

# INTERNATIONAL STANDARD

**IEC**  
**60870-5-6**

First edition  
2006-03

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**Telecontrol equipment and systems –**

**Part 5-6:**

**Guidelines for conformance testing for  
the IEC 60870-5 companion standards**

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Commission Electrotechnique Internationale  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## TELECONTROL EQUIPMENT AND SYSTEMS –

**Part 5-6: Guidelines for conformance testing for  
the IEC 60870-5 companion standards**

## FOREWORD

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International Standard IEC 60870-5-6 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The text of this part of IEC 60870-5 is based on the following documents:

FDIS	Report on voting
57/792/FDIS	57/807/RVD

Full information on the voting for the approval of this part of IEC 60870-5 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.

IEC 60870-5 consists of the following parts, under the general title *Telecontrol equipment and systems – Part 5: Transmission protocols*:

- Part 5-1: Transmission frame formats
- Part 5-2: Link transmission procedures
- Part 5-3: General structure of application data
- Part 5-4: Definition and coding of application information elements
- Part 5-5: Basic application functions
- Part 5-6: Guidelines for conformance testing for the IEC 60870-5 companion standards
- Part 5-101: Companion standard for basic telecontrol tasks
- Part 5-102: Companion standard for the transmission of integrated totals in electric power systems
- Part 5-103: Companion standard for the informative interface of protection equipment
- Part 5-104: Network access for IEC 60870-5-101 using standard transport profiles
- Part 5-601: Conformance test cases for the IEC 60870-5-101 companion standard

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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- withdrawn;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.

A bilingual version of this publication may be issued at a later date.

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## INTRODUCTION

This part of IEC 60870-5 specifies methods and procedures for conformance testing of Telecontrol equipment or systems using IEC 60870-5 standard(s).

This part of IEC 60870-5 contains general subjects and guidelines for the test environment. Detailed test cases, mandatory and optional mandatory test cases for the companion standards will become available as technical specifications (IEC 60870-5-60x).

Tests according to EMC requirements or related to environmental and organisational conditions are beyond the scope of this part of IEC 60870-5. This part of IEC 60870-5 only focuses on the protocol implementation and the related system functionality necessary to validate the protocol implementation.

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## TELECONTROL EQUIPMENT AND SYSTEMS –

### Part 5-6: Guidelines for conformance testing for the IEC 60870-5 companion standards

#### 1 Scope

This part of the IEC 60870-5 series specifies methods for conformance testing of telecontrol equipment, amongst Substation Automation Systems (SAS) and telecontrol systems, including front-end functions of SCADA.

The use of this part of IEC 60870-5 facilitates interoperability by providing a standard method of testing protocol implementations, but it does not guarantee interoperability of devices. It is expected that using this part of IEC 60870-5 during testing will minimize the risk of non-interoperability.

The goal of this part of IEC 60870-5 is to enable unambiguous and standardised evaluation of IEC 60870-5 companion standard protocol implementations. The guidelines and conditions for the testing environment are described in this part of IEC 60870-5. The detailed test cases per companion standard, containing among others mandatory and optional mandatory test cases per Basic Application Function, ASDU and transmission procedure, will become available as technical specifications (IEC 60870-5-60x). Other functionalities may need test cases, but this is beyond the scope of this part of IEC 60870-5.

This part of IEC 60870-5 deals mainly with communication conformance testing; therefore other requirements, such as safety or EMC are not covered. These requirements are covered by other standards (if applicable) and the proof of compliance for these topics should be done according to those standards.

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#### 2 Normative references

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

IEC 60870-5-1, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section One: Transmission frame formats*

IEC 60870-5-2, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 2: Link transmission procedures*

IEC 60870-5-3, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 3: General structure of application data*

IEC 60870-5-4, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 4: Definition and coding of application information elements*

IEC 60870-5-5, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 5: Basic application functions*

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



### 3 Terms and definitions

For the purposes of this part of IEC 60870-5, the following terms and definitions apply.

#### 3.1

##### **configuration (of a system or device)**

step in system design: selecting functional units, assigning their locations and defining their interconnections

#### 3.2

##### **configuration list**

supplies an overview of all compatible hardware and software versions of components of controlled/controlling stations including the software versions of relevant supporting tools

#### 3.3

##### **address config**

address config is the configuration file containing the ASDU-addressing including the information object addresses necessary to test all the functionality defined as in the PID

#### 3.4

##### **conformance test**

verification process of the protocol implementation in a device by executing tests according to the applicable test plan, which contain mandatory and possibly mandatory optional test cases, so as to be able to answer the following question:

*“Does the protocol implementation in device xxx of supplier yyy conform to the IEC 60870-5-10x standard and the applicable Protocol Implementation Document (PID)?”*

NOTE A supplier-independent party that is allowed to issue a Conformance Statement can carry out a conformance test.

#### 3.5

##### **device**

mechanism or piece of equipment designed to serve a purpose or perform a function

[IEEE STD 100-1996, IEEE Dictionary of Electrical and Electronic Terms]

#### 3.6

##### **direction**

communication direction in which the device exchanges the data

NOTE IEC 60870-5 companion standards describe functions and ASDU's in the monitor direction (from the controlled to the controlling station) and control direction (from controlling to controlled station) as Normal direction (N). For some purposes, the functions or ASDU's can be used also in the Reverse direction (R) or in Both directions (B). The way they are used should be indicated in the PICS. If reversed direction is enabled, by using R or B, the functionality is used in the reverse direction, the applicable test cases in the normal direction are applicable for the reversed functionality.

#### 3.7

##### **error**

behaviour, which does not conform to the standard and/or the applicable test cases as described in this part of IEC 60870-5

#### 3.8

##### **Factory Acceptance Test**

##### **FAT**

customer agreed functional tests of the specifically manufactured telecontrol equipment or its parts using the parameter set for the planned application

NOTE The FAT should be carried out in the factory of the manufacturer by the use of process simulating test equipment.

### 3.9

#### **function**

tasks performed by the telecontrol equipment

NOTE Generally, functions will exchange data with each other.

### 3.10

#### **hold point**

**H**

point, defined in the appropriate document beyond which an activity should not proceed without the approval of the initiator of the conformance test. If necessary, the test facility could provide a written notice to the initiator at an agreed time prior to the hold point. The initiator or his representative is obliged to verify the hold point and approve the proceeding of the activity

### 3.11

#### **quality program**

quality program for the IEC 60870-5 series as described in Figure 3

### 3.12

#### **initiator of conformance test**

party initiating a conformance test that may be executed by a test facility

### 3.13

#### **interface**

shared boundary between two functional units, defined by functional characteristics, signal characteristics, or other characteristics as appropriate

### 3.14

#### **interoperability**

ability of two or more telecontrol devices from the same vendor, or different vendors, to exchange information and use that information for correct co-operation

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#### **interoperability test**

verification of the information exchange of two or more devices from the same vendor or different vendors.

In case of an open protocol, the test shall give an answer to the following question:

*“Are the devices under test (DUT) able to communicate correctly according to the IEC 60870-5-10x standard and the Protocol Implementation Document (PID)?”*

The interoperability test can be carried by a supplier-independent party that may result in an interoperability statement. A basic condition for this interoperability test is a passed conformance test of both devices

NOTE Interoperability does not necessarily mean that both systems are communicating according a specific protocol, but that both those devices are able to communicate and this might be an open protocol. Interoperability is not interchangeability.

### 3.16

#### **interchangability**

ability to replace a device from the same vendor, or from different vendors, using the same communication interface and as a minimum, with the same functionality, and with no impact on the rest of the system