



BSI Standards Publication

Telecontrol equipment and systems

Part 5-604: Conformance test cases for the
IEC 60870-5-104 companion standard

National foreword

This Published Document is the UK implementation of IEC/TS 60870-5-604:2016. It supersedes DD IEC/TS 60870-5-604:2007 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/57, Power systems management and associated information exchange.

A list of organizations represented on this committee can be obtained on request to its secretary.

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TECHNICAL SPECIFICATION



**Telecontrol equipment and systems –
Part 5-604: Conformance test cases for the IEC 60870-5-104 companion standard**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TELECONTROL EQUIPMENT AND SYSTEMS –

**Part 5-604: Conformance test cases for
the IEC 60870-5-104 companion standard**

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 60870-5-604, which is a technical specification, 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 2007. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Resolution of ambiguities between IEC 60870-5-104:2006 and IEC TS 60870-5-604:2016 (together with IEC 60870-5-104/AMD1);
- b) Refinement of some test cases to enhance operability between tested devices;
- c) Additional test cases (mainly negative test cases) added.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
57/1614/DTS	57/1683/RVC

Full information on the voting for the approval of this technical specification 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 60870 series, published under the general title *Telecontrol equipment and systems*, 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 website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

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 60870, which is a technical specification, describes test cases for conformance testing of telecontrol equipment or systems using the IEC 60870-5-104 companion standard and IEC 60870-5-6, *Guidelines for conformance testing for the IEC 60870-5 companion standards*.

TELECONTROL EQUIPMENT AND SYSTEMS –

Part 5-604: Conformance test cases for the IEC 60870-5-104 companion standard

1 Scope

This part of IEC 60870, which is a technical specification, describes test cases for conformance testing of telecontrol equipment, Substation Automation Systems (SAS) and telecontrol systems, including front-end functions of SCADA, using the IEC 60870-5-104 companion standard and IEC 60870-5-6, *Guidelines for conformance testing for the IEC 60870-5 companion standards*.

The use of this part of IEC 60870 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 specification during testing will minimize the risk of non-interoperability.

The goal of this part of IEC 60870 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 IEC 60870-5-6. 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 a technical specification. Other functionality may need additional test cases but this is outside the scope of this part of IEC 60870. For proper testing, it is recommended to define these additional test cases. This document is such a Technical Specification for the mentioned companion standard.

This part of IEC 60870 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 is done according to these standards.

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.¹

IEC 60870-5-4:1993, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 4: Definition and coding of application information elements*

IEC 60870-5-5:1995, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 5: Basic application functions*

¹ The base standard always takes precedence. In case of ambiguity between this technical specification and the base standards (IEC 60870-5-1 to IEC 60870-5-5, IEC 60870-5-104), this part of IEC 60870 needs to be clarified or amended.

When testing, negative behaviour is not described in the base standard, the behaviour described in this document prevails and should be observed.

The conformance statement produced after testing indicates any lack of conformance to either the test plan or the base standard.

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

IEC 60870-5-101:2003, *Telecontrol equipment and systems – Part 5-101: Transmission protocols – Companion standard for basic telecontrol tasks*

IEC 60870-5-104:2006, *Telecontrol equipment and systems – Part 5-104: Transmission protocols – Network access for IEC 60870-5-101 using standard transport profiles*

IETF RFC2200, *Internet Official Protocol Standards*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60870-5-6 apply.

4 Abbreviated terms

For the purposes of this document, the abbreviations given in IEC 60870-5-6 apply.

5 Conformance testing for IEC 60870-5-104

5.1 Overview and legend

An overview of tests is given in Tables 1 to 26. Procedural and functional testing shall always start with the Station Initialisation function and proceeds with the next Basic Application Functions. The procedure in each test case shall be followed, which means that the DUT is able to function as described in the specific test case.

The test procedures in Tables 1 through 11 shall be carried out with no errors detected during testing of all the Basic Application Functions in Tables 12 through 26. These tests are preferably automatically performed by the used test platform.

In addition to the performance criteria listed in the test procedures, 5.3 lists the protocol specifications that shall be verified automatically by the testing software or verified manually by review of the test history log after execution of the test procedures. The verification shall result in no errors detected during the complete test procedure.

This test plan has a direct reference to the PICS and possibly a PIXIT. Without a reference to a PICS or PIXIT this test plan is obsolete.

Test case numbering syntax is subclause number + table number + test case number.

Test cases are mandatory depending on the description in the column 'Required'. The following situations are possible:

M = Mandatory test case regardless if enabled in the PICS/PIXIT, not only in one situation but during execution of all the tests as in the PICS and/or PIXIT

PICS, x.x = Mandatory test case if the functionality is enabled in the PICS (by marking the applicable check box), with a reference to the section number of the PICS (x.x);

NOTE PICS 9.x always refers to 60870-5-104:2006, Clause 9.

PIXIT = Mandatory test case if the functionality is enabled/described in the PIXIT. Verification of these test cases by the user/owner of the PIXIT is required before the test is started.

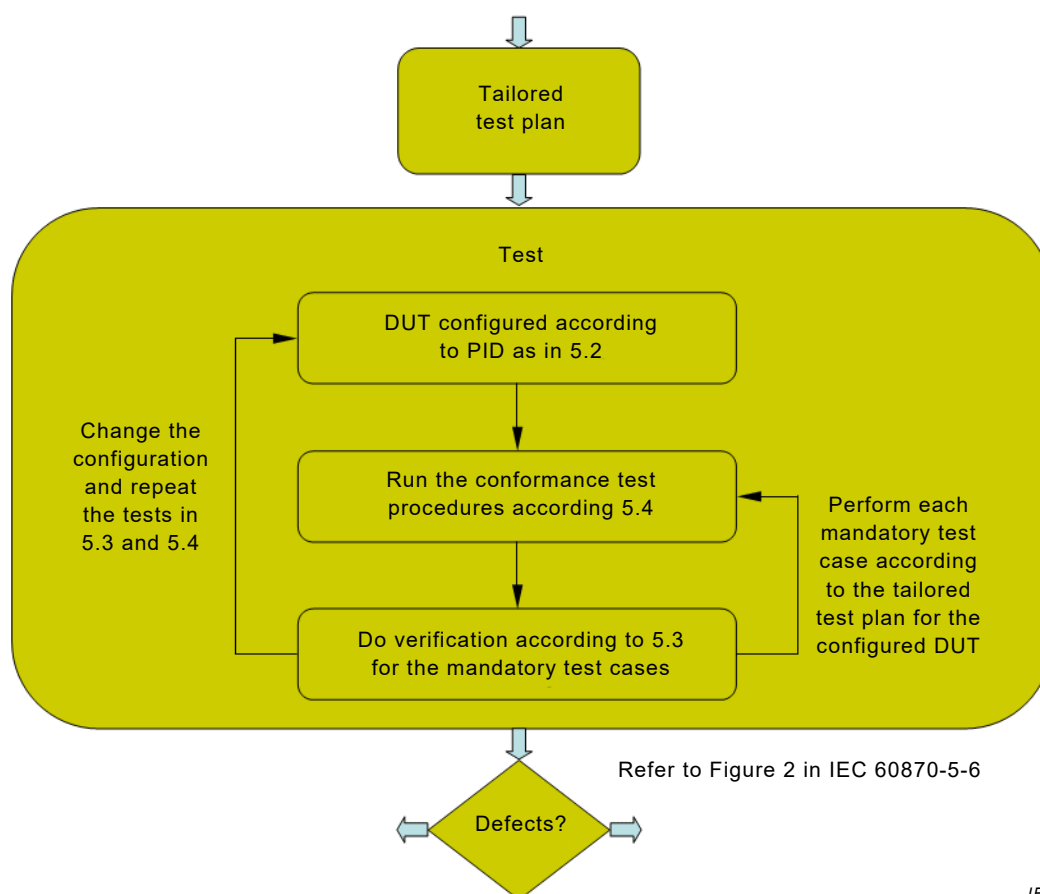
For each test case the test results shall be marked in the appropriate column of the test result chart in 5.5 and 5.6. Each test case can either pass the test (Passed), fail the test (Failed), not applicable, when the configuration value is not supported by the device (N.A.), or the test case was not performed (Empty). Ideally, there should be no empty boxes when testing is complete.

For testing reverse direction, the same test procedures apply in the opposite direction (replace "Controlling" with "Controlled" and vice versa), except for COT44-47 which are only defined in Monitor direction (only a controlled station is allowed to send these COT).

The test tables are divided into 5 subclauses:

- Subclause 5.2 Configuration parameters IEC 60870-5-104
- Subclause 5.3 Verification of IEC 60870-5-104 communication
- Subclause 5.4 Conformance test procedures
- Subclause 5.5 Test result chart
- Subclause 5.6 Test results of command transmission

The procedure to perform all the mandatory test cases, according to the PID, is shown in Figure 1.



IEC

Figure 1 – Test procedure

5.2 Configuration parameters IEC 60870-5-104

Since IEC 60870-5-104 contains a number of configuration parameters affecting protocol behaviour, the conformance test procedures in 5.4 and verification in 5.3 shall be performed at least once for each supported value of the parameters listed in Table 1. Basically the DUT shall be tested if the functionality in 5.3 and 5.4 behaviour is correct for the configuration(s) in Table 1.

Table 1 – Run the Conformance Test Procedures for
each of the following supported configuration parameter values

No.	Test	Description	Reference	Required
5.2.1.1	System definition	Controlling station test (Master)		PICS, 9.1
5.2.1.2		Controlled station test (Slave)		PICS, 9.1
5.2.1.50	Frame length	Maximum length L (control direction)	IEC 60870-5-101:2003, 6.2	PICS, 9.4
5.2.1.51		Maximum length L (monitor direction)	IEC 60870-5-101:2003, 6.2	PICS, 9.4
5.2.1.70	COMMON ADDRESS of ASDU	Two (2) octets for Common Address of ASDU (CASDU)	IEC 60870-5-101:2003, 7.2.4	PICS, 9.5
5.2.1.80	INFORMATION OBJECT ADDRESS	Three (3) octets for Information Object Address (structured or unstructured)	IEC 60870-5-101:2003, 7.2.5	PICS, 9.5
5.2.1.90	CAUSE OF TRANSMISSION	Two (2) octets for COT field (2 nd octet is Originator address)	IEC 60870-5-101:2003, 7.2.3	PICS, 9.5

5.3 Verification of IEC 60870-5-104 communication

This subclause lists the protocol specifications that shall be verified automatically by the testing software or verified manually by review of the test history log after execution of the test procedures. Every test case describes functionality that has passed the test if the functionality as in the the description column was shown to be correct. Correct means: the functionality shall be checked either automatically or manually, and also be checked by the test engineer in a human readable format log-file. For example to test the IV qualifier of some information elements, the ASDU containing this element shall be sent with the IV=1. Every test case marked "Passed", has to be verifiable during testing and archived in log-files for post assessment.

To identify if a test case is mandatory, it is necessary to read 5.1 carefully.



Table 2 – Tests on transport provider level (1 of 5)

No.	Test	Description	Reference	Required
5.3.2.1	IP FRAME	IP Header, IP Fragment Re-assembling	IETF RFC2200	M
5.3.2.2		Source Address, Destination address	IETF RFC2200	M
5.3.2.3	TCP FRAME	TCP Header, TCP Control field (specifically ACK, RST, SYN, FIN), TCP Sequencing	IETF RFC2200	M
5.3.2.4		[The server (controlled station) uses the] port number 2404 [(confirmed by IANA) in all cases, both for the listening port and established connections. The client (controlling station) is free to use ephemeral port number, e.g. as allocated by the client's TCP/IP implementation]	IEC 60870-5-104:2006, 5.4	M
5.3.2.5		Actively <i>opening</i> a new TCP connection starts with a TCP frame containing (SYN) from the node that takes the initiative to establish the TCP connection. This is answered by the other node with (SYN, ACK), which in turn is answered by the initiating node with (ACK). Thereinafter the TCP connection is established	IETF RFC2200 IEC 60870-5-104:2006, 7.1	M
5.3.2.6		Actively <i>closing</i> an established TCP connection starts with a TCP frame containing (FIN) from the node that takes the initiative to close the TCP connection. This is answered by the other node (ACK) followed by a TCP frame from this same other node containing also (FIN). This in turn is answered by the initiating node with (ACK). Thereinafter the TCP connection is closed. It can be accepted if a node combines an (ACK) and a (FIN) in a single TCP frame in reply to a TCP frame with a (FIN).	IETF RFC2200 IEC 60870-5-104:2006, 7.1, Figure 19	M
5.3.2.7	CS104 APDU FRAME LAYOUT	During the test no problems should be detected on TCP/IP level	IETF RFC2200	M
5.3.2.10		Start character of APDU: 68 _H	IEC 60870-5-104:2006, Clause 5	M
5.3.2.11		Configured number of octets L as the maximum number of Data octets (ASDU + Control field) in APDU: The maximum length of APDU for both directions is 253. It is a fixed system parameter.	IEC 60870-5-104:2006, Clause 5	M
5.3.2.12		4-octet Control field	IEC 60870-5-104:2006, Clause 5	M

Table 2 (2 of 5)

No.	Test	Description	Reference	Required
5.3.2.20	CS104 I-FORMAT APDU Information transfer frame	Control field octet 1 bit 1 (LSB) = 0	IEC 60870-5-104:2006, Clause 5	M
5.3.2.21		Control field octets 1-2, bit 2..16 contain end sequence number N(S) range 0..Maximum value 32767	IEC 60870-5-104:2006, Clause 5	M
5.3.2.22		Control field octet 3 bit 1 (bit 17) = 0	IEC 60870-5-104:2006, Clause 5	M
5.3.2.23		Control field octets 3-4, bit 18..32 contain Receive sequence number N(R) range 0..maximum value 32767	IEC 60870-5-104:2006, Clause 5	M
5.3.2.24		I-format frame contains exactly one ASDU	IEC 60870-5-104:2006, Clause 5	M
5.3.2.25	CS104 S-FORMAT APDU Numbered Supervisory function frame	Control field octet 1, bit 1-2 have value 01 _B	IEC 60870-5-104:2006, Clause 5	M
5.3.2.26		Control field octets 1-2, bit 3..16 all contain value 0	IEC 60870-5-104:2006, Clause 5	M
5.3.2.27		Control field octet 3 bit 1 (bit 17) = 0	IEC 60870-5-104:2006, Clause 5	M
5.3.2.28		Control field octets 3-4, bit 18..32 contain Receive sequence number N(R) range 0..maximum value 32767	IEC 60870-5-104:2006, Clause 5	M
5.3.2.29		S-frame APDU only contains a single APCI field	IEC 60870-5-104:2006, Clause 5	M
5.3.2.30	CS104 U-FORMAT APDU Unnumbered Control function frame	Control field octet 1, bit 1-2 have value 11 _B	IEC 60870-5-104:2006, Clause 5	M
5.3.2.31		Control field octet 1, bit 3 used for control function STARTDT Activation	IEC 60870-5-104:2006, Clause 5	M
5.3.2.32		Control field octet 1, bit 4 used for control function STARTDT Confirmation	IEC 60870-5-104:2006, Clause 5	M
5.3.2.33		Control field octet 1, bit 5 used for control function STOPDT Activation	IEC 60870-5-104:2006, Clause 5	M
5.3.2.34		Control field octet 1, bit 6 used for control function STOPDT Confirmation	IEC 60870-5-104:2006, Clause 5	M
5.3.2.35		Control field octet 1, bit 7 used for control function TESTFR Activation	IEC 60870-5-104:2006, Clause 5	M
5.3.2.36		Control field octet 1, bit 8 used for control function TESTFR Confirmation	IEC 60870-5-104:2006, Clause 5	M
5.3.2.37		Control field bit 3..8 contains exactly one active (bit with value 1) Control function (TESTFR, STARTDT, STOPDT, either Activation or Confirmation) per U-frame	IEC 60870-5-104:2006, Clause 5	M
5.3.2.38		Control field octets 2-4, bit 9..32 all contain value 0	IEC 60870-5-104:2006, Clause 5	M
5.3.2.39		U-frame APDU only contains a single APCI field	IEC 60870-5-104:2006, Clause 5	M

Table 2 (3 of 5)

No.	Test	Description	Reference	Required
5.3.2.50	TRANSMISSION PROCEDURE	Balanced transmission (after TCP connection has been established)	IEC 60870-5-104:2006, Introduction	M
		The initial values of the Send sequence number N(S) and the Receive sequence number N(R) are set to 0 (zero) after a new TCP connection is successfully established which is then a Stopped connection	IEC 60870-5-104:2006, 5.1	M
		An I-frame contains the current values of the Send sequence number N(S) and the Receive sequence number N(R)	IEC 60870-5-104:2006, 5.1	M
		After <i>sending</i> an I-frame, the Send sequence number N(S) in the Primary station is incremented with 1	IEC 60870-5-104:2006, 5.1	M
		After <i>receiving</i> a valid I-frame, the Receive sequence number N(R) in the Secondary station is incremented with 1	IEC 60870-5-104:2006, 5.1	M
		Yet unacknowledged I-frames from the Primary station are acknowledged by either an I-frame or an S-frame from the Secondary station	IEC 60870-5-104:2006, 5.1	M
		The Receive sequence number N(R) acknowledges all yet unacknowledged I-frames with $N(S) < N(R)$	IEC 60870-5-104:2006, 5.1	M
		A Primary station sends at most the configured amount of K unacknowledged I-frames before it stops and waits for an acknowledgement	IEC 60870-5-104:2006, 5.5	M
		A Secondary station sends an acknowledgement after receiving at most the configured amount of W I-frames	IEC 60870-5-104:2006, 5.5	M
		An APDU with a Send sequence number N(S) that is <i>higher or lower (called "out of sequence")</i> than the current Receive sequence number N(R), results in [sending an S-frame to confirm the I-frames that it has received (if applicable) after which] a TCP Active close (TCP Control field FIN) is given by the Secondary Station (because one or more previous APDUs may have been lost along the way to their destination due to connection failures)	IEC 60870-5-104:2006, 5.1	M
		U-Frame Control function STARTDT_ACT answered with STARTDT_CON	IEC 60870-5-104:2006, 5.3	M
		U-Frame Control function STOPDT_ACT answered with STOPDT_CON	IEC 60870-5-104:2006, 5.3	M
		U-Frame Control function TESTFR_ACT answered with TESTFR_CON	IEC 60870-5-104:2006, 5.2	M

Table 2 (4 of 5)

No.	Test	Description	Reference	Required
5.3.2.70	TRANSMISSION CONTROL USING START/STOP	After a TCP connection has been established, initially a <i>Stopped connection</i> is created (a <i>Stopped connection</i> is an open ("established") TCP connection that is in confirmed STOPDT state) and allows the exchange of U-frames in controlling and controlled direction	IEC 60870-5-104:2006, 5.3	M
		The receipt of I- and S-frames in a <i>Stopped connection</i> results in a TCP Active close (TCP Control field FIN).	IEC 60870-5-104:2006, 5.3	M
		The controlling station sends a STARTDT_ACT after which a <i>Pending Started connection</i> is created.	IEC 60870-5-104:2006, 5.3	M
		If no redundant links are configured, the controlling station may send U-, I-, and S- frames immediately after the STARTDT_ACT which will be accepted by the controlled station		
		The controlled station explicitly disables the transfer of I- and S-frames and the controlling station does not accept I- or S-frames in a <i>Pending Started connection</i> , but only U-frames	IEC 60870-5-104:2006, 5.3	M
		After the controlling station has received STARTDT_CON, the <i>Started connection</i> is created and the controlled station may send U-, I-, and S- frames immediately after the STARTDT_CON. Controlled and controlling stations are allowed to send U-, I-, and S- frames	IEC 60870-5-104:2006, 5.3	M
		The Controlling station explicitly disables the transfer of I-frames in monitoring direction by sending a STOPDT_ACT to the Controlled station, after which a <i>Pending Stopped connection</i> is created	IEC 60870-5-104:2006, 5.3	M
		The controlled station disables the transfer of I-frames after the STOPDT_ACT is received. The controlling station may receive I-frames, which are transferred before the receipt of the STOPDT_ACT	IEC 60870-5-104:2006, 5.3	M
		If unconfirmed I-frames are in the controlled station, the <i>Pending Stopped connection</i> is called the <i>Pending Unconfirmed Stopped connection</i> . If the controlled station receives the S-frame to confirm the I-frames (immediately or after time-out t2 of the controlling station expires) the controlled station sends the STOPDT_CON after the <i>Stopped connection</i> is created	IEC 60870-5-104:2006, 5.3	M
		If NO unconfirmed I-frames are in the controlled station the controlled station sends a STOPDT_CON to the controlling station after which the <i>Stopped connection</i> is created	IEC 60870-5-104:2006, 5.3	M
		Send sequence number N(S) and Receive Sequence number N(R) remain unchanged during the use of U-frames with STARTDT / STOPDT indications	IEC 60870-5-104:2006, 5.3	M

Table 2 (5 of 5)

No.	Test	Description	Reference	Required
5.3.2.90	TIME OUT INTERVALS	An unanswered TCP Active open by the (fixed) Controlling Station (TCP Control field SYN: CONNECTION REQUEST) is actually cancelled after the configured time out t_0 (range 1..255 s) and subsequently restarted. It is highly recommended to cancel the current timed out TCP Active open, to prevent against an increasing number of "not cancelled" TCP connections because of the limited number of available open connections in a system	IEC 60870-5-104:2006, 7.1, Figure 19	PIXIT
		A TCP Passive open by the Controlled Station (LISTEN) remains active infinitely until a CONNECT is received	IEC 60870-5-104:2006, 7.1	M
		An I-frame from the Primary Station that is not acknowledged within the configured time out t_1 (range 1..255 s) results in a TCP Active close (TCP Control field FIN) by the Primary Station. [The time out t_1 runs for every I-frame individually and is cancelled if that particular I-frame has been confirmed.]	IEC 60870-5-104:2006, 5.1, Figure 12 IEC 60870-5-104:2006, 5.2 IEC 60870-5-104:2006, 5.3	M
		A U-frame from the Primary Station that is not confirmed within the configured time out t_1 (range 1..255 s) results in a TCP Active close (TCP Control field FIN) by the Primary Station	IEC 60870-5-104:2006, 5.1 IEC 60870-5-104:2006, 5.2	M
		After the configured time period t_2 (range 1..254 s) of transmitting I-frames, [which starts after the first unconfirmed frame is received], from the Primary Station in one direction only, an S-frame is sent by the Secondary Station to acknowledge the last I-frame	IEC 60870-5-104:2006, 5.1, Figure 10	M
		$t_2 < t_1$	IEC 60870-5-104:2006, 9.6	M
		After the configured time period t_3 (range 1 s..48 h, resolution 1 s) of inactivity (no reception of I-, S- or U-frames on the connection by either Primary or Secondary station), a U-frame with TESTFR_ACT is sent. The reception of every frame – I frame, S frame or U frame – re-triggers timer t_3 and all time out interval rules apply	IEC 60870-5-104:2006, 5.2	M
		$t_3 > t_1$	IEC 60870-5-104:2006, 9.6	M

Table 3 – Tests on data unit identifier

No.	Test	Description	Reference	Required
5.3.3.1	TYPE IDENTIFICATION	Compatible ASDU type used/accepted for all ASDUs as in the PICS	IEC 60870-5-101:2003, 7.2.1.1 IEC 60870-5-101:2003, 7.3.1 IEC 60870-5-104:2006, Clause 8 PID	PICS, 9.5
5.3.3.2	VARIABLE STRUCTURE QUALIFIER	Variable structure qualifier SQ (Sequence or Set) as defined for each ASDU	IEC 60870-5-101:2003, 7.2.2 IEC 60870-5-101:2003, 7.3.1	M
5.3.3.3		SQ:=1 only for COT Spontaneous (3), Cyclic/Periodic (1), Background Scan (2) or Interrogation (20..36). Check the PICS for the supported COT values	IEC 60870-5-101:2003, 7.2.2	PIXIT
5.3.3.4		Variable structure qualifier i (Number of elements) according to transmitted number of information elements	IEC 60870-5-101:2003, 7.2.2	M
5.3.3.5		Defined number of octets for ASDU	IEC 60870-5-101:2003, 7.2	M
5.3.3.10		Originator address identifies source application of Primary station or 0 if present but not used	IEC 60870-5-101:2003, 7.2.3 IEC 60870-5-104:2006, 9.5	PIXIT
5.3.3.11	CAUSE OF TRANSMISSION	Compatible Cause Of Transmission (COT) used/accepted. Check the PICS for the supported COT values	IEC 60870-5-101:2003, 7.2.3 IEC 60870-5-101:2003, 7.2.3	PICS, 9.5
5.3.3.12		P/N bit = 0: positive confirmation of activation	IEC 60870-5-101:2003, 7.2.3	M
5.3.3.13		P/N bit = 1: negative confirmation of activation	IEC 60870-5-101:2003, 7.2.3	M
5.3.3.14		Test bit = 0: ASDU generated during normal conditions	IEC 60870-5-101:2003, 7.2.3	M
5.3.3.15		Test bit = 1: ASDU generated during test conditions	IEC 60870-5-101:2003, 7.2.3	PIXIT

Table 4 – Verification of ASDUs for process information in monitor (normal) direction (1 of 18)

No.	Test	Description	Reference	Required
5.3.4.10	M_SP_NA_1 ASDU 1 Single-point information	SIQ with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.1	PICS, 9.5
5.3.4.11		SIQ with SQ = 1, with only the IOA of the 1 st element and the following Information Elements are identified by numbers incrementing continuously by +1 from this offset (see IEC 60870-5-101:2003, 7.2.2.1)	IEC 60870-5-101:2003, 7.3.1.1	PIXIT
5.3.4.12		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.1	PICS, 9.5
5.3.4.13		SPI = 0 (OFF), 1 (ON)	IEC 60870-5-101:2003, 7.2.6.1	PICS, 9.5
5.3.4.14		RES = 0	IEC 60870-5-101:2003, 7.2.6.1	PICS, 9.5
5.3.4.15		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.4.16		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.4.17		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.4.18		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PICS, 9.5
5.3.4.30		DIQ with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.3	PICS, 9.5
5.3.4.31	M_DP_NA_1 ASDU 3 Double-point information	DIQ with SQ = 1, with only the IOA of the 1 st element and the following Information Elements are identified by numbers incrementing continuously by +1 from this offset (see IEC 60870-5-101:2003, 7.2.2.1)	IEC 60870-5-101:2003, 7.3.1.3	PIXIT
5.3.4.32		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.3	PICS, 9.5
5.3.4.33		DPI = 0 (indeterminate or intermediate state), 1 (OFF), 2 (ON), 3 (indeterminate state)	IEC 60870-5-101:2003, 7.2.6.2	PICS, 9.5
5.3.4.34		RES = 0	IEC 60870-5-101:2003, 7.2.6.2	PICS, 9.5
5.3.4.35		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.4.36		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.4.37		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.4.38		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PICS, 9.5

Table 4 (2 of 18)

No.	Test	Description	Reference	Required
5.3.4.50	M_ST_NA_1	VTI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.5	PICS, 9.5
5.3.4.51	ASDU 5 Step-position information	VTI with SQ = 1, with only the IOA of the 1st element and the following Information Elements are identified by numbers incrementing continuously by +1 from this offset (see IEC 60870-5-101:2003, 7.2.2.1)	IEC 60870-5-101:2003, 7.3.1.5	PIXIT
5.3.4.52		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.5	PICS, 9.5
5.3.4.53	VTI	Value valid range -64...+63	IEC 60870-5-101:2003, 7.2.6.5	PICS, 9.5
5.3.4.54		Transient = 0,1	IEC 60870-5-101:2003, 7.2.6.5	PICS, 9.5
5.3.4.55	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.56		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.57		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.58		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.59		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.60		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.70	M_BO_NA_1	BSI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.7	PICS, 9.5
5.3.4.71	ASDU 7 Bitstring of 32 bit	BSI with SQ = 1, with only the IOA of the 1st element and the following Information Elements are identified by numbers incrementing continuously by +1 from this offset (see IEC 60870-5-101:2003, 7.2.2.1)	IEC 60870-5-101:2003, 7.3.1.7	PIXIT
5.3.4.72		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.7	PICS, 9.5
5.3.4.73	BSI	BSI = 0,1	IEC 60870-5-101:2003, 7.2.6.13	PICS, 9.5
5.3.4.74	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.75		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT

Table 4 (3 of 18)

No.	Test	Description	Reference	Required
5.3.4.76		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.77		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.78		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.79		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.90	M_ME_NA_1 ASDU 9 Measured value, normalised value	NVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.9	PICS, 9.5
5.3.4.91		NVA with SQ = 1, with only the IOA of the 1st element and the following Information Elements are identified by numbers incrementing continuously by +1 from this offset (see IEC 60870-5-101:2003, 7.2.2.1)	IEC 60870-5-101:2003, 7.3.1.9	PIXIT
5.3.4.92		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.9	PICS, 9.5
5.3.4.93		Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.6	PICS, 9.5 PIXIT
5.3.4.94	QDS	Range -1 to $+1-2^{-15}$	IEC 60870-5-101:2003, 7.2.6.6	PICS, 9.5
5.3.4.95		RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.96		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.97		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.98		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.99		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.100		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5

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No.	Test	Description	Reference	Required
5.3.4.110	M_ME_NB_1 ASDU 11 Measured value, scaled value	SVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.11	PICS, 9.5
5.3.4.111		SVA with SQ = 1, with only the IOA of the 1st element and the following Information Elements are identified by numbers incrementing continuously by +1 from this offset (see IEC 60870-5-101:2003, 7.2.2.1)	IEC 60870-5-101:2003, 7.3.1.11	PIXIT
5.3.4.112		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.11	PICS, 9.5
5.3.4.113	SVA	Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.7	PICS, 9.5 PIXIT
5.3.4.114		Range -2^{15} to $2^{15} - 1$	IEC 60870-5-101:2003, 7.2.6.7	PICS, 9.5
5.3.4.115	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.116		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.117		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.118		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.119		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.120		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.130	M_ME_NC_1 ASDU 13 Measured value, short floating point number	IEEE STD 754 with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.13	PICS, 9.5
5.3.4.131		IEEE STD 754 with SQ = 1, with only the IOA of the 1st element and the following Information Elements are identified by numbers incrementing continuously by +1 from this offset (see IEC 60870-5-101:2003, 7.2.2.1)	IEC 60870-5-101:2003, 7.3.1.13	PIXIT
5.3.4.132		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.13	PICS, 9.5

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No.	Test	Description	Reference	Required
5.3.4.133	IEEE STD 754	Fraction = 0.. $1-2^{-23}$	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 9.5
5.3.4.134		Exponent = 0.. 255	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 9.5
5.3.4.135		Sign = 0,1	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 9.5
5.3.4.136	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.137		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.138		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.139		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.140		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.141	M_IT_NA_1 ASDU 15 Integrated totals	OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.150		BCR with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.15	PICS, 9.5
5.3.4.151		BCR with SQ = 1, with only the IOA of the 1st element and the following Information Elements are identified by numbers incrementing continuously by +1 from this offset (see IEC 60870-5-101:2003, 7.2.2.1)	IEC 60870-5-101:2003, 7.3.1.15	PIXIT
5.3.4.152		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.15	PICS, 9.5
5.3.4.153		Value range -2^{31} to $+2^{31}-1$	IEC 60870-5-101:2003, 7.2.6.9	PICS, 9.5
5.3.4.154	BCR	Sequence Number SQ range 0 to 31	IEC 60870-5-101:2003, 7.2.6.9	PICS, 9.5
5.3.4.155		CY = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 9.5
5.3.4.156		CA = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 9.5
5.3.4.157		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 9.5
5.3.4.170		SCD with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.20	PICS, 9.5
5.3.4.171	M_PS_NA_1 ASDU 20 Packed single-point information with status change detection	SCD with SQ = 1, with only the IOA of the 1st element and the following Information Elements are identified by numbers incrementing continuously by +1 from this offset (see IEC 60870-5-101:2003, 7.2.2.1)	IEC 60870-5-101:2003, 7.3.1.20	PIXIT
5.3.4.172		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.20	PICS, 9.5

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No.	Test	Description	Reference	Required
5.3.4.173	SCD	STi = 0,1	IEC 60870-5-101:2003, 7.2.6.40	PIXIT
5.3.4.174		CDi = 0,1	IEC 60870-5-101:2003, 7.2.6.40	PIXIT
5.3.4.175	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.176		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.177		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.178		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.179		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.180		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.190	M_ME_ND_1	NVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.21	PICS, 9.5
5.3.4.191	ASDU 21 Measured value, normalised value without quality descriptor	NVA with SQ = 1, with only the IOA of the 1st element and the following Information Elements are identified by numbers incrementing continuously by +1 from this offset (see IEC 60870-5-101:2003, 7.2.2.1)	IEC 60870-5-101:2003, 7.3.1.21	PIXIT
5.3.4.192	NVA	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.21	PICS, 9.5
5.3.4.193		Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.6	PICS, 9.5 PIXIT
5.3.4.194		Range -1 to +1-2 ⁻¹⁵	IEC 60870-5-101:2003, 7.2.6.6	PICS, 9.5
5.3.4.210	M_SP_TB_1	SIQ with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.22	PICS, 9.5
5.3.4.211	ASDU 30 Single-point information with time tag CP56Time2a	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.22	PICS, 9.5

Table 4 (7 of 18)

No.	Test	Description	Reference	Required
5.3.4.212	SIQ	SPI = 0 (OFF), 1 (ON)	IEC 60870-5-101:2003, 7.2.6.1	PICS, 9.5
5.3.4.213		RES = 0	IEC 60870-5-101:2003, 7.2.6.1	PICS, 9.5
5.3.4.214		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.4.215		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.4.216		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.4.217		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PICS, 9.5
5.3.4.218	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.219		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.220		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.221		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.222		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.223		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.224		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.225		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.226		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.227		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.228		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.230	M_DP_TB_1 ASDU 31 Double-point information with time-tag CP56Time2a	DIQ with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.23	PICS, 9.5
5.3.4.231		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.23	PICS, 9.5

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No.	Test	Description	Reference	Required
5.3.4.232	DIQ	DIQ = 0 (indeterminate or intermediate state), 1 (OFF), 2 (ON), 3 (indeterminate state)	IEC 60870-5-101:2003, 7.2.6.2	PICS, 9.5
5.3.4.233		RES = 0	IEC 60870-5-101:2003, 7.2.6.2	PICS, 9.5
5.3.4.234		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.4.235		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.4.236		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.4.237		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PICS, 9.5
5.3.4.238	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.239		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.240		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.241		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.242		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.243		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.244		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.245		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.246		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.247		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.248		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.250	M_ST_TB_1	VTI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.24	PICS, 9.5
5.3.4.251	ASDU 32 Step-position information with time-tag CP56Time2a	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.24	PICS, 9.5
5.3.4.252	VTI	Value valid range -64..+63	IEC 60870-5-101:2003, 7.2.6.5	PICS, 9.5
5.3.4.253		Transient = 0,1	IEC 60870-5-101:2003, 7.2.6.5	PICS, 9.5

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No.	Test	Description	Reference	Required
5.3.4.254	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.255		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PXIT
5.3.4.256		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PXIT
5.3.4.257		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PXIT
5.3.4.258		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.259		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.260	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.261		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.262		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.263		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.264		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.265		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.266		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.267		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.268		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.269		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.270	M_BO_TB_1	year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.280		BSI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.25	PICS, 9.5
5.3.4.281		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.25	PICS, 9.5
5.3.4.282		BSI	IEC 60870-5-101:2003, 7.2.6.13	PICS, 9.5

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No.	Test	Description	Reference	Required
5.3.4.283	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.284		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.285		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.286		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.287		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.288		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.289	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.290		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.291		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.292		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.293		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.294		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.295		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.296		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.297		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.298		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.299		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.310	M_ME_TD_1 ASDU 34 Measured value, normalised value with time-tag CP56Time2a	NVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.26	PICS, 9.5
5.3.4.311		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.26	PICS, 9.5
5.3.4.312		Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.6	PICS, 9.5 PIXIT
5.3.4.313		Range -1 to +1-2 ⁻¹⁵	IEC 60870-5-101:2003, 7.2.6.6	PICS, 9.5

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No.	Test	Description	Reference	Required
5.3.4.314	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.315		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.316		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.317		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.318		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.319		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.320	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.321		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.322		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.323		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.324		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.325		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.326		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.327		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.328		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.329		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.330	M_ME_TE_1 ASDU 35	year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.340		SVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.27	PICS, 9.5
5.3.4.341		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.27	PICS, 9.5
5.3.4.342		Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.7	PICS, 9.5
5.3.4.343	SVA	Range -2^{15} to $2^{15} - 1$	IEC 60870-5-101:2003, 7.2.6.7	PICS, 9.5

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No.	Test	Description	Reference	Required
5.3.4.344	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.345		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.346		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.347		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.348		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.349		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.350	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.351		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.352		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.353		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.354		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.355		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.356		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.357		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.358		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.359		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.360		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.370	M_ME_TF_1	IEEE STD 754 with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.28	PICS, 9.5
5.3.4.371	ASDU 36 Measured value, short floating point number with time-tag CP56Time2a	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.28	PICS, 9.5

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No.	Test	Description	Reference	Required
5.3.4.372	IEEE STD 754	Fraction = 0.. 1-2 ⁻²³	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 9.5
5.3.4.373		Exponent = 0.. 255	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 9.5
5.3.4.374		Sign = 0,1	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 9.5
5.3.4.375		QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3
5.3.4.376	BL = 0,1		IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.377	SB = 0,1		IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.378	NT = 0,1		IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.4.379	IV = 0,1		IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.380	OV = 0,1		IEC 60870-5-101:2003, 7.2.6.3	PICS, 9.5
5.3.4.381	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.382		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.383		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.384		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.385		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.386		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.387		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.388		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.389		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.390		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.391		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5



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No.	Test	Description	Reference	Required
5.3.4.400	M_IT_TB_1	BCR with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.29	PICS, 9.5
5.3.4.401	ASDU 37 Integrated totals with time tag CP56Time2a	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.29	PICS, 9.5
5.3.4.402	BCR	range -2^{31} to $+2^{31}-1$	IEC 60870-5-101:2003, 7.2.6.9	PICS, 9.5
5.3.4.403		Sequence Number SQ range 0 to 31	IEC 60870-5-101:2003, 7.2.6.9	PICS, 9.5
5.3.4.404		CY = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 9.5
5.3.4.405		CA = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 9.5
5.3.4.406		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 9.5
5.3.4.407	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.408		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.409		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.410		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.411		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.412		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.413		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.414		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.415		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.416		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.417		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5

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No.	Test	Description	Reference	Required
5.3.4.430	M_EP_TD_1	SEP with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.30	PICS, 9.5
5.3.4.431	ASDU 38 Event of protection equipment with time-tag CP56Time2a	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.30	PICS, 9.5
5.3.4.432	SEP	ES = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.4.433		RES = 0	IEC 60870-5-101:2003, 7.2.6.10	PICS, 9.5
5.3.4.434		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.4.435		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.4.436		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.4.437		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PICS, 9.5
5.3.4.438		EI = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.4.439	CP16Time2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.20	PICS, 9.5
5.3.4.440	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.441		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.442		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.443		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.444		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.445		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.446		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.447		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.448		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.449		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5
5.3.4.450		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 9.5