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AMENDMENT 1

Communication networks and systems for power utility automation - Part 10: Conformance testing

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Communication networks and systems for power utility automation - Part 10: Conformance testing

AMENDMENT 1

FOREWORD

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Amendment 1 to IEC 61850-10 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The major changes in this amendment are as follows:

– server device conformance test procedures have been updated; new test cases are: sAss4, sAss5, sAssN7, sSrv14, sSrv15, sDs15, sSg11..sSg14, sRp15, sRp16, sRp17, sRp23, sRpN9, sBr29, sBrN9, sBrN10, sGop12, sGos8..15, sGos20..23, sGosN7, sSBOns8, sTm6, sTm7, sTmP1, sTmP2, sTmP5, sTmPN1;
– client device conformance test procedures have been updated; new test cases are: cAss10, cAssN8, cAssN9, cSrv10, cSrvN7..cSrvN9, cSg46, cRp14..22, cRp40..46, cBr14..22, cBr30..32, cBr46, cLog9, cLog46, cLogN4, cGcb46, cSBOns10, cFt16, cMsvcb1, cMsvcb2, cMsvcb46;

– sampled values test procedures have been merged into server;
– server IED configuration tool related conformance test procedures have been updated; the ICD export and SCD import test cases have been merged into server, new test cases are: tTf4, tTf5;
– System Configuration Tool related conformance test procedures have been updated; new test cases are: tSieN2, tSce8..10, tSceN2, tDfeN3, tSmo7..9, tSse4..7, tSsi5..6, tSeh7..11;
– GOOSE performance test procedures have been updated; the performance classes have been updated to align with the performance class definition updates.

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

Draft	Report on voting
57/2769/FDIS	57/2797/RVD

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

The language used for the development of this Amendment is English.

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

A list of all parts of IEC 61850 series, under the general title *Communication networks and systems for power utility automation*, can be found on the IEC website.

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

- reconfirmed,
- withdrawn, or
- revised.

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1 Scope

Add the following new text after the first paragraph of the Scope (before the NOTE):

Cyber security extensions provided by IEC 62351 are conformance tested against the IEC 62351-100-4 and IEC 62351-100-6.

2 Normative references

Insert the following new normative references:

IEC/IEEE 61850-9-3:2016, *Communication networks and systems for power utility automation – Part 9-3: Precision time protocol profile for power utility*

IEC 61869-9:2016, *Instrument transformers – Part 9: Digital interface for instrument transformers*

Remove the following existing normative reference:

IEC 62439-3:2012, *Industrial communication networks – High availability automation networks – Part 3: Parallel Redundancy Protocol (PRP) and High Availability Seamless Redundancy (HSR)*

4 Abbreviated terms

Insert the following new abbreviated term:

PTP Precision Time Protocol

6 Device related conformance testing

Replace the existing text, figures (Figures 2 to 6) and tables (Tables 1 to 71) of Clause 6 with the following new text, figures and tables:

6.1 Test methodology

Communication testing needs at least two devices to communicate with each other. Comprehensive interoperability testing of all possible products is not feasible. Therefore, the test concept shall include test devices, test configurations, and test scenarios. The dynamic behaviour should be tested properly by using well-defined test cases.

Messages are generated to test the communication capabilities. Hardwired stimuli (contacts, voltages, currents, etc.) and stimuli coming over a serial link if applicable should be used if applicable.

Special attention shall be given to communication equipment such as star-couplers, switches, etc. which shall support all requested features of the standard but not introduce additional contingencies and limitations. The impact of the communication method (client-server, GOOSE, SV, etc.) used by the DUT shall be considered properly in the test procedures. Verification of functional applications (use of GOOSE messages) is not part of a conformance test even if advanced tools may offer such analysis.

6.2 Conformance test procedures

6.2.1 General

This subclause describes the test procedure requirements, test structure, the abstract test cases (what is to be tested). The format and a few examples of detailed test procedures (how to perform the test) are given in Annex A.

6.2.2 Test procedure requirements

The test procedure requirements are:

– The abstract test cases describe what shall be tested, the detailed test procedures describe how a test engineer, or a test system shall perform the test.

– Test cases include a reference to the applicable paragraph(s) in the referenced document(s).

– The test results shall be reproducible in the same test lab and in other test labs.

– Support automated testing with minimal human intervention, as far as reasonably possible.

– The tests shall focus on situations that cannot easily be tested during, for example, a factory or site acceptance test, and prevent inter-operability risks, for example:
  - check behaviour of the device on delayed, lost, double and out of order packets,
  - configuration, implementation, operation risks,
  - mismatching names, parameters, settings, or data types,
  - exceeding certain limits, ranges or timeouts,
  - force situations to test negative responses,
  - check all (control) state machine paths, and
  - force simultaneous control operations from multiple clients.
– The ACSI tests focus on the application layer (mapping).
– The device under test (DUT) is considered as a black box. The I/O and the communication interface are used for testing.
– The test includes testing the versions, data model and configuration file, and the use of applicable ISO/IEC 9646 series terminology.

The test procedures shall be formatted as outlined in Figure 2. With this format, the test procedures document can also be used as test report. A few test procedure examples are depicted in Annex A.

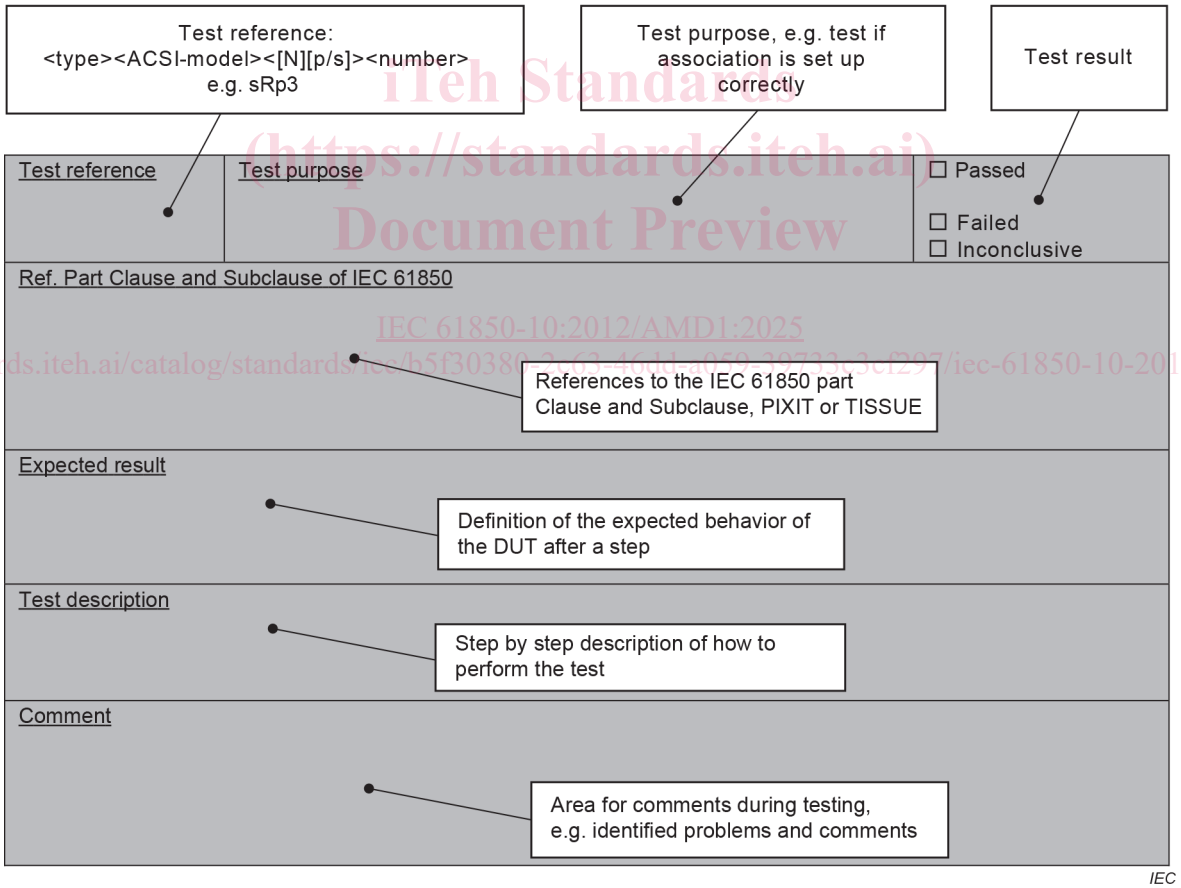

Figure 2 – Test procedure format

6.2.3 Test structure

The test cases are structured as follows:

– documentation and version control (IEC 61850-4);
– configuration file (IEC 61850-6);
– data model (IEC 61850-7-3 and IEC 61850-7-4);
– mapping of ACSI models and services (IEC 61850-7-2 and applicable SCSM).

6.2.4 Test cases to test a server device

6.2.4.1 General

This part of the IEC 61850 series specifies the test system architecture and abstract test cases for server devices. The abstract test cases shall be used for the definition of test procedures to run in tests.

NOTE The SCSM specific test procedures are provided by test facilities agreed upon by the market participants.

6.2.4.2 Test system architecture to test a server device

In order to be able to perform a server device test, a minimum test set-up is necessary. The test architecture contains (see Figure 3):

– DUT;
– client simulator to initiate and generate TPAA messages;
– GOOSE simulator to send correct and incorrect GOOSE messages;
– SV simulator to send correct and incorrect SV messages;
– test master to start/stop test cases, start/stop the analyzer and archive test results;
– time master;
– engineering tool to configure the DUT;
– protocol analyzer to store all the network traffic for each test case;
– signal generator to force binary and analogue events, controlled by the test master or test engineer.

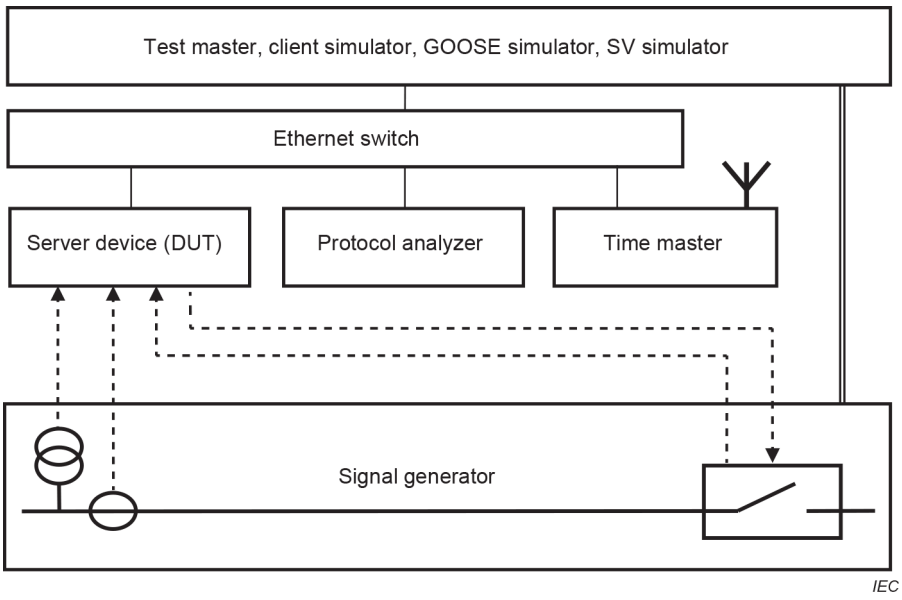

Figure 3 – Test system architecture to test a server device