IEC 61850-10

Edition 2.0 2012-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

Réseaux et systèmes de communication pour l'automatisation des systèmes électriques – Partie 10: Essais de conformité

IEC 61850-10:2012

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 33.200

ISBN 978-2-83220-557-0

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 10: Conformance testing

FOREWORD

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

This second edition cancels and replaces the first edition published in 2005. It constitutes a technical revision.

The major technical changes with regard to the previous edition are as follows:

– server device conformance test procedures have been updated;
– client device conformance test procedures have been added;
– sampled values device conformance test procedures have been added;
– (engineering) tool related conformance test procedures have been added;
– GOOSE performance test procedures have been added.

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

FDIS	Report on voting
57/1284/FDIS	57/1303/RVD

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

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

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 publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

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

INTRODUCTION

This part of IEC 61850 is part of a set of specifications which details a layered power utility communication architecture.

This part of IEC 61850 defines:

- the methods and abstract test cases for conformance testing of client, server and sampled values devices used in power utility automation systems, and
- the methods and abstract test cases for conformance testing of engineering tools used in power utility automation systems, and
- the metrics to be measured within devices according to the requirements defined in IEC 61850-5.

The intended readers are IEC 61850 developers, test engineers and test system developers.

NOTE 1 Tests regarding EMC requirements and environmental conditions are subject to IEC 61850-3 and not included in this part of IEC 61850.

It is recommended that IEC 61850-5 and IEC 61850-7-1 be read first in conjunction with IEC 61850-7-2, IEC 61850-7-3, and IEC 61850-7-4.

NOTE 2 Abbreviations used in IEC 61850-10 are listed in Clause 4 or may be found in other parts of IEC 61850 that are relevant for conformance testing.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 10: Conformance testing

1 Scope

This part of IEC 61850 specifies standard techniques for testing of conformance of client, server and sampled value devices and engineering tools, as well as specific measurement techniques to be applied when declaring performance parameters. The use of these techniques will enhance the ability of the system integrator to integrate IEDs easily, operate IEDs correctly, and support the applications as intended.

NOTE The role of the test facilities for conformance testing and certifying the results is beyond the scope of this part of IEC 61850.

2 Normative references

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

IEC 61850-2, *Communication networks and systems for power utility automation – Part 2: Glossary*

IEC 61850-3, *Communication networks and systems for power utility automation – Part 3: General requirements*

IEC 61850-4:2011, *Communication networks and systems for power utility automation – Part 4: System and project management*

IEC 61850-5:2003, *Communication networks and systems for power utility automation – Part 5: Communication requirements for functions and devices models*

IEC 61850-6:2009, *Communication networks and systems for power utility automation – Part 6: Configuration description language for communication in electrical substations related to IEDs*

IEC 61850-7-1:2011, *Communication networks and systems for power utility automation – Part 7-1: Basic communication structure – Principles and models*

IEC 61850-7-2:2010, *Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure – Abstract communication service interface (ACSI)*

IEC 61850-7-3:2010, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*

IEC 61850-7-4:2011, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*

IEC 61850-8-1:2011, *Communication networks and systems for power utility automation – Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO/IEC 9506-1 and ISO/IEC 9506-2) and to ISO/IEC 8802-3*

IEC 61850-9-2:2011, *Communication networks and systems for power utility automation – Part 9-2: Specific Communication Service Mapping (SCSM) – Sampled values over ISO/IEC 8802-3*

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

ISO/IEC 9646 (all parts), *Information technology – Open Systems Interconnection – Conformance testing methodology and framework*

ISO 9001 (all parts), *Quality management systems*

ISO 9506 (all parts), *Industrial automation systems – Manufacturing Message Specification*

IEEE 1588:2008, *Standard for a precision clock synchronization protocol for networked measurement and control systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61850-2 and the following apply.

3.1
factory acceptance test
FAT
customer-agreed functional tests of the specifically manufactured power utility automation system or its parts using the parameter set for the planned application as specified in a specific customer specification

Note 1 to entry: The FAT will be carried out in the factory of the manufacturer or other agreed-upon location by the use of process simulating test equipment.

3.2
hold point
point, defined in the appropriate document beyond which an activity shall not proceed without the approval of the initiator of the conformance test

Note 1 to entry: The test facility shall provide a written notice to the initiator at an agreed time prior to the hold point. The initiator or his representative is obligated to verify the hold point and approve the proceeding of the activity.

3.3
interoperability
ability of two or more IEDs from the same vendor (or different vendors) to exchange information and use that information for correct co-operation.

Set of values having defined correspondence with the quantities or values of another set

3.4
model implementation conformance statement
MICS
statement that details the standard data object model elements supported by the system or device

3.5
negative test
test to verify the correct response of a system or a device when subjected to:

– IEC 61850 series conformant information and services which are not implemented in the system or device under test;

– non IEC 61850 series conformant information and services sent to the system or device under test

3.6
protocol implementation conformance statement
PICS
statement with the summary of the communication capabilities of the system or device to be tested

3.7
protocol implementation extra Information for testing
PIXIT
statement with system or device specific information regarding the communication capabilities of the system or device to be tested and which are outside the scope of the IEC 61850 series. The PIXIT is not subject to standardisation.

3.8
routine test
performed by the manufacturer in order to ensure device operation and safety

3.9
site acceptance test
SAT
verification of each data and control point and the correct functionality within the PUAS and between the PUAS and its operating environment at the whole installed plant by use of the final parameter set as specified in a specific customer specification

Note 1 to entry: The SAT is the precondition for the power utility automation system (PUAS) being put into operation.

3.10
SCL implementation conformance statement
SICS
statement with the summary of the capabilities of the SCL engineering tool

3.11
system related test
verification of correct behaviour of the IEDs and of the overall PUAS under specific application conditions

Note 1 to entry: The system related test is part of the final stage of the development of IEDs as belonging to a PUAS-product family.

3.12
test equipment
all tools and instruments which simulate and verify the input/outputs of the operating environment of the PUAS such as switchgear, transformers, network control centres or connected telecommunication units on the one side, and the serial links between the IEDs of the PUAS on the other

3.13
test facility
organisation able to provide appropriate test equipment and trained staff for conformance testing

Note 1 to entry: The management of conformance tests and the resulting information should follow a quality system.

3.14
technical issues conformance statement
TICS
statement with device specific information regarding the implemented technical issues detected after publication of the standard. The TICS is not subject to standardisation.

3.15
type test
verification of correct behaviour of the IEDs of the PUAS by use of the system tested software under the test conditions corresponding with the technical data

Note 1 to entry: The type test marks the final stage of the hardware development and is the precondition for the start of the production. This test is carried out with IEDs, which have been manufactured through the normal production cycle.

3.16
witness point
point, defined in the appropriate document, at which an inspection will take place on an activity

Note 1 to entry: The activity may proceed without the approval of the initiator of the conformance test. The test facility provides a written notice to the initiator at an agreed time prior to the witness point. The initiator or his representative has the right, but is not obligated, to verify the witness point.

4 Abbreviated terms

ACSI	abstract communication service interface
BRCB	buffered report control block
CDC	common data class
DUT	device under test
FAT	factory acceptance test
GI	general interrogation
GoCB	GOOSE control block
GOOSE	generic object oriented substation events
HMI	human machine interface
HSR	high availability seamless ring
ICD	IED capability description
IED	intelligent electronic device
IID	instantiated IED description
IP	internet protocol
LCB	log control block
LD	logical device
LN	logical node
MICS	model implementation conformance statement
MMS	manufacturing message specification (ISO 9506 series)
MSVCB	multicast sampled value control block
PICS	protocol implementation conformance statement
PIXIT	protocol implementation extra information for testing
PPS	pulse per second

PRP	parallel redundancy protocol
PUAS	power utility automation system
SAT	site acceptance test
SAV	sampled analogue values (IEC 61850-9-2)
SCD	substation configuration description
SCL	substation configuration language
SCSM	specific communication service mapping
SGCB	setting group control block
SICS	SCL implementation conformance statement
SNTP	simple network time protocol
SSD	system specification description
SV	sampled values
SVCB	sampled values control block
TCP	transport control protocol
TICS	technical issues conformance statement
TPAA	two party application association
TUT	tool under test
URCB	unbuffered report control block
USVCB	unicast sampled values control block
UTC	coordinated universal time
XML	extensible markup language

5 Introduction to conformance testing

5.1 General

There are many steps involved from the development and production of a device to the proper running of a complete system designed according the specific needs of a customer. Suitable test steps are incorporated in this process.

The quality system of the producer/supplier forms the basis of reliable testing in development and production activities.

Many internal tests during the development of a device (or a system kit) result in a type test (unit level test) performed at least by the provider and – if required by applicable standards – by an independent test authority. In the context of this standard, the term type test is restricted to the functional behaviour of the device.

Continuing routine tests in the production chain are necessary to ensure a constant quality of delivered devices in accordance with the quality procedures of the producer.

A conformance test is the type test for communication and – since communication establishes a system – the system related test of the incorporated IEDs. As a global communications standard, the IEC 61850 series includes standardised conformance tests to ensure that all suppliers comply with applicable requirements.

Type tests and conformance tests do not completely guarantee that all functional and performance requirements are met. However, when properly performed, such tests