Interface object model, specified in DLMS UA 1000-1 and the DLMS/COSEM Application layer specified in DLMS UA 1000-2 are used in all IUTs.

The selection of the lower layers depends on the communication profile:

- in the 3-layer, connection-oriented, HDLC based communication profile, the DLMS/COSEM Application layer is supported by the data link layer using HDLC protocol, specified in DLMS UA 1000-2 Ed. 8.3: 2017, Clause 8 and this is supported by the physical layer specified in DLMS UA 1000-2 Ed. 8.3: 2017 Clause 5;
- in the TCP-UDP/IP based communication profile the DLMS/COSEM Application layer is supported by the DLMS/COSEM transport layer specified in DLMS UA 1000-2 Ed. 8.3: 2017 Clause 7, and this is supported by a set of lower layers appropriate for the communication media.

See also 0.

The conformance test plans cover:

- the data link layer using the HDLC protocol;
- the DLMS/COSEM Application layer;

- the COSEM Interface objects; and
- the Security Suite 0 supported by CTT 3.0;
- the Security Suite 0, 1 and 2 supported by CTT 3.1;
- the COSEM Data protection mechanism;
- the General Block Transfer mechanism.

The TCP and IP layers – when used – are implicitly tested.

5.2 The CTT and the IUT

A single IUT is tested against a single test source which is the CTT.

For the purposes of testing, the IUT is considered as a black box. The test session consists of sending messages by the CTT to the IUT and observing the responses.

As access to protocol layer boundaries is not available, the interface object model and the protocol stack are tested in combination. Therefore, the following assumptions are made:

- for testing the data link layer using the HDLC protocol, it is assumed that the physical layer works correctly;
- for testing the DLMS/COSEM Application layer, it is assumed that the supporting layers work correctly;
- for testing the COSEM Interface object model, it is assumed that the protocol stack works correctly.
- See also 7.2.

5.3 Structure of the abstract test plans

The abstract test plan comprises abstract test suites (ATs).

NOTE The remaining part of 5.3 and 5.4 applies strictly to the protocol layer test plans only.

The abstract test suites have a hierarchical structure – see Figure 3 – in which an important level is the test case.

Each test case has a specified test purpose, such as verifying that the IUT has a certain required capability (e.g. the ability to support certain packet sizes) or exhibits a certain required behaviour (e.g. behave as required when a particular event occurs in a particular state).

Within a test suite, nested test groups are used to provide a logical ordering of the test cases.

Associated with each test group is a test group objective.

Test cases may be modularised by using named subdivisions called subtests. Test events are indivisible units of specification within a test step (e.g. the transfer of a single PDU to or from the IUT).

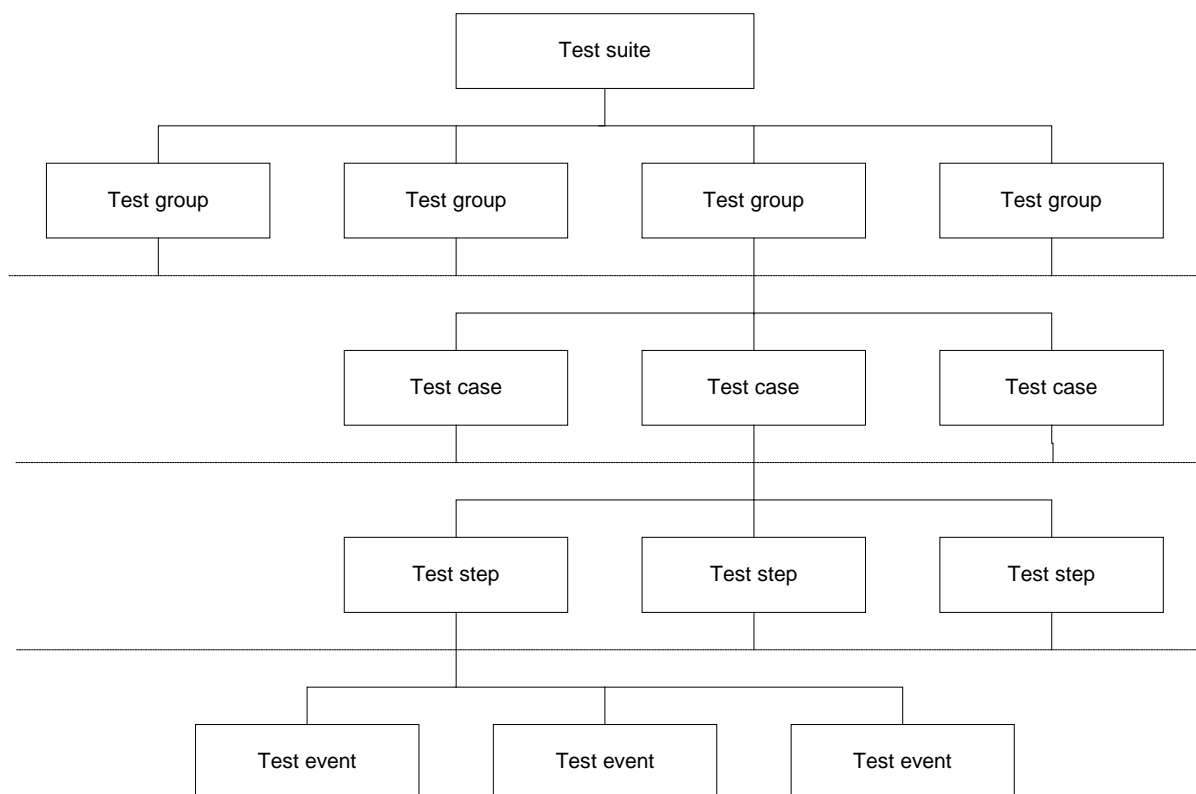


Figure 3 – Test suite structure

Test suites include test cases falling in the following categories (the list is not exhaustive):

- capability tests;
- tests of valid behaviour (positive tests);
- tests of syntactically invalid or inopportune behaviour (negative tests);
- tests related to each protocol state;
- PDU encoding variations;
- variations in values of individual parameters and/or combination of parameters.

5.4 Abstract test cases

An abstract test case is derived from a test purpose and from the relevant specifications. An abstract test case:

- has a *Test case* name, used as a reference and relating the test case to the test group and the test suite;
- gives the *References* pointing to the relevant clauses of the Blue Book DLMS UA 1000-1 and the Green Book DLMS UA 1000-2 constituting the base specification the test case is related to and derived from;
- describes the *Test purpose*;
- in the case of complex test cases, describes the *Test strategy*;
- when relevant, defines the *AA filters* i.e. the Application Associations in which the test is performed;
- specifies the *Prerequisites*;
- specifies the *Expected result*, i.e. the expected behaviour of the IUT;

- specifies the test steps needed to define the path from the starting stable state of the test case up to the initial state from which the test body will start; this test sequence comprises the *Preamble*;
- specifies the sequences of foreseen test events necessary in order to achieve the test purpose. These sequences comprise the *Test body*. It may consist of one or more subtests;
- specifies the verdict to be assigned to each foreseen test outcome;
- specifies test steps needed to define the paths from the end of the test body up to the finishing stable state for the test case; this test sequence comprises the *Postamble*;

The abstract test cases are formatted using the template shown in Table 1.

Table 1 – Template for test cases

Test case	
References	
Test purpose	
Test strategy	
AA filter	
Prerequisites	
Expected result	
Preamble	
Test body	Subtest 1
	...
	Subtest n:
Postamble	
Comments	

5.5 Outcomes and verdicts

The outcome is the sequence of test events observed during test execution.

A foreseen test outcome is one, which has been identified in the abstract test case i.e. the events which occurred during test execution matched a sequence of test events defined in the abstract test case. A foreseen test outcome always results in the assignment of a test verdict to the test case.

The test verdict will be PASSED, FAILED, INAPPLICABLE or INCONCLUSIVE:

- PASSED – Means that the observed test outcome gives evidence of conformance to the conformance requirement(s) on which the test purpose of the test case is focused, and is valid with respect to the relevant specification(s);
- FAILED – Means that the observed test outcome either demonstrates non-conformance with respect to (at least one of) the conformance requirement(s) on which the test purpose of the test case is focused, or contains at least one invalid test event, with respect to the relevant specification(s);
- INAPPLICABLE – Means that the test case cannot be run with the given CTI declarations and with the information taken from the IUT;
- INCONCLUSIVE – Means that the observed test outcome is such that neither a pass nor a fail verdict can be given.

An unforeseen test outcome is one, which has not been identified by the abstract test case, i.e. the events, which occurred during execution of the test case did not match any sequence of test events defined in the abstract test case. An unforeseen test outcome always results in the recording of a test case error or an abnormal test case termination for the test case.

A test case error is recorded if an error is detected either in the abstract test case itself, (i.e. an abstract test case error) or in its realization, (i.e. an executable test case error).

An abnormal test case termination is recorded if the execution of the test case is prematurely terminated by the test system for reasons other than test case error.

The results of executing the relevant individual test cases will be recorded in the conformance Test Result.

5.6 The HDLC based data link layer ATS

The HDLC based data link layer ATS is specified in DLMS UA 1001-3: ATS_DL V 5. Its structure is shown on Figure 4.

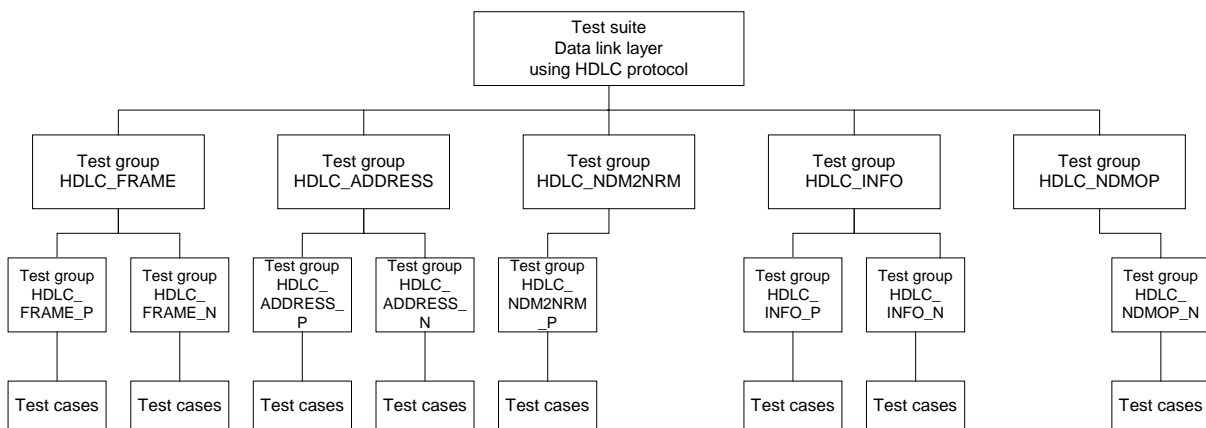


Figure 4 – Structure of the HDLC based data link layer ATS

5.7 The DLMS/COSEM application layer ATS

The DLMS/COSEM application layer ATS is specified in:

- for CTT 3.0, in DLMS UA 1001-6 V 1.5;
- for CTT 3.1, in DLMS UA 1001-8 V 2.2.

Its structure is shown on Figure 5.

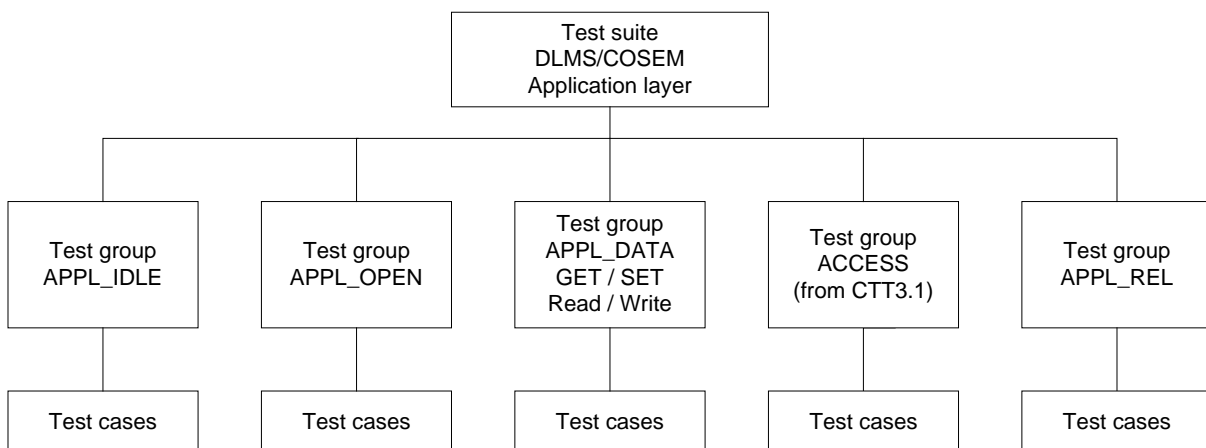


Figure 5 – Structure of the DLMS/COSEM application layer ATS

5.8 The COSEM interface objects ATS

The COSEM interface objects ATS is specified in:

- for CTT 3.0, in DLMS UA 1001-6 V 1.5;
- for CTT 3.1, in DLMS UA 1001-8 V 2.2.

Its structure is shown in Figure 6.

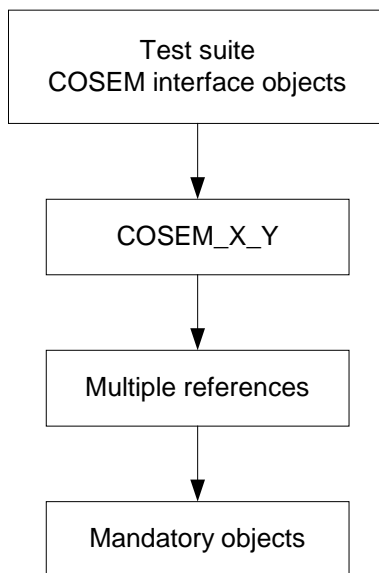


Figure 6 – Structure of the COSEM interface objects ATS

5.9 The Security Suite 0 (SYMSEC_0) ATS

For CTT 3.0, the Security Suite 0 (SYMSEC_0) ATS is specified in DLMS UA 1001-6 V 1.5.

For CTT 3.1, the Security Suite 0 (SYMSEC_0) ATS is specified in DLMS UA 1001-8 V 2.2. This test suite is run when an IUT implementing Security Suite 0 is tested with CTT 3.1.

Its structure is shown in Figure 7.

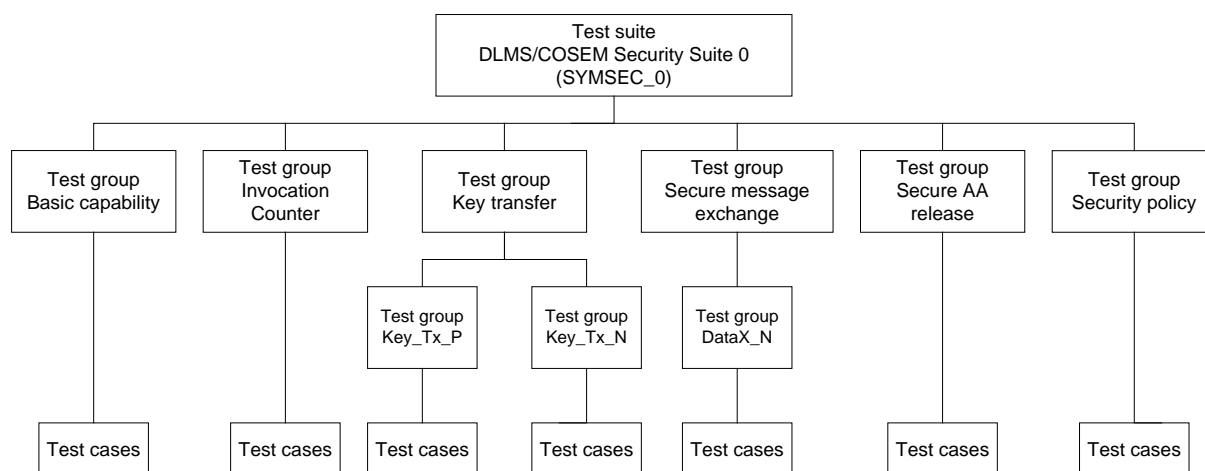


Figure 7 – Structure of the Security Suite 0 (SYMSEC_0) ATS

5.10 The Security Suite 1 and 2 (PUBSEC_1_2) ATS

For CTT 3.1, the Security Suite 1 and 2 (PUBSEC_1_2) ATS comprises both symmetric key and public key test cases. It is specified in DLMS UA 1001-8 V 2.2.

This test suite is run when an IUT implementing security Suite 1 or Security Suite 2 is tested with CTT 3.1. Its structure is shown in Figure 8.

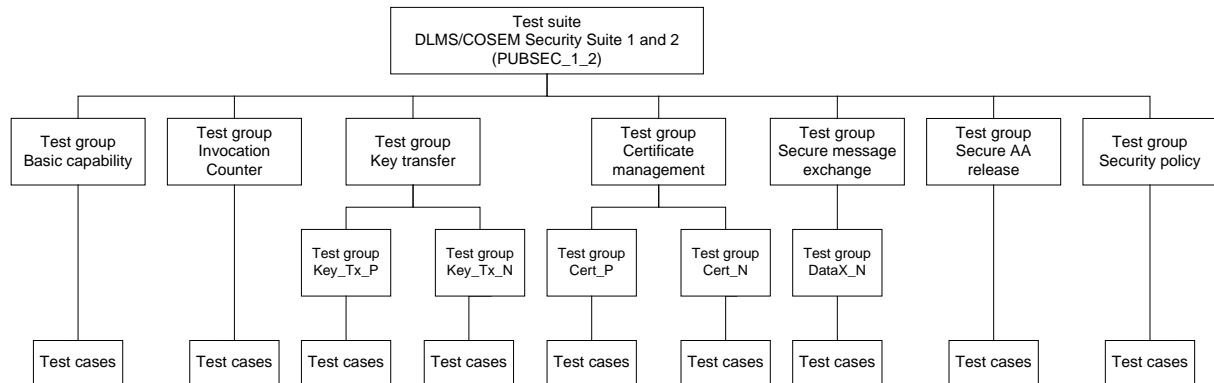


Figure 8 – Structure of the Security Suite 1 and 2 (PUBSEC_1_2) ATS

5.11 The COSEM Data protection ATS

This test suite verifies applying, verifying and removing cryptographic protection when the target attribute(s) and the target method of COSEM objects are accessed through the “Data protection” object. It is available in CTT3.1. Its structure is shown in Figure 9

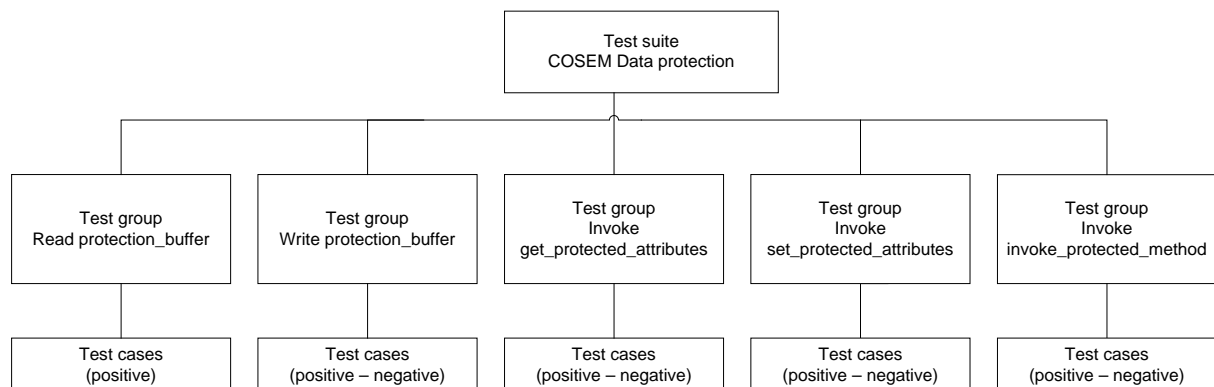


Figure 9 – Structure of the COSEM Data protection ATS

5.12 The General Block Transfer ATS

This test suite contains test cases to verify that the GBT protocol is correctly implemented in the IUT. Its structure is shown in Figure 10.

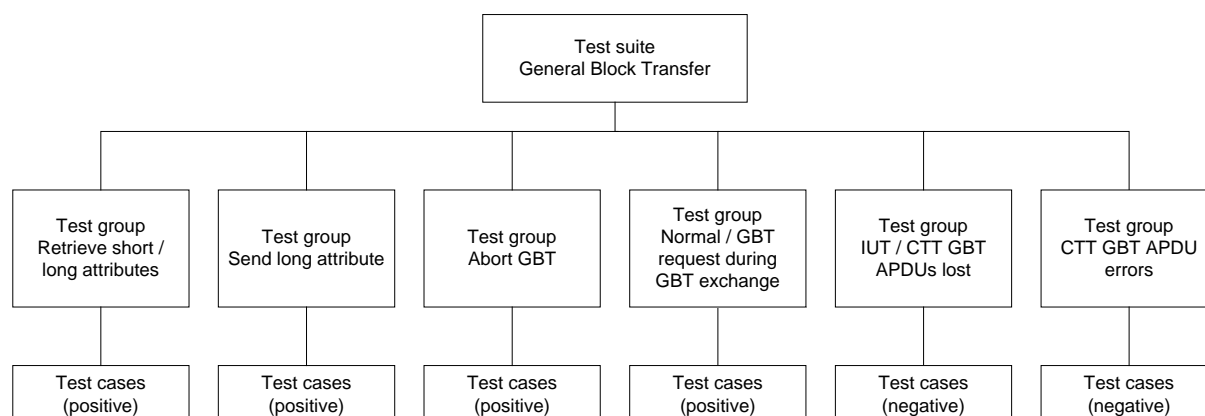


Figure 10 – Structure of the General Block Transfer ATS

5.13 Executable test suites and test cases

The executable test suites and test cases are derived from the relevant ATSS. There is one ETS for each ATS and one executable test case for each abstract test case.

In each executable test case, the sequences of test events and the verdict assignments are the same as in the corresponding ATS. The depth of analysing the PDUs is as specified in the ATS.

6 The DLMS/COSEM conformance test tool

6.1 Overview

The DLMS/COSEM conformance test tool (CTT) is a Means Of Testing (MOT) as defined in 3.1.23, i.e. an implementation of the abstract test suites (ATS) in the form of executable test suites (ETS). It is a computer program running on a PC that acts as a test DLMS/COSEM client whereas the Implementation Under Test (IUT) acts as a DLMS/COSEM server; see 7.2.

The CTT can perform the following:

- the parametrization of the test cases taking information from a Conformance Test Information (CTI) file and the IUT itself, see 7.5.2 and 7.5.3;
- the selection of the communication parameters, see 7.7;
- the selection of test options, see 7.8;
- the selection of test cases to be performed, see 0;
- running test sessions, i.e. automatically executing the test cases selected; see 7.12;
- the generation and saving of the Test Result, see 7.14.

6.2 CTT versions and editions

The DLMS UA CTT has been first introduced in 2002 and CTT 2.X was in use until 31st December 2016.

Currently, there are two versions of the CTT in use:

- CTT 3.0, introduced in 2015; and
- CTT 3.1 introduced in 2017.

CTT 3.0 can be used to test DLMS/COSEM servers implementing the features specified in the Blue Book DLMS UA 1000-1 Ed. 11.0: 2013 and in the Green Book DLMS UA 1000-2 Ed. 7.0:2009 Amendment 3:2013. Important new features supported by CTT3.0 are:

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	23/57
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- HLS authentication mechanisms 3 to 5;
- security suite 0;
- the Push mechanism with the DataNotification service;
- General Block Transfer (implicit testing); and
- the compact-array data type.

CTT 3.1, released in March 2017, can be used to test DLMS/COSEM servers implementing the features specified in the Blue Book DLMS UA 1000-1 Ed. 12.2: 2017 and the Green Book DLMS UA 1000-2 Ed. 8.3: 2017. Important new features supported by CTT3.1 are:

- the xDLMS service ACCESS;
- security suites 0, 1 and 2 and HLS authentication mechanisms 6 and 7; and
- all interface classes and versions specified in BB Ed. 12.1;
- COSEM Data protection;
- General Block Transfer (positive and negative test cases).

Test cases for the following features will be added later (as free upgrades for CTT 3.1 licence holders):

- Testing “Security setup” COSEM interface class `key_agreement` method, the attributes and methods for private / public key pair generation and handling public key Certificates, compression, and new interface classes specified in Blue Book Ed. 12.2.

For up-to-date information on the features supported please refer to the Readme file with each CTT release.

CTT 3.0 and CTT 3.1 are available as:

- standard edition that produces the Test Result files (Line Traffic, Report, Log, CTI and Hash) in a .zip file necessary for Certification;
- extended edition that provides the same Test Result files but with a detailed Log file: in this, all messages exchanged between the CTT and the IUT are represented in a deciphered, decoded, XML-like, human readable form:
 - in the case of the 3-layer, CO, HDLC based profile the HDLC frames in a decoded form;
 - in the case of the TCP/IP profile the wrapper frames in a decoded form;
 - the COSEM APDUs in XML format.

This facilitates interpreting the log. See also 7.13.3.

6.3 Licensing the CTT

The CTT licence can be purchased by Full Members and Adopter Members of the DLMS User Association from the CTT sales team operating within EuroDCS, a member of the DLMS UA.

For terms and conditions please see:

<http://dlms.com/conformance/conformancetesttool/index.html>

6.4 Installing the CTT

The CTT can be downloaded from www.eurodcs.com and installed following the process described by EuroDCS. The licence file (.lic) shall be present in the same folder where the .exe file is located.

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	24/57
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6.5 Operating system and hardware requirements

The CTT runs on a host computer under 64 bit versions of Windows 7, Windows 8.1 and – from CTT 3.0 version 108 – Windows 10.

7 The conformance assessment process

7.1 Overview

The conformance assessment process is the complete process of accomplishing all conformance testing activities necessary to enable the conformance of the IUT to be assessed. An overview of the conformance assessment process is given in Figure 11.

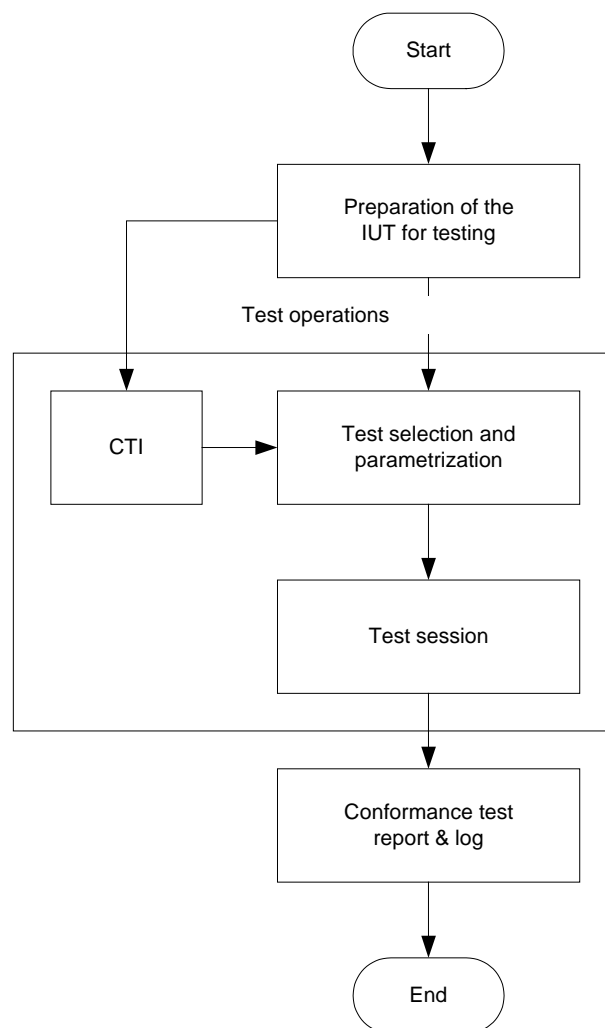


Figure 11 – Conformance assessment process overview

The test sessions shall always be performed with the latest release of the CTT version licensed and of the Object definitions file. Test results obtained with older versions may be rejected by the DLMS UA.

If the IUT supports more than one communication profile, application context or security suite, several tests sessions have to be run for each combination using the appropriate IUT configuration and CTI file. See also 7.12.

The test shall be performed on the IUT suitably configured and parameterized so that it is representative for the intended application and has a sufficient amount of data so that the test conditions specified in the test plans are met.

NOTE This relates particularly to testing selective access to "Profile generic" objects.

The steps of the conformance assessment process are the following:

- 1) Preparation the IUT for testing, see 7.3;
- 2) Starting the CTT application, see 7.4;
- 3) Preparation of the CTI files, see 7.5;
- 4) Selecting the appropriate CTI file for the given test session, see 7.6;
- 5) Setting the communication parameters according to the communication profile used for the test session, see 7.7;
- 6) Selecting the COSEM object definitions .dat file, see 7.8;
- 7) Entering the identity and contact details of the tester, see 7.9;
- 8) Selecting logging options (available only with the CTT extended edition), see 7.9;
- 9) Selecting fatal failure handling options, see 7.9;
- 10) Connecting the IUT, see 7.10;
- 11) Selecting the test cases to be performed, see 0;
- 12) Starting the test using "Run" for preliminary tests, 7.12;
- 13) Starting the test session using "Run for Certification" if the purpose of the test is to obtain a Certification;
- 14) Observing the progress by viewing the Log and the Line Traffic, 7.13;
- 15) Saving the test result, see 7.14.

7.2 Implementation Under Test (IUT, meter)

The IUT is a DLMS/COSEM server, for example an energy meter. It shall be unambiguously identified by specifying the manufacturer, the type and the Management Logical device name.

Generally, the type designation contains a group of letters and numbers. As the DLMS/COSEM features implemented are determined by the firmware of the IUT, the type designation shall also include the firmware identifier and version.

If the same firmware determining the DLMS/COSEM features implemented is used in several meter types that are different from each other e.g.:

- from the metrological point of view; or
- due to some other features that do not affect the DLMS/COSEM interface;

it is possible to include a list of types in the type designation. The DLMS UA may request evidence to prove that such differences do not affect the DLMS/COSEM interface.

The Management Logical Device name shall uniquely identify the IUT tested.

7.3 Preparation of the IUT for testing

The configuration of the IUT for the test(s) is the responsibility of the manufacturer. To facilitate system integration, it is advisable that the test(s) are performed on a configuration that is representative for the intended application(s) so that all required features for which DLMS/COSEM compliance is claimed are tested. The following provides a guideline:

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	26/57
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- if the IUT supports more than one logical device, then at least two logical devices should be configured;
- if the IUT supports more than one application context, authentication security mechanism and xDLMS context then the set of AAs declared shall cover each context and mechanism implemented and declared. These AAs may be in the same logical device or spread across the logical devices;
- an AA between the same client and the server may be declared several times with different application contexts, authentication mechanisms, DLMS contexts and security contexts as needed;
- if the IUT is a complete – fully integrated or modular – meter, then the mandatory Management Logical Device (Server SAP = 0x01) shall be present and it shall support an AA with the public client (Client SAP = 0x10, Server SAP = 0x01, no ciphering, no authentication security);
- if the IUT is a communication module, then the Management Logical Device (Server SAP = 0x01) does not have to be present: it is assumed that it is present in the base meter. However a Logical Device of the communication module shall support an AA with the public client, see above;
- the set of xDLMS services and capabilities – i.e. the conformance block – should be representative for the intended application;
- the set of security features should be representative for the intended application;
- the set of interface objects available should be representative for the intended application;
- the AAs shall provide access to the objects and attributes to be tested, with appropriate access rights;
- if load profiles with selective access are to be tested, then a sufficient amount of data should be present. The conditions are specified in the COSEM objects test plan;
- it is the responsibility of the manufacturer to restrict access rights to attributes, so that the CTT cannot unduly modify them. This can be done by providing interface class and/or instance related extra information in the CTI.

For testing IUTs supporting push operation, additional requirements are specified in the COSEM objects ATS.

For testing IUTs supporting the security suites, additional requirements are specified in the Security ATSS SYMSEC_0 and PUBSEC_1_2.

See also 8.6, Scope and validity of the Certification.

7.4 Starting the CTT: the CTT user interface

For more details please see the complete Yellow Book

7.5 Preparation of the conformance test information

7.5.1 General

For the parametrization of the executable test cases, the following information is necessary:

- information on the manufacturer;
- information on the IUT:
 - type;
 - logical devices;
 - application associations;
 - media / energy types supported;
 - COSEM interface objects.

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	27/57
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One part of this information has to be declared in the Conformance Test Information (CTI) file to be prepared by the manufacturer or the tester, see 7.5.2.

Another part of this information is obtained by CTT from the IUT itself during the test session, see 7.5.3.

7.5.2 Preparation of the CTI file

The CTT delivery package includes a CTI template (for CTT 3.0) or a CTI specification file (for CTT 3.1) that provides guidance on the preparation of the CTI file. The CTI file can be edited, saved and loaded from the CTI pane. The main elements of the CTI are:

- the name of the manufacturer exactly as in the DLMS UA database;
NOTE The name of the licence holder is imported by the CTT from the licence file.
- the FLAG ID of the manufacturer exactly as recorded in the FLAG IDs database;
- the information related to the Implementation Under Test (IUT):
 - the type of the IUT;
 - the firmware identifier and version;
 - the configuration ID;
 - the serial number, that should allow to identify the device that has been tested;
- the declaration of the Logical Devices. The name of each Logical Device shall be unique and shall start with the three-letter manufacturer ID (FLAG ID) assigned to the manufacturer;
- the declaration of the Application Associations in each Logical Device, including the application context, authentication mechanism, xDLMS context (conformance block), security suite and security material for each AA;
- the declaration of the communication profile and its parameters;
- the declaration of any extra information as described in the CTI template / CTI specification file.

For each combination to be used for testing, a separate CTI file has to be prepared. See also 7.6.

Figure 12 shows the CTT 3.0 CTI template loaded, with the contextual menu open, that allows loading and saving CTI files and to edit the file.

The CTI specification file to be used with CTT 3.1 is part of the delivery package. An example is shown in Figure 13.

The CTI file content and file syntax is described in the Help Menu.

The CTI allows declaring some DoNotTest options:

- ATTRIBUTES_TYPE_CHOICES: when this element is present, then CTT does not check the type of COSEM object attributes specified as a CHOICE type;
- ATTRIBUTES_VALUES: when this element is present, then CTT does not check the values (ranges, and sub-ranges) of COSEM object attributes;

If the purpose of the test session is to obtain a Certification, then DoNotTest has to be omitted or empty.

- DoNotTestCOSEM: the purpose of this option is to allow disabling COSEM tests in some AAs (DoNotTestCOSEM = TRUE). It is useful if several AAs with the same COSEM object list are declared using different client users or different security contexts. If this option is declared globally, COSEM tests have to be enabled (DoNotTestCOSEM = FALSE) in at least one AA in each logical device. The test report summary will include only the COSEM interface classes actually tested.

The image shows a screenshot of a text editor window titled "CTT - [1] CTI_TEMPLATE-3.0-4.txt". The editor has a menu bar with "File", "Run", "View", "Settings", and "Help". Below the menu bar are four tabs: "REPORT", "LOG", "CTI", and "TEST CASES". The "CTI" tab is active, displaying a code fragment in a blue monospaced font. The code is a CTI template for version 3.0 and up, defining various fields and options. A context menu is open on the right side of the editor, listing standard editing actions such as Undo, Redo, Cut, Copy, Paste, Delete, Select All, Indent, Unindent, Search..., Replace..., Load..., Save, and Save as... with their respective keyboard shortcuts.

```

// CTI_template for CTI 3.0 and up.
// The CTI syntax is described in the help-file.
// The CTI template is best viewed in the 'CTI' tab of CTT.

// Identification, mandatory structure
Identification = {
  // Manufacturer, mandatory string, the manufacturers name
  Manufacturer = "\Manufacturer's name"

  // FLAGid, mandatory string, the FLAG id registered for the manufacturer
  FLAGid = "\XYZ"

  // Type, mandatory string, any string that identifies the type of the IUT
  Type = "\Any type"

  // IUTisModule, optional boolean, default FALSE
  // Allows to declare that the IUT is a stand-alone communication module.
  // If TRUE, then the CTT does not test if a logical device with SAP = 1
  // (Management Logical Device) is present.
  IUTisModule = FALSE

  // SerialNr, mandatory string, the serial number of the IUT
  SerialNr = "\12345-67.89"

  // Comment, optional string, there may be several, any additional information
  Comment = "\This is a comment"
  Comment = "\This is another comment"
}

// TestOptions, mandatory structure, options chosen for the test session
TestOptions = {
  // CommunicationProfile, mandatory enum, the communication profile used for test
  // HDLC or TCP
  CommunicationProfile = TCP

  // ReferencingMethod, mandatory if the CTI declares both LN and SN associations, else
  // optional. It selects the referencing method used for testing.
  // LONG_NAMES or SHORT_NAMES
  ReferencingMethod = SHORT_NAMES
    
```

Figure 12 – CTT 3.0 CTI template (fragment, illustration)

The screenshot shows a software window titled "CTT - [1] CTI-LN-example.txt". The window has a menu bar with "File", "Run", "View", "Settings", and "Help". Below the menu bar are four tabs: "REPORT", "LOG", "CTI", and "TEST CASES". The "CTI" tab is active, displaying a text file with the following content:

```
// CTI example (03-Mar-2017)

Identification = {
// The name of the manufacturer exactly as registered with the DLMS UA
Manufacturer = "\ManName"

// FLAG id registered for that manufacturer.
FLAGId = "\ICU"

// Identifier of the meter type
Type = "\Type1"

// The firmware identifier, OBIS code 0-b:0.2.0.255.
FirmwareID = "\FirmwareID"

// The firmware version, OBIS code 0-b:0.2.1.255
FirmwareVersion = "\FirmwareVersion"

// Could be held by one of the device IDs
ConfigurationID = "\ConfigurationId"

// The serial number of the IUT, specify a real value.
SerialNr = "000001"

// Any additional information about the IUT. Delete if not used.
Comment = "\comment 1"
// ...
Comment = "\comment N"
}

TestOptions = {
// Choose the profile used for testing
CommunicationProfile = TCP
ReferencingMethod = LONG_NAMES
}

DoNotTestCOSEM = TRUE // override to FALSE in one of the AAs

// HDLCProfile, if needed
HDLCProfile = {

PhysicalLayer = {
HDLCBaud = 9600
OpeningMode = MODE_E
}

DataLinkLayer = {
AddressingScheme = TWO_BYTES_ADDRESSING
}
}

```

Overlaid on the right side of the window is a contextual menu with the following items and keyboard shortcuts:

- Undo (Ctrl+Z)
- Redo
- Cut (Ctrl+X)
- Copy (Ctrl+C)
- Paste (Ctrl+V)
- Delete
- Select All (Ctrl+A)
- Indent
- Unindent
- Search...
- Replace...
- Load...
- Save
- Save as...

Figure 13 – CTT 3.1 CTI example (fragment)

7.5.3 Information taken from the IUT

Information on the IUT is also taken by the CTT during the test session, through the negotiation of the application context, the authentication mechanism and the xDLMS context, as well as by reading the **object_list attribute** of the "Association SN /LN" objects and, in the case of SN referencing, the **access_rights_list attribute** of "Association SN" object (supported from version 1 of that IC).

7.6 Selection of the CTI file

Before a test session is started, the appropriate CTI file shall be loaded from the CTI pane using the contextual menu.

7.7 Selection of the communication parameters

The communication parameters can be set from the **Settings** menu, **Communication** tab as shown in Figure 14:

- COM port: here, the communication port used in the case of the 3-layer, CO, HDLC based profile can be selected;
- Format: refers to the physical layer of the 3-layer, CO, HDLC based communication profile. It shall be set to 8N1: asynchronous transmission with 1 start bit, 8 data bits, no parity and 1 stop bit;
- Echoing: this shall be set if the optical probe is used and it is echoing;
- Server IP: when the TCP-UDP/IP based profile is used, the IP address of the IUT shall be entered here;

NOTE The way to obtain the IP address depends on the provider and the SIM card and the process is out of the Scope of this document.

- "My IP addresses" holds the IP address of the PC running the CTT. It is needed only if the IUT has to establish the TCP connection to the CTT i.e. when the IUT is pushing. It shall be then configured in the IUT.

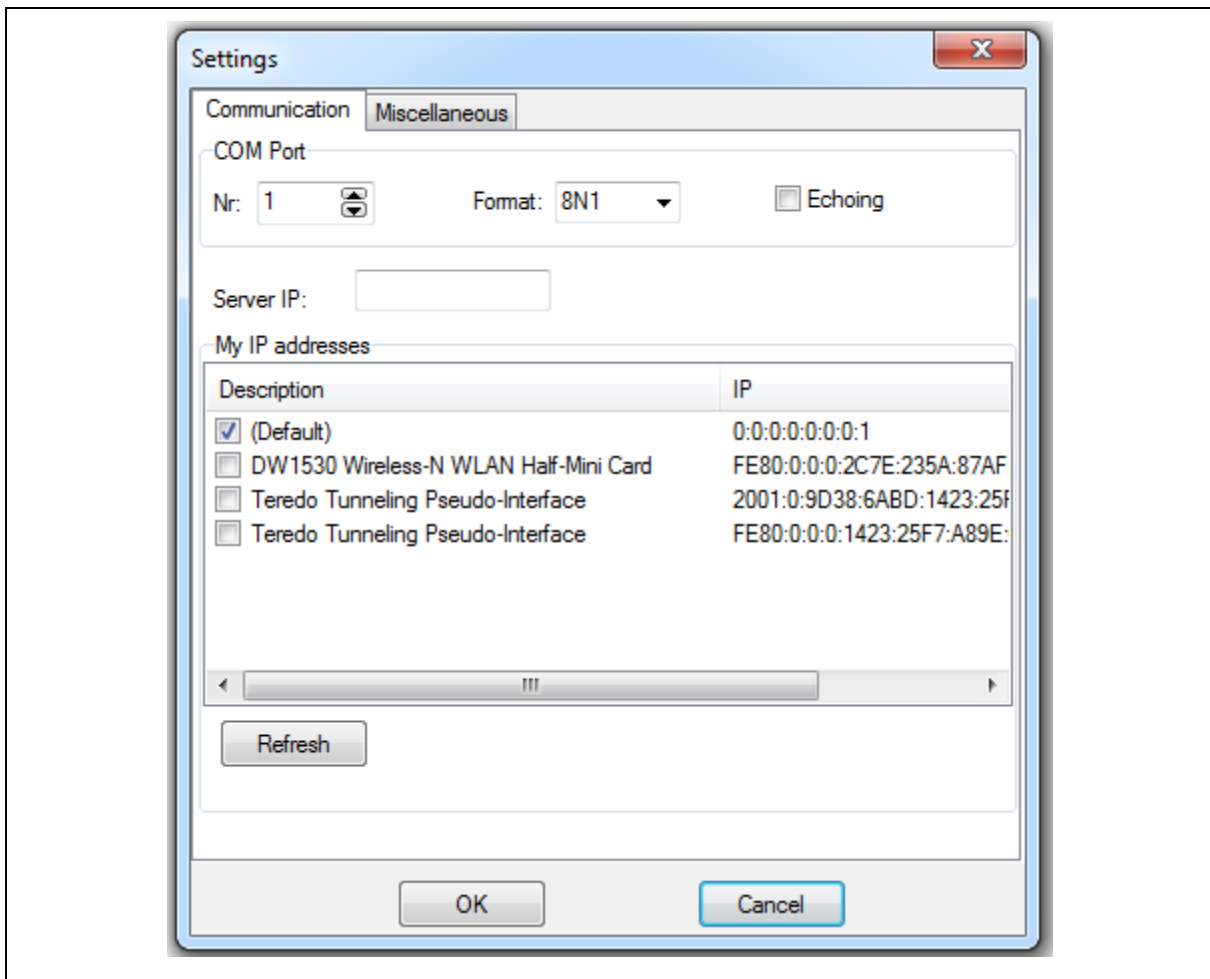


Figure 14 – Communication settings

7.8 The COSEM object definition file

The COSEM object definition file DLMS UA 1001-7 contains all information for testing the COSEM objects including:

- the valid OBIS codes that – together with the COSEM interface class – provide the semantical meaning of all data. In some cases, an OBIS code may be used with alternative interface classes;
- the valid data type of the attributes in the cases where the Blue Book DLMS UA 1000-1 allows CHOICE-s.

NOTE The COSEM object definition file currently covers abstract, electricity and gas related COSEM objects.

Figure 15 shows the COSEM object definition file cover sheet (version 3.2).

The COSEM object definition file is updated by the DLMS UA whenever new COSEM objects (OBIS codes and/or interface classes) are defined. The various versions are publicly available at www.dlms.com as excel files under the CONFORMANCE and the DOCUMENTATION menu.

The CTT uses a .dat file generated from the excel file. The various versions can be downloaded by licensed CTT users from <http://www.eurodcs.com/>. The .dat file has to be copied to the same folder where the CTT.exe file is located, see 6.4.

NOTE The excel file is not used by the CTT.

The Test Report contains the file name and the hash value of the excel file.

It is recommended using always the latest version. Earlier versions can be used for re-testing whenever it is necessary.

The COSEM object definition .dat file to be used for the test session can be selected from Settings menu – Miscellaneous tab, see Figure 16. The selections cannot be OK-d if this field is empty.


	COSEM conformance testing
COSEM conformance testing - Object definition tables	
Author:	DLMS UA WG Maintenance Gyozo Kmethy, Victoria Varju
Version:	V3.2
Filename:	Object_defs_v3.2_Released_180306
Revision date:	3/6/2018
Status:	Released
Digital signature of .dat file	E28E-3417-5900-9BF7-0B88-4766-F1C2-724C
Copyright:	© Copyright DLMS UA 1997-2018
Classification:	DLMS User Association use only
Replaces:	Object_defs_v3.1_Released_170313
Date:	3/13/2017
<p>Object definitions are valid combinations of Logical names, interface classes and the list of data types for attributes which are declared in the relevant interface class definitions as type "CHOICE".</p> <p>This version contains object definitions of abstract, electricity and gas related objects.</p> <p>The textual name of each object is described in a modular way.</p> <p>For the changes in the various version, see the "Change log" sheet.</p> <p>A special tool converts the worksheets to a .dat file for use by the Conformance Test Tool.</p> <p>CTT 3.X reports all objects found with their logical name, textual name and in case of "CHOICE" attributes, with data type. The access rights to all attributes are also reported.</p> <p>References: [1] DLMS UA 1000-1 Ed. 12.2 2017-01-19, COSEM Interface Classes and OBIS Object Identification System "Blue Book" [2] EN 13757-1 Communication system for meters and remote reading of meters - Part 1: Data exchange</p>	
DLMS User Association	DLMS UA 1001-7 Ed. 3.2: 2018-03-06

Figure 15 – COSEM object definition file cover sheet

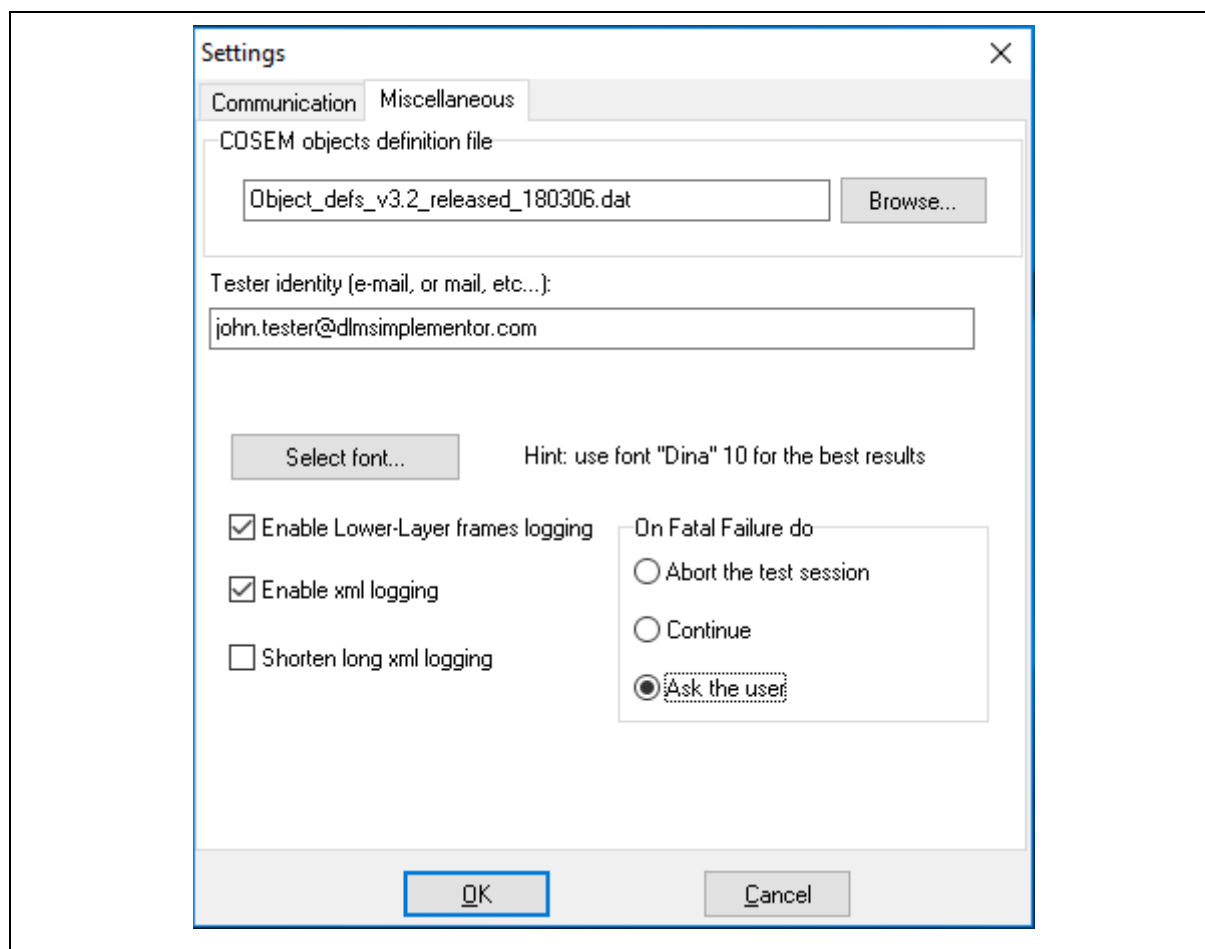


Figure 16 – Miscellaneous settings (CTT 3.0)

7.9 Miscellaneous settings

The miscellaneous tab –see Figure 16 – also allows selecting / setting the following elements:

- the tester identity e.g. an email address. This information, if provided, is used to keep contact between the DLMS UA Certification team and the tester and appears in the Test Report;
- the font used in the Test Result documents;
- logging of lower layer frames and COSEM APDUs (in XML format) can be enabled. This feature is available in the extended edition, see 6.2 and 7.13.3;
- the options on the occurrence of a fatal failure can be chosen, see 7.13.1.

7.10 Connecting the IUT to CTT

For more details please see the complete Yellow Book

7.11 Selection of the test cases

The TEST CASES window allows selecting the test cases. The test suites are:

- HDLC, see DLMS UA 1001-3: ATS_DL V 5;
- For CTT 3.0: Application layer (APPL), COSEM objects (COSEM) and Symmetric key security (SYMSEC_0), see DLMS UA 1001-6 V 1.5;

- For CTT 3.1: Application layer (APPL), COSEM objects (COSEM), Symmetric key security (SYMSEC_0), public key security (PUBSEC_1_2), Data protection and GBT, see DLMS UA 1001-8 V 2.2.

The test cases can be selected by test suites and within each test suite one by one, see Figure 17.

During a test session, the CTT executes only those test cases that have been selected and that are applicable based on the IUT configuration and the CTI declarations.

Test cases, which are not selected, are marked in the Report and the Log as “SKIPPED”.

If the purpose of the test session is to obtain a Certification, then all test cases shall be selected. The CTT will automatically run all test cases applicable with the given CTI file and IUT configuration. The tests that cannot be run are marked as “INAPPLICABLE”.

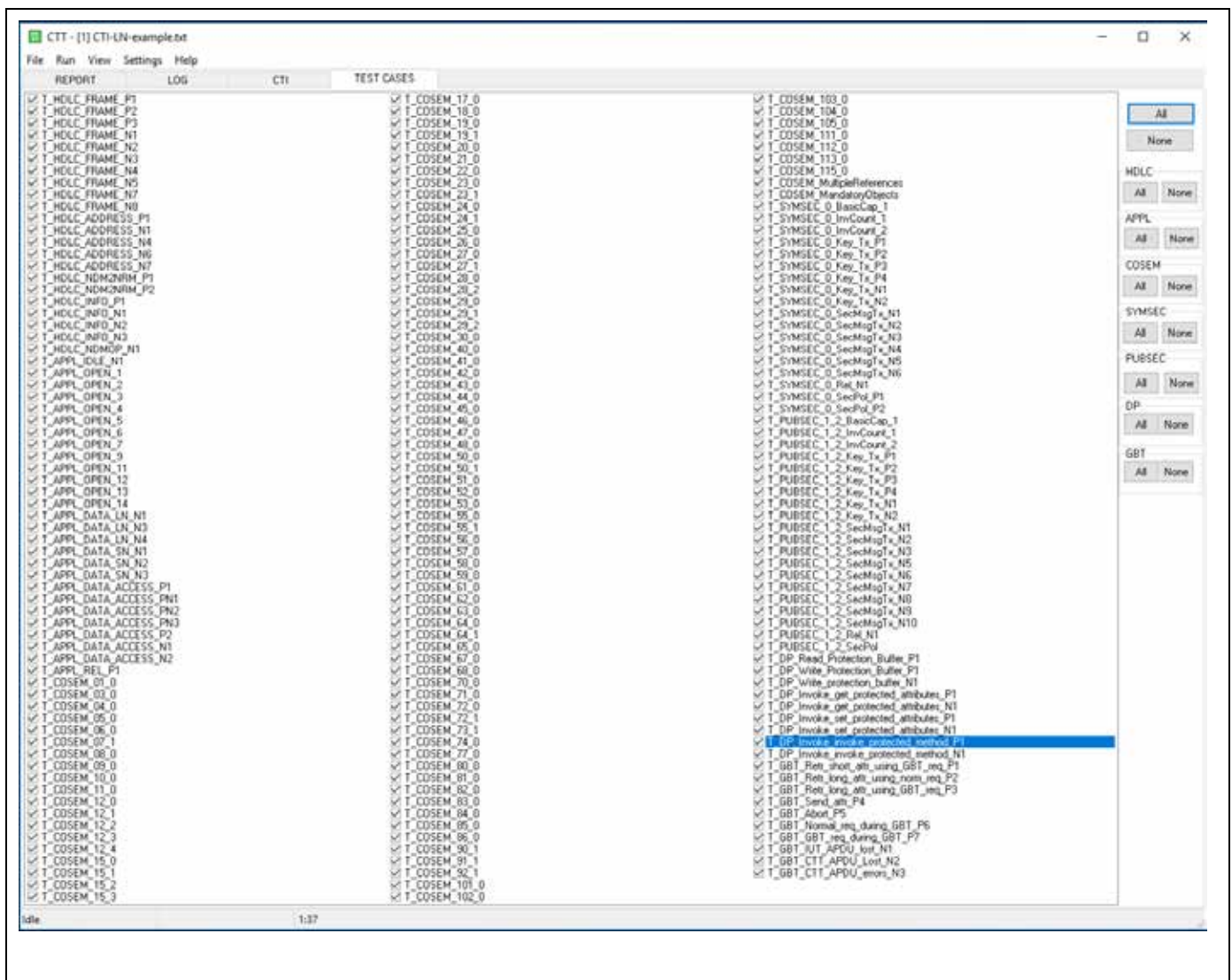


Figure 17 – Selection of the test cases (CTT 3.1)

7.12 Test sessions

If the IUT supports more than one communication profile, then a test session shall be performed for each communication profile for which compliance is claimed.

If the IUT supports more than one communication interface, then a test session may be performed on each interface.

An IUT may support several application associations with different combinations of the application context, the authentication mechanism, the xDLMS context, the security suite and related security material in each AA so that all these combinations may be tested in a single test session. However such combinations may also be tested in different test sessions.

Example: If an IUT supports both LN referencing and SN referencing, these may be tested in two different test sessions.

Before starting the test, the appropriate CTI file has to be loaded using the contextual menu.

A test session can be started from the Run menu in two ways:

- “Run”: the test session runs the test cases selected on the Logical Devices and AAs enabled for testing, with the media and “Do not test” options selected. Test cases not selected are marked in the Test Report and Log as “SKIPPED”;
- “Run for Certification”: when the purpose of the testing is to obtain a Certification, all tests cases shall be selected, all Logical Devices and AAs must be enabled, and there shall be no “Do not test” options specified. Test cases that could not be run on the IUT with the given IUT configuration and CTI declarations are marked in the Test Report and the Log as “INAPPLICABLE”.

7.13 Observing the progress of testing

7.13.1 General

The progress of the test can be followed via:

- the line traffic (to be opened from the View menu);
- the LOG pane; and
- the REPORT pane.

In the case when a failure occurs in a test case that may affect running other test cases the CTT raises a fatal failure. CTT allows the user to choose one of a predefined set of options:

- “Abort the test session”: if this choice is taken, the test session is aborted;
- “Continue”: if this choice is taken, the test session is continued;
- “Ask the user”: if this choice is taken, the test session is suspended and a dialog box is displayed. If the operator chooses to continue the test session, it is resumed. If the operator chooses not to continue, then the test session is aborted.

In all cases, the reason for raising the fatal failure is logged.

In some cases, an EXCEPTION can occur during the test session. These may be caused by inappropriate settings or by abnormal data received from the IUT. The Help file provides more information on this.

The test session can be aborted any time from the **Run** menu.

7.13.2 The line traffic

The Traffic window– see Figure 18 – can be opened from the **View** menu. As the test progresses, it shows the frames sent to (in green) and the received from (in red) the IUT.

Time stamps are provided so that the Line Traffic can be readily correlated with the Log. In the case of the 3-layer, CO, HDLC profile it shows the HDLC frames. In the case of the TCP-UDP/IP profile, it shows the TCP streams.

```

TCPClient 0'00.021 +14 Connecting
TCPClient 0'00.157 +136 Connected to 127.0.0.1:4057
TCPClient 0'00.167 +9
000100100001001F601DA109060760857405080101BE10040E01000000065F1F040060FEDFFFFF
TCPClient 0'00.589 +422
00010001001000346132A109060760857405080101A203020100A305A103020100890760857405080200BE
10040E0800065F1F0400603ADD01000007
TCPClient 0'00.630 +40 0001001000010013D969CA8521000101000F0000280000FF020100
TCPClient 0'00.843 +213
00010001001000FEE0010001000081F6DA69CA8521000001016102041200401100090600002B0000FF02020
10502030F0116030002030F0216030002030F0316030002030F0416030002030F05160300010202020F0116
0102020F02160102041200401101090600002B0001FF0202010602030F0116030002030F0216030002030F0
316030002030F0416030002030F0516030002030F06160300010202020F01160102020F0216010204120040
1101090600002B0002FF0202010602030F0116030002030F0216030002030F0316030002030F04160300020
30F0516030002030F06160300010202020F01160102020F0216010204120001110009060001806403FF0202
01
TCPClient 0'00.885 +42 0001001000010007E0810001000100
TCPClient 0'01.358 +473
00010001001000FEE0010002000181F60202030F0116030002030F021603000100020412000111000906000
2806403FF0202010202030F0116030002030F0216030001000204120001110009060003806403FF02020102
02030F0116030002030F0216030001000204120001110009060004806403FF0202010202030F01160300020
30F0216030001000204120001110009060005806403FF0202010202030F0116030002030F02160300010002
04120001110009060006806403FF0202010202030F0116030002030F0216030001000204120001110009060
007806403FF0202010202030F0116030002030F0216030001000204120001110009060000600D00FF020201
02
TCPClient 0'01.386 +27 0001001000010007E0810002000200
TCPClient 0'01.874 +487
00010001001000FEE0010003000281F602030F0116030002030F02160300010002041200011100090600002
A0000FF0202010202030F0116030002030F0216030001000204120003110009060100020806FF0202010302
030F0116030002030F0216030002030F0316030001000204120004110009060100090601FF0202010502030
F0116030002030F0216030002030F0316030002030F0416030002030F051603000100020412000511000906
01000F0400FF0202010902030F0116030002030F0216030002030F0316030002030F0416030002030F05160
30002030F0616030002030F0716030002030F0816030002030F09160300010002041200061100090600000E
00
TCPClient 0'01.900 +26 0001001000010007E0810003000300
TCPClient 0'02.389 +489
00010001001000FEE0010004000381F601FF0202010402030F0116030002030F0216030002030F031603000
2030F0416030001000204120007110109060003180300FF0202010802030F0116030002030F02160301020F
010F0202030F0316030002030F0416030002030F0516030002030F0616030002030F0716030002030F08160
30001000204120008110009060000010000FF0202010902030F0116030002030F0216030002030F03160300
02030F0416030002030F0516030002030F0616030002030F0716030002030F0816030002030F09160300010
002041200091100090600000A0067FF0202010202030F0116030002030F021603000100020412000A110009
06

```

Figure 18 – The Traffic window (TCP-IP profile, fragment)

7.13.3 The log

The Log displays the listing of all actions executed by CTT, see Figure 19.

```

STARTED 5/29/2017 9:26:52 AM
0'00.008 Starting server listening on port 4059
0'00.015 APPL Tests
0'00.019 VERDICT: T_APPL_IDLE_N1 SKIPPED(disabled)

0'00.024 Starting T_APPL_OPEN_1

0'00.027 0/0, ServerSAP = 1, ClientSAP = 16, LONG_NAMES, NO_SECURITY
0'00.030 SubTest 1.Establish an AA using the parameters declared
0'00.663 Reading the object-list
0'00.667 READ attribute 2 of instance 0000280000FF of class Association LN
0'14.288 VERDICT: 1.Establish an AA using the parameters declared PASSED

0'14.292 SubTest 2.Check that the AA has been established
0'14.298 READ attribute 1 of instance 0000280000FF of class Association LN
0'14.411 VERDICT: 2.Check that the AA has been established PASSED

0'14.418 SubTest 3.Release the AA
0'14.508 VERDICT: 3.Release the AA PASSED

0'14.513 0/1, ServerSAP = 1, ClientSAP = 1, LONG_NAMES, LOW_LEVEL_SECURITY
0'14.524 SubTest 1.Establish an AA using the parameters declared
0'15.629 Reading the object-list
0'15.634 READ attribute 2 of instance 0000280000FF of class Association LN
0'29.259 VERDICT: 1.Establish an AA using the parameters declared PASSED

0'29.264 SubTest 2.Check that the AA has been established
0'29.271 READ attribute 1 of instance 0000280000FF of class Association LN
0'29.360 VERDICT: 2.Check that the AA has been established PASSED

0'29.364 SubTest 3.Release the AA
0'29.471 VERDICT: 3.Release the AA PASSED

<Log on testing logical device 0, Associations 1 to 4 omitted>

0'54.823 0/5, ServerSAP = 1, ClientSAP = 5, LONG_NAMES_WITH_CIPHERING,
HIGH_LEVEL_SECURITY_GMAC, SecuritySuite = 0
0'54.825 - CLIENT, CIPHERING, SERVICE_GLO
0'54.827 SubTest 1.Establish an AA using the parameters declared
0'54.832 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CA9760
0'55.959 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F
0'55.963 INVOKE method 1 of instance 0000280000FF of class Association LN
0'55.967 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CA9765
0'56.099 Reading the object-list
0'56.100 READ attribute 2 of instance 0000280000FF of class Association LN
0'56.105 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CA9766
1'03.255 Reading SecuritySetup Reference
1'03.256 READ attribute 9 of instance 0000280000FF of class Association LN
1'03.262 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CA978C
1'03.363 Reading Security Policy
1'03.364 READ attribute 2 of instance 00002B0000FF of class Security setup
1'03.370 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CA978D
1'03.491 VERDICT: 1.Establish an AA using the parameters declared PASSED

1'03.492 SubTest 2.Check that the AA has been established
1'03.493 READ attribute 1 of instance 0000280000FF of class Association LN
1'03.497 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CA978E
1'03.617 VERDICT: 2.Check that the AA has been established PASSED

1'03.619 SubTest 3.Release the AA
1'03.624 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CA978F
1'03.740 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F
1'03.745 VERDICT: 3.Release the AA PASSED

1'03.748 0/6, ServerSAP = 1, ClientSAP = 6, LONG_NAMES_WITH_CIPHERING,
HIGH_LEVEL_SECURITY_GMAC, SecuritySuite = 1
1'03.750 - CLIENT, CIPHERING, GENERAL_DED
1'03.754 SubTest 1.Establish an AA using the parameters declared
1'03.760 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CA9790

```

```
1'04.886 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F
1'04.891 INVOKE method 1 of instance 0000280000FF of class Association LN
1'04.894 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CA9793
1'05.017 Reading the object-list
1'05.020 READ attribute 2 of instance 0000280000FF of class Association LN
1'05.023 ENCRYPTION KEY: DED05C25D639DA879B814BA81CFA4D50, IC: 39CA9795
1'12.016 Reading SecuritySetup Reference
1'12.019 READ attribute 9 of instance 0000280000FF of class Association LN
1'12.023 ENCRYPTION KEY: DED05C25D639DA879B814BA81CFA4D50, IC: 39CA97B5
1'12.126 Reading Security Policy
1'12.129 READ attribute 2 of instance 00002B0001FF of class Security setup
1'12.132 ENCRYPTION KEY: DED05C25D639DA879B814BA81CFA4D50, IC: 39CA97B7
1'12.262 VERDICT: 1.Establish an AA using the parameters declared PASSED

1'12.263 SubTest 2.Check that the AA has been established
1'12.266 READ attribute 1 of instance 0000280000FF of class Association LN
1'12.396 VERDICT: 2.Check that the AA has been established PASSED

1'12.397 SubTest 3.Release the AA
1'12.401 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CA97BA
1'12.533 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F
1'12.536 VERDICT: 3.Release the AA PASSED
```

Figure 19 – Basic log example: APPL_OPEN_1 test case

The CTT extended edition provides a more detailed log. Figure 20 shows the detailed log presenting COSEM APDUs in XML format.


```

STARTED 5/29/2017 2:57:10 PM
0'00.011 Starting server listening on port 4059
0'00.019 APPL Tests
0'00.029 VERDICT: T_APPL_IDLE_N1 SKIPPED(disabled)

<part of the test on Logical Device 0, Association 5 is shown

0'00.038 Starting T_APPL_OPEN_1
1'01.943 0/5, ServerSAP = 1, ClientSAP = 5, LONG_NAMES_WITH_CIPHERING,
HIGH_LEVEL_SECURITY_GMAC, SecuritySuite = 0
1'01.953 - CLIENT, CIPHERING, SERVICE_GLO
1'01.968 SubTest 1.Establish an AA using the parameters declared
>>>Applying general glo/ded [AUTHENTICATION,ENCRYPTION] to:
    <InitiateRequest>
    <ProposedDlmsVersionNumber Value="06" />
    <ProposedConformance>
    <ConformanceBit Name="Action" />
    <ConformanceBit Name="EventNotification" />
    <ConformanceBit Name="SelectiveAccess" />
    <ConformanceBit Name="Set" />
    <ConformanceBit Name="Get" />
    <ConformanceBit Name="Access" />
    <ConformanceBit Name="DataNotification" />
    <ConformanceBit Name="MultipleReferences" />
    <ConformanceBit Name="BlockTransferWithAction" />
    <ConformanceBit Name="BlockTransferWithSetOrWrite" />
    <ConformanceBit Name="BlockTransferWithGetOrRead" />
    <ConformanceBit Name="Attribute0SupportedWithGet" />
    <ConformanceBit Name="PriorityMgmtSupported" />
    <ConformanceBit Name="Attribute0SupportedWithSet" />
    <ConformanceBit Name="GeneralBlockTransfer" />
    <ConformanceBit Name="GeneralProtection" />
    </ProposedConformance>
    <ProposedMaxPduSize Value="FFFF" />
    </InitiateRequest>
1'02.001 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CC1A94
REQUEST:
    <AssociationRequest>
    <ApplicationContextName Value="LN_WITH_CIPHERING" />
    <CallingAPTtitle Value="\CTT00000" />
    <SenderACSERequirements Value="1" />
    <MechanismName Value="HIGH_SECURITY_GMAC" />
    <CallingAuthenticationValue
Value="A778A3A26142031C1EFD6D8D21E32B143072C747A100B757690B05EDDD5DD0604E26D630B79D7F
C712D5FDF41BCE89AC99F7" />
    <GeneralGloCiphering>
    <SystemTitle Value="\CTT00000" />
    <CipheredService
Value="3039CC1A94162A0C01840AC8A39CB543DA14C9A89D316EED7ED7CA854AF3FD" />
    </GeneralGloCiphering>
    </AssociationRequest>
    WRAPPER[1]
000100050001008B608188A109060760857405080103A60A040843545430303030308A0207808B0760857
405080205AC348032A778A3A26142031C1EFD6D8D21E32B143072C747A100B757690B05EDDD5DD0604E26
D630B79D7FC712D5FDF41BCE89AC99F7BE2C042ADB0843545430303030301F3039CC1A94162A0C01840AC
8A39CB543DA14C9A89D316EED7ED7CA854AF3FD
+564
    WRAPPER[1] Rec
000100010005006D616BA109060760857405080103A203020100A305A10302010EA40A040849435530303
0303088020780890760857405080205AA0B8009096009C16B414834C6BE2C042ADB084943553030303030
1F3039CC1A995877B2416EFAAA97A2D2D475EC2236F3EDF0BF3E8A8356C6C5C
RESPONSE:
    <AssociationResponse>
    <ApplicationContextName Value="LN_WITH_CIPHERING" />
    <AssociationResult Value="00" />
    <ResultSourceDiagnostic>
    <ACSEServiceUser Value="0E" />
    </ResultSourceDiagnostic>
    <RespondingAPTtitle Value="\ICU00000" />
    <ResponderACSERequirement Value="1" />
    <MechanismName Value="HIGH_SECURITY_GMAC" />
    <RespondingAuthenticationValue Value="096009C16B414834C6" />

```



```

        <GeneralGloCiphering>
        <SystemTitle Value="\ICU00000" />
        <CipheredService
Value="3039CC1A995877B2416EFAAA97A2D2D475EC2236F3EDF0BFE3E8A8356C6C5C" />
        </GeneralGloCiphering>
        </AssociationResponse>
>>>Remove general glo/ded from:
        <GeneralGloCiphering>
        <SystemTitle Value="\ICU00000" />
        <CipheredService
Value="3039CC1A995877B2416EFAAA97A2D2D475EC2236F3EDF0BFE3E8A8356C6C5C" />
        </GeneralGloCiphering>
1'03.236 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F
DECIPHERED USER INFORMATION
        <InitiateResponse>
        <NegotiatedDlmsVersionNumber Value="06" />
        <NegotiatedConformance>
        <ConformanceBit Name="Action" />
        <ConformanceBit Name="SelectiveAccess" />
        <ConformanceBit Name="Set" />
        <ConformanceBit Name="Get" />
        <ConformanceBit Name="DataNotification" />
        <ConformanceBit Name="MultipleReferences" />
        <ConformanceBit Name="BlockTransferWithSetOrWrite" />
        <ConformanceBit Name="BlockTransferWithGetOrRead" />
        <ConformanceBit Name="GeneralBlockTransfer" />
        <ConformanceBit Name="GeneralProtection" />
        </NegotiatedConformance>
        <NegotiatedMaxPduSize Value="0200" />
        <VaaName Value="0007" />
        </InitiateResponse>
1'03.266 INVOKE method 1 of instance 0000280000FF of class Association LN
>>>Applying general glo/ded [AUTHENTICATION,ENCRYPTION] to:
        <ActionRequest>
        <ActionRequestNormal>
        <InvokeIdAndPriority Value="C1" />
        <MethodDescriptor>
        <ClassId Value="000F" />
        <InstanceId Value="0000280000FF" />
        <MethodId Value="01" />
        </MethodDescriptor>
        <MethodInvocationParameters>
        <OctetString Value="1039CC1A99B2D5B7FA142BC9B4D36FEECF" />
        </MethodInvocationParameters>
        </ActionRequestNormal>
        </ActionRequest>
1'03.296 ENCRYPTION KEY: 000102030405060708090A0B0C0D0E0F, IC: 39CC1A9A
REQUEST:
        <GeneralGloCiphering>
        <SystemTitle Value="\CTT00000" />
        <CipheredService
Value="3039CC1A9A46CD9E8331DFCB0F8485EF3A1E4258418D60765BE7D5E59415B0932ED33AEF91A6F8
968AB7A2EE3C578D8914" />
        </GeneralGloCiphering>
        WRAPPER[1]
000100050001003CDB0843545430303030313039CC1A9A46CD9E8331DFCB0F8485EF3A1E4258418D607
65BE7D5E59415B0932ED33AEF91A6F8968AB7A2EE3C578D8914
+537
        WRAPPER[1]
0001000100050019C701C100010009111039CC1A9ED93CFE3A3B53595193B3727E
RESPONSE:
        <ActionResponse>
        <ActionResponseNormal>
        <InvokeIdAndPriority Value="C1" />
        <Result Value="Success" />
        <ReturnParameters>
        <Data>
        <OctetString Value="1039CC1A9ED93CFE3A3B53595193B3727E" />
        </Data>
        </ReturnParameters>
        </ActionResponseNormal>
        </ActionResponse>
    
```

Figure 20 – Extended log example: APPL_OPEN_1 test case

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	41/57
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7.13.3.1 The Report

The main elements of the Report are the following:

- 1) General information on the test session:
 - date of testing;
 - CTT version and release;
 - information on the licensee;
 - information on the tester;
 - whether the test session was started as “Run for Certification”;
- 2) Identification of the IUT;
- 3) A summary of results and the features supported (aggregated over all logical devices and AAs):
 - number of tests executed for each test suite, and the summary of the verdicts;
 - the communication profile supported;
 - the application context names supported;
 - the authentication mechanisms supported;
 - the ACSE and xDLMS features supported;
 - the security features supported;
 - information on the Logical Devices found;
 - the COSEM interface classes tested;
 - the COSEM interface classes found but not tested;
- 4) the result of HDLC tests (when applicable);
- 5) the result of the Application layer test cases;
- 6) the result of the COSEM test cases;
- 7) the result of the SYMSEC_0 test cases;
- 8) the result of the PUBSEC_1_2 test cases;
- 9) the result of the Data protection test cases;
- 10) the result of the General Block Transfer test cases;
- 11) the CTI file;
- 12) the name of the Object definition file used and its hash value.

The summary is generated at the end of the test session.

A fragment of a sample report is shown in Figure 21.

```

*****
DLMS Conformance test report
27-MAY-2017 19:32:41
CTT 3.1 extended edition, 64bits, release 101
Licensed to: Gyozo (8/17/2006)
Tester: Gyozo
RUN FOR CERTIFICATION
*****

*****
* Identification *
*****

Identification = {
  Manufacturer = "\i-cube."
  FLAGid = "\ICU"
  Type = "\simulation"
  SerialNr = "000102"
  Comment = "\comment"
}

*****
* Summary *
*****

TYPE  TOTAL  SKIPPED  INAPPLICABLE  INCONCLUSIVE  PASSED  FAILED
-----
HDLC           All(Communication profile not HDLC)
APPL  191    0    22         0         169    0
COSEM 673    0    9         0         664    0
SYMSEC 39    0    9         0          30    0
PUBSEC 138   0    6         0          132   0

Communication profile:          TCP

Application context names:      LONG_NAMES, LONG_NAMES_WITH_CIPHERING

Authentication mechanisms:      NO_SECURITY, LOW_LEVEL_SECURITY
                                HIGH_LEVEL_SECURITY_MD5
                                HIGH_LEVEL_SECURITY_SHA1
                                HIGH_LEVEL_SECURITY_GMAC
                                HIGH_LEVEL_SECURITY_SHA256
                                HIGH_LEVEL_SECURITY_ECDSA

ACSE and xDLMS features:       ACCESS, ACTION, DATA_NOTIFICATION
                                GENERAL_BLOCK_TRANSFER, GET
                                MULTIPLE_REFERENCES, RLRQ_RLRE
                                SELECTIVE_ACCESS, SET

Security features:              GENERAL_CIPHERING_WITH_IDENTIFIED_KEY
                                GENERAL_GLO_CIPHERING, GENERAL_SIGNING
                                SERVICE_SPECIFIC_GLO_CIPHERING, SUITE_0
                                SUITE_1, SUITE_2, SECURITY_ACTIVATE
                                KEY_TRANSFER

Data protection features:       (not collected)

Logical device(s) found:        SAP = 1 is "4943553030303030" (ICU00000)
                                SAP = 2 is "4943553030303032" (ICU00002)
                                SAP = 3 is "4943553030303033" (ICU00003)

COSEM classes tested:           1,3,4,5,6,7(1),8,9,10,11,12(4),15(3),17,18
                                19(1),20,21,22,23(1),24,24(1),25,26,27,28
                                28(2),29,29(1),29(2),40,41,42,43,44,45,46
                                47,48,50(1),51,52,53,55(1),56,57,58,59,61
                                62,63,64,64(1),65,68,70,71,72,73(1),74,77
                                80,81,82,83,84,85,86,90(1),91(1),92(1),101
                                102,103,104,105,111,112,113,115

COSEM classes found but not tested: (none)

```

Figure 21 – Fragment of a sample test report

7.14 Saving the test result

At the end of the test session, the test result can be saved as a .zip file from the **File** menu / **Save Test-Result**. It is recommended to give a filename that is informative regarding the IUT type, the tests performed and the date and time of testing.

Example: MyMeterV99_LN_Sec0_TCP_YYMMDD

The Test Result .zip file comprises five files produced at the end of the test session:

- `_Report.txt` is a text file holding the content the "REPORT" pane;
- `_Log.txt` is a text file holding the content of the "LOG" pane;
- `_Traffic.rtf` is a rich text file holding the content of the Traffic window;
- `_CTI.txt` is the CTI file used for the test session. It is also added to the `_Report` file;
- `_hash.txt` is a text file containing a digest of the 4 other files and that allows verifying the authenticity of the test result.

The files are best viewed from CTT itself or using a suitable Large Text Viewer program.

An existing Test Result file can be loaded using **File** / **Load Test-Result**. The files of the zip archive are displayed in their respective panes and windows. The integrity of the archive is verified by the CTT using the `_hash` file.

7.15 Repeatability of results

In order to achieve the objective of credible conformance testing, it is clear that the result of executing a test case on an IUT should be the same whenever it is performed. Experience shows that it may not be possible to execute a complete conformance test suite and observed test outcomes which are identical to those obtained on another occasion.

Nevertheless, at the test case level, every effort has been made to minimize the possibility that a test case produces different test outcomes on different occasions.

7.16 Requirements for test laboratories

Conformance assessment may be performed by a manufacturer (self-testing), a third party or a user.

If the test is done by the manufacturer, the test laboratory should be an identifiable part of the manufacturer's organisation.

8 The conformance certification process

8.1 General

The purpose of the conformance certification process is to obtain a "DLMS/COSEM compliant" Certification. This clause describes the necessary steps.

8.2 Initiation of the certification process

The certification process may be initiated by any member of the DLMS UA.

The manufacturer of the device to be certified shall be a member of the DLMS UA and shall possess a three-letter manufacturer ID. For more information on the manufacturer IDs (FLAG ID) see www.dlms.com, **ORGANIZATION** menu.

In the case of third party testing, the company performing the test shall also be a member of the DLMS UA.

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	44/57
-----------------------	------------	--------------------------------	-------

In this case, a certification fee applies, see <http://dlms.com/conformance/index.html>.

8.3 Submission of conformance test documents

When the IUT passes all test cases applicable for the given implementation, the Test result .zip file(s) can be submitted to the DLMS UA Certification team at:

certification@dlms.com

WARNING: Test results submitted to other email addresses used by the DLMS UA may not be processed.

In the case of third party testing the invoicing address for the certification fee shall be provided together with any specific invoicing requirements. The certification fee is payable to the vendor of the CTT Euro DCS.

8.4 Examination of the test results

The DLMS UA registers the test results submitted and examines them to confirm their authenticity and to verify that all technical and administrative acceptance conditions are met. The DLMS UA does not publish the test results; these may be obtained from the manufacturer.

The DLMS UA maintains the right to discuss the contents of the conformance test result with the organization having initiated the certification process.

The technical verification and acceptance criteria are the following:

- the Test result .zip file includes the Report, the Log, the Line traffic, the CTI and the hash files and the hash value is correct;
- an up-to-date version and release of the CTT and the COSEM object definitions file has been used;
- the Logical Device Name of the Management Logical Device is syntactically correct and the Three Letter Manufacturer ID (AKA FLAG ID) matches the one registered for the manufacturer;
- the test session has been started with "Run for Certification";
- there are no FAILED test cases;
- the reasons for INAPPLICABLE and INCONCLUSIVE test results are acceptable;
EXAMPLE: The verdict on Selective access tests are INCONCLUSIVE if there are not enough entries in the buffer.

The administrative checks before issuing the Certification are the following:

- the test result has been generated by a test laboratory having purchased the CTT. This is verified by checking the license owner's name reported;
- the manufacturer and the tester – if different – are members of good standing of the DLMS UA;
- in the case of third party testing, the license fee is paid;
- there was no Certification issued for the same type (except when the same type is re-tested with a new version of the CTT, see 8.7).

8.5 The Certification

A Certification is issued if the technical and administrative checks are completed with a positive result and the certification fee – when applicable – is paid.

The Certification is prepared using strictly the data extracted from the Test Result and contains the following elements:

- a unique Certification number assigned by the DLMS UA;
- the identification / type of the IUT;

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	45/57
-----------------------	------------	--------------------------------	-------

- the identification of the Management Logical Device (bound to SAP = 1);
- the identification of the manufacturer as declared in the CTI;
- the identification of the CTT version and release;
- the identification of the licensee;
- the version of the COSEM Object definitions file used;
- the media (energy types) used for COSEM object testing;
- for each test performed:
 - the communication profile and the opening mode (when applicable);
 - the application contexts;
 - the security suite;
 - the date and time of testing; and
 - the hash value of the Test Result;
- a statement that the Certification is only valid for the functions successfully tested;
- a statement that the test is executed on one specimen of the product and that the test results may not be applicable for other test specimens;
- any remarks added by the DLMS UA, as seen fit;
- date of issue and signature;
- a summary of features for each test session extracted from the Test Report.

A Certification with example data is shown in Annex A.

The Certification is always issued to the manufacturer as given in the Test Report. The Certifications are published on the website of the DLMS UA at www.dlms.com, CONFORMANCE menu.

The Certification obtained entitles the manufacturer to place the “DLMS/COSEM compliant mark” on its products and documentation. See Figure 22.



Figure 22 – The DLMS/COSEM compliant logo

The test results are filed by the DLMS UA.

8.6 Scope and validity of the Certification

The DLMS/COSEM Certification certifies that the IUT as identified by the manufacturer / test house passed the tests applicable for the given configuration.

The supporting evidence is the conformance Test Result.

DLMS/COSEM compliance can be claimed only for the features tested.

The DLMS UA does not control if the meters manufactured are identical to the IUT type tested.

The Certifications issued for a given type are valid without a time limit.

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	46/57
-----------------------	------------	--------------------------------	-------

It is the responsibility of the manufacturer to initiate a new conformance assessment and certification process when the hardware and/or the firmware of the meter type determining the DLMS/COSEM features supported are changed. This applies also in the case when the firmware is updated in the field via the COSEM Image transfer mechanism.

The Certification serves as documentary evidence of what has been tested under what conditions. For this reason a Certification, once issued, cannot be withdrawn, changed or replaced. If the data are incorrect or have to be changed for any reason, the test session(s) have to be run again and a new Certification application is needed.

For re-testing an IUT type with a new version of the CTT see 8.7.

The case when the name of the manufacture changes is covered in 8.8.

8.7 Re-testing with a new version of the CTT

If an IUT exactly of the same type and DLMS/COSEM features is re-tested with a new version of the CTT, a new Certification will be issued, with reference to the earlier Certification.

However, often the reason to re-test is that the IUT supports additional or different testable DLMS/COSEM features. This should be reflected then in the meter type / firmware version and shall lead to a new Certification.

8.8 Manufacturer name change

In the case when the name of a manufacturer changes, it is up to the manufacturer to inform its customers about the Certifications assigned to its predecessor(s) that should be considered by them as valid for the new company name.

If the manufacturer wishes to obtain a Certification under its new name, a new conformance assessment and certification is necessary.

8.9 Disclaimer

The DLMS UA takes all possible effort to ensure that the conformance test plans and the CTT are line with the DLMS/COSEM specification and provide a reasonable depth of testing.

The Certification does not mean however that an absolute proof of conformance is given.

9 The quality program

9.1 General

An important element of the DLMS/COSEM conformance testing process is the quality program. It includes:

- validation of the conformance test plans and the CTT;
- the support provided to users;
- maintenance.

9.2 Validation of the Abstract Test Suites and CTT

The validation of the ATSS and its implementation, the CTT has been done in several steps:

1. the test plans have been written by experts from different members of the DLMS UA WG Maintenance based on DLMS UA 1000-1 and DLMS UA 1000-2;
2. the executable Test Suite has been validated by running them against a simulator and several real implementations.

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	47/57
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9.3 Support provided to users

The DLMS UA, upon request, provides support to the users of the tool.

All queries related to installation and operation of the CTT shall be submitted to support-ctt@eurodcs.com.

All queries concerning the WIBU protection of the CTT software shall be submitted to sales-ctt@eurodcs.com.

NOTE WIBU is a company providing CodeMeter, a universal technology for software publishers and intelligent device manufacturers, upon which all solutions from Wibu-Systems are built. For more, see <https://www.wibu.com/codemeter.html>.

Problems related to testing can be submitted, together with the test result .zip file generated by the CTT to certification@dlms.com.

Consultancy concerning the implementation of the DLMS/COSEM specification is not part of the CTT support.

9.4 Maintenance

The DLMS UA maintains the conformance testing process to eliminate any problems with the tool found during testing, to enhance tests and to accommodate changes in the DLMS/COSEM specification. The procedure is the following:

1. a proposal, together with a justification is made to modify or to add a test. This can be initiated by any CTT licence owner or by the DLMS UA itself;
2. the request is investigated by the DLMS UA;
3. if the request is accepted, the relevant abstract test cases are amended by the DLMS UA;
4. the new abstract test cases are validated by the DLMS UA;
5. the new abstract test cases are implemented;
6. the amended ATs are published;
7. a new version of the CTT is made available to the licensed tool users.

This process is supported by the DLMS UA website.

In the following, the process is illustrated by use cases.

9.5 Use cases

9.5.1 Use case 1 – introducing a new standard OBIS code

A manufacturer needs a new standard OBIS code to support a new functionality in the metering equipment.

The proposal is submitted to the DLMS UA. The DLMS UA checks if the proposal is in line and can fit with the DLMS/COSEM specification. If approved, the COSEM Object definition tables DLMS UA 1001-7 are amended and a new .dat file is made available for download. See also 7.8.

9.5.2 Use case 2 – modification of an existing test

If it is found that despite of careful validation, a test case is not fully compliant with the DLMS/COSEM specification or if it is necessary to enhance a test, then a proposal may be submitted to the DLMS UA and the process described above is followed.

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	48/57
-----------------------	------------	--------------------------------	-------

9.5.3 Use case 3 – adding a test for a new standard feature

A manufacturer implements a feature described in the DLMS/COSEM specification, but which is not yet covered in the CTT.

The manufacturer submits the proposed test plan to the DLMS UA and the process described above is followed.

9.5.4 Use case 4 – revision of the specification

The DLMS UA initiates a revision or amendment of the DLMS/COSEM specification (e.g. introducing a new protocol stack).

The conformance requirements and the test plans are prepared together with the standard, but at least upon the acceptance of the new standard.

The DLMS UA initiates the maintenance of the tool.

Annex A Certification template (with sample data) (informative)



DLMS UserAssociation

Bahnhofstrasse 28
CH-6304 Zug
Switzerland

Tel. +36 28 514 065
Fax +36 28 514 066
dlms@dlms.com

Certification No. 1XXX

This is to certify that the metering equipment identified as:

Type: **SAMPLE**
Mgmt. Logical Device Name: **ICU00002**
Manufactured by: **I-Cube**

has successfully passed the DLMS/COSEM Conformance test, under the following conditions:

- CTT version: CTT 3.0 extended edition, 64bits (100)
- Licensed to: I-Cube
- COSEM object definitions file version: Object_defs_v3.1_released_170313.dat
- Media identifier(s): Abstract, Electricity

Tests	Comm. profile & opening mode	Application contexts	Security suite	Date and time	Test Result hash value
Test 1	TCP	LN, LN with ciphering	0	2017-05-22	481CF68B9A26C89EED7BCD9908281C50 4312FA91D3E1EFC09B70358D00B9AA8C
Test 2	HDLC, Mode_E	LN, LN with ciphering	0	2017-05-22	<hash value >
Test 3	HDLC, Direct	LN, LN with ciphering	0	2017-05-22	<hash value >

The authenticity of the test report(s) has been verified by the DLMS User Association and the metering equipment identified above is listed on its web site at: www.dlms.com.

With this, the manufacturer is entitled to display the DLMS/COSEM Compliant mark – shown below – on its product duly identified and on its product literature.



The test reports are filed by the DLMS UA. Copies are available from the manufacturer.

This Certificate is only valid for the functions successfully tested; see the Summary. The test has been executed on one specimen of the product, as identified by the Management Logical Device Name reported. Results may not be applicable for other test specimens.

Date: Zug, the

<Signature>

DLMS User Association

dlms@dlms.com

Page 1 of 3

Certification No. 1XXX

Summary of features tested for Test 1

This section provides an overview of the features tested, aggregated over all logical devices and Application Associations in one test session. Full information is available in the Test Result.

```

*****
* Identification *
*****

Identification = {
  Manufacturer = "\i-cube"
  FLAGid = "\ICU"
  Type = "\simulation"
  SerialNr = "000102"
  Comment = 1234
  Comment = "\comment 2"
}

*****
* Summary *
*****

TYPE    TOTAL    SKIPPED    INAPPLICABLE    INCONCLUSIVE    PASSED    FAILED
-----
HDLC                All (Communication profile not HDLC)
APPL    52         0         10             0              42        0
COSEM   988         0          1             0             987        0
SYMSEC  55         0         10             0              45        0

Communication profile:          TCP

Application context names:     LONG_NAMES, LONG_NAMES_WITH_CIPHERING

Security mechanisms:           NO_SECURITY, HIGH_LEVEL_SECURITY_GMAC

ACSE and xDLMS features:      ACTION, GENERAL_BLOCK_TRANSFER, GET
                               MULTIPLE_REFERENCES, RLRQ_RLRE
                               SELECTIVE_ACCESS
                               SERVICE_SPECIFIC_BLOCK_TRANSFER, SET

Security features:             ACTIVATE_SECURITY_POLICY
                               GENERAL_GLO_CIPHERING

Logical device(s) found:       SAP = 1 is "4943553030303030" (ICU00000)
                               SAP = 2 is "4943553030303032" (ICU00002)
                               SAP = 3 is "4943553030303033" (ICU00003)

COSEM classes tested:          1, 3, 4, 5, 6, 7 (1), 8, 9, 10, 11, 12 (3), 15 (2), 17, 18
                               19 (1), 20, 21, 22, 23 (1), 24, 24 (1), 25, 26, 27, 28
                               28 (2), 29, 29 (1), 29 (2), 40, 41, 42, 43, 44, 45, 46
                               47, 48, 50 (1), 51, 52, 53, 55 (1), 56, 57, 58, 59, 61
                               63, 64, 65, 70, 71, 72, 73 (1), 74, 80, 81, 82, 83, 84
                               85, 86, 90 (1), 91 (1), 92 (1), 101, 102, 103, 104, 105

COSEM classes found but not tested: (none)

```

**Annex B
(normative)
Conformance Test Plans**

The Conformance test plans are attached to *the complete Yellow Book..*

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	52/57
-----------------------	------------	--------------------------------	-------

Annex C (informative) Bibliography

ETSI ETR 021: 1991, *Advanced testing methods (ATM); Tutorial on protocol conformance testing (especially OSI standards and profiles) ETR/ATM-1002*

IEC 60870-5-6:2006, *Telecontrol equipment and systems – Part 5-6: Guidelines for conformance testing for the IEC 60870-5 companion standards*

IEC 61850-10: 2005, *Communication networks and systems in substations – Part 10: Conformance testing*

IEC 62056-1-0:2014, *Electricity metering data exchange – The DLMS/COSEM suite – Part 1 0: Smart metering standardisation framework*

IEC TS 62056-1-1:2016, *Electricity metering data exchange - The DLMS/COSEM suite - Part 1-1: Template for DLMS/COSEM communication profile standards*

IEC 62056-21, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange*

IEC 62056-3-1:2013, *Electricity metering data exchange - The DLMS/COSEM suite - Part 3-1: Use of local area networks on twisted pair with carrier signalling*

IEC 62056-46, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC protocol*

IEC 62056-4-7:2015, *Electricity metering data exchange - The DLMS/COSEM suite - Part 4-7: DLMS/COSEM transport layer for IP networks*

IEC 62056-5-3, *Electricity metering data exchange – The DLMS/COSEM suite – Part 5-3: DLMS/COSEM application layer*

IEC 62056-6-1, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-1: Object Identification System (OBIS)*

IEC 62056-6-2, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes 3*

IEC 62056-7-3, *Electricity metering data exchange - The DLMS/COSEM suite - Part 7-3: Wired and wireless M-Bus communication profiles for local and neighbourhood networks*

IEC 62056-7-5:2016, *Electricity metering data exchange - The DLMS/COSEM suite - Part 7-5: Local data transmission profiles for Local Networks (LN)*

IEC 62056-7-6, *Electricity metering data exchange – The DLMS/COSEM suite – Part 7-6: The 3-layer, connection-oriented HDLC based communication profile*

IEC 62056-8-3, *Electricity metering data exchange – The DLMS/COSEM suite – Part 8-3: Communication profile for PLC S-FSK neighbourhood networks*

IEC 62056-8-4, *Electricity metering data exchange – The DLMS/COSEM suite – Part 8-4: Communication profiles for narrow-band OFDM PLC PRIME neighbourhood networks*

IEC 62056-8-5, *Electricity metering data exchange - The DLMS/COSEM suite - Part 8-5: Narrow-band OFDM G3-PLC communication profile for neighbourhood networks*

IEC 62056-8-6:2017, *Electricity metering data exchange - The DLMS/COSEM suite - Part 8-6: High speed PLC ISO/IEC 12139-1 profile for neighbourhood networks*

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	53/57
-----------------------	------------	--------------------------------	-------

IEC TS 62056-8-20:2016, *Electricity metering data exchange - The DLMS/COSEM suite - Part 8-20: Mesh communication profile for neighbourhood networks*

IEC 62056-9-7, *Electricity metering data exchange – The DLMS/COSEM suite – Part 9-7: Communication profile for TCP-UDP/IP networks*

EN 13757-1:2014, *Communication system for meters – Part 1: Data exchange*

EN 13757-3:2004, *Communication systems for and remote reading of meters – Part 3: Dedicated application layer*

NOTE This standard is referenced in the “M-Bus client setup” interface class version 0.

EN 13757-3:2013, *Communication systems for and remote reading of meters – Part 3: Dedicated application layer*

NOTE This standard is referenced in the M-Bus client setup interface class version 1.

ITU-T X.291:1992, *OSI conformance testing methodology and framework for protocol recommendations for IUT-T applications – Abstract test suite specification*

ITU-T X.293:1995, *OSI conformance testing methodology and framework for protocol recommendations for IUT-T applications – Test realization*

Annex D
Test Plan Documents

For more details please see the complete Yellow Book

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	55/57
-----------------------	------------	--------------------------------	-------

INDEX

- 3-layer, CO, HDLC based communication profile, 16
- AA filter, 18
- Abnormal test case termination, 20
- Abstract Test Case, 6, 18, 19
- Abstract Test Case error, 20
- Abstract Test Suite, 7, 12, 14, 17, 23, 47
- Access right, 27
- Application Association, 12, 28
- Application context, 27, 46
- Ask the user, 36
- Authentication security mechanism, 27
- base specification, 18
- Basic interconnection test (BIT), 7
- Behaviour, 17
- Behaviour test, 7, 18
- Black box, 17
- Capabilities, required, 13
- Capability, 7, 17
- Capability test, 7, 18
- Certification, 35, 45
- Certification process, 44
- Certification, scope and validity, 46
- Communication interface, 15, 36
- Communication model, 15
- Communication port, 31
- Communication profile, 35, 46
- Companion Specification, 12
- Conformance assessment process, 6, 7, 14, 15, 25
- Conformance certification process, 14, 15
- Conformance log, 7
- Conformance test information (CTI), 8
- Conformance test plan, 14, 15, 16, 47
- Conformance test result, 20, 46
- Conformance Test Tool, 14, 23
- Conformance testing, 8, 13, 15, 25, 44, 47
- Conforming implementation, 8
- COSEM Data protection, 17, 22, 24
- COSEM interface object, 21
- COSEM interface object model, 15
- COSEM Interface object model, 16
- COSEM object definition file, 32, 46
- CTT, installation, 25
- CTT, licensing, 24
- Data link layer using HDLC protocol, 16
- DLMS/COSEM application layer, 15
- DLMS/COSEM Application layer, 16
- DLMS/COSEM compliant, 44
- DLMS/COSEM compliant mark, 46
- DLMS/COSEM conformance testing, 13
- DLMS/COSEM transport layer, 16
- DoNotTest options, 28
- Executable Test Case, 8
- Executable Test Case error, 8, 20
- Executable Test Suite, 8, 12, 14, 23
- Expected result, 18
- Extra information, 27
- FAILED, 19
- Foreseen test event, 19
- General Block Transfer, 17, 22, 24
- Idle testing state, 8
- Implementation Under Test, 26
- Implementation Under Test (IUT), 8, 13
- Inapplicable, 9
- INAPPLICABLE, 19, 35
- INCONCLUSIVE, 19
- Inconclusive (verdict), 9
- Initial testing state, 9
- Inopportune test event, 9
- Intended application, 27
- Interface object, 27
- Interworking, 13
- Invalid test event, 19
- IP address, 31
- IUT, identification, 46
- IUT, preparation, 27
- Line traffic, 36
- Load profile, 27
- Logging, basic, 39, 41
- Logical device, 27
- Maintenance, 47, 48
- Management Logical Device, 27
- Manufacturer, 44
- Manufacturer identification, 46
- Means Of Testing, 9, 23
- Negative test, 9, 18
- Observed test outcome, 9, 19, 44
- OSI conformance testing, 13
- Parameterized executable test case, 9
- Pass verdict, 9
- PASSED, 19
- Physical layer, 17
- Positive test, 9, 18
- Postamble, 19
- Preamble, 19
- Prerequisite;, 18
- Protocol conformance test report (PCTR), 10
- Protocol Data Unit, 12
- Protocol stack, 17
- Quality program, 15, 47
- Repeatability of results, 10, 44
- Run, 36
- Run for Certification, 36
- Security features, 27
- Security suite, 46
- Security Suite 0 (SYMSEC_0), 21
- Security Suite 1 and 2 (PUBSEC_1_2), 22
- Selective access, 27
- Self testing, 15

DLMS User Association	2018-05-16	EXCERPT DLMS UA 1001-1 Ed. 6.1	56/57
-----------------------	------------	--------------------------------	-------

Self-testing, 15, 44
Semantically invalid test event, 10
Service Access Point, 12
SKIPPED, 35
Stable testing state, 10
Static conformance review, 10
Supporting layer, 17
Syntactically invalid test event, 10
TCP/IP based communication profile, 16
Template, test case, 19
Test, 19
Test body, 10, 19
Test case, 10, 17, 18, 44
Test case error, 11, 20
Test case name, 18
Test event, 11, 17, 20
Test group, 11, 17, 18
Test group objective, 11, 17
Test laboratory, 11, 44
Test outcome, 19
Test outcome, foreseen, 8, 19
Test outcome, unforeseen, 11, 19
Test purpose, 11, 17, 18
Test result, hash value, 46
Test session, 11, 35
Test step, 17
Test step (sub-test), 11
Test strategy, 18
Test suite, 11, 18, 44
Test tool version, 46
Third party testing, 15, 44
Three-letter manufacturer ID, 15, 44
Valid test event, 11
Validation of the conformance test plan, 47
Verdict, 12, 19
Verdict, FAIL, 8
xDLMS context, 27
xDLMS services, 27