IEC TS 60870-5-601

Edition 2.0 2015-10

TECHNICAL SPECIFICATION

colour inside

Telecontrol equipment and systems – Part 5-601: Transmission protocols – Conformance test cases for the IEC 60870-5-101 companion standard

IEC TS 60870-5-601:2015-10(en)

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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.

This technical specification is to be used in conjunction with IEC 60870-5-101:2003/AMD1:2015. IEC 60870-5-101:2003/AMD1:2015 resolves ambiguities

and inconsistencies discovered by users of the standard and was worked out in parallel with IEC 60870-5-601:2006.

IEC 60870-5-601, 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 2006. This edition constitutes a technical revision.

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

a) Resolving ambiguities and inconsistencies between IEC 60870-5-101:2003 and IEC TS 60870-5-601:2006;
b) Enhancements and optimisation of test cases which are needed to prove conformance with IEC 60870-5-101:2003;
c) Additional negative test cases made to avoid circulation of messages not conformant with IEC 60870-5-101:2003.

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

Enquiry draft	Report on voting
57/1528/DTS	57/1590/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 the IEC 60870 series, 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 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

- 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.

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TELECONTROL EQUIPMENT AND SYSTEMS –

Part 5-601: Transmission protocols – Conformance test cases for the IEC 60870-5-101 companion standard

1 Scope

This part of IEC 60870describes test cases for conformance testing of telecontrol equipment, Substation Automation Systems (SAS) and telecontrol systems, including front-end functions of SCADA.

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 part of IEC 60870 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 procedures, will become available as a technical specification (TS). Other functionality may need additional test cases but this is beyond the scope of this part of IEC 60870. For proper testing, it is recommended to define these additional test cases.

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 in accordance with 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 60870-5-1:1990, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section One: Transmission frame formats*

IEC 60870-5-2:1992, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 2: Link transmission procedures*

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[1] The base standard always takes precedence. In case of ambiguity between this part of IEC 60870 and the base standards (IEC 60870-5-1 to IEC 60870-5-5, IEC 60870-5-101), 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 part of IEC 60870 shall prevail and shall be observed.

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

IEC 60870-5-3:1992, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 3: General structure of application data*

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

IEC 60870-5-5:1999, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 5: Basic application functions*

IEC 60870-5-6, *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 60870-5-101:2003/AMD1:2015

IEEE 754, *Standard for Binary Floating-Point Arithmetic*

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 60870-5-101

5.1 Overview and legend

Procedural and functional testing should always start with the Station Initialization function and proceeds with the next Basic Application Functions. The procedure in each test case should be followed, which means that the DUT is able to function as described in the specific test case.

The test procedures in Tables 1 to 14 should be tested with no errors detected during testing of all the Basic Application Functions in Tables 15 to 32. These tests are preferably automatically performed by the used test platform.

In addition to the performance criteria listed in the test procedures, Subclause 5.3 lists the protocol specifications that should 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 should 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 Subclause number of the PICS (x.x); For example: PICS 8.x always refers to IEC 60870-5-101:2003, Clause 8

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 need to 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), be 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 five subclauses:

– Subclause 5.2, Configuration Parameters for IEC 60870-5-101
– Subclause 5.3, Verification of IEC 60870-5-101 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.

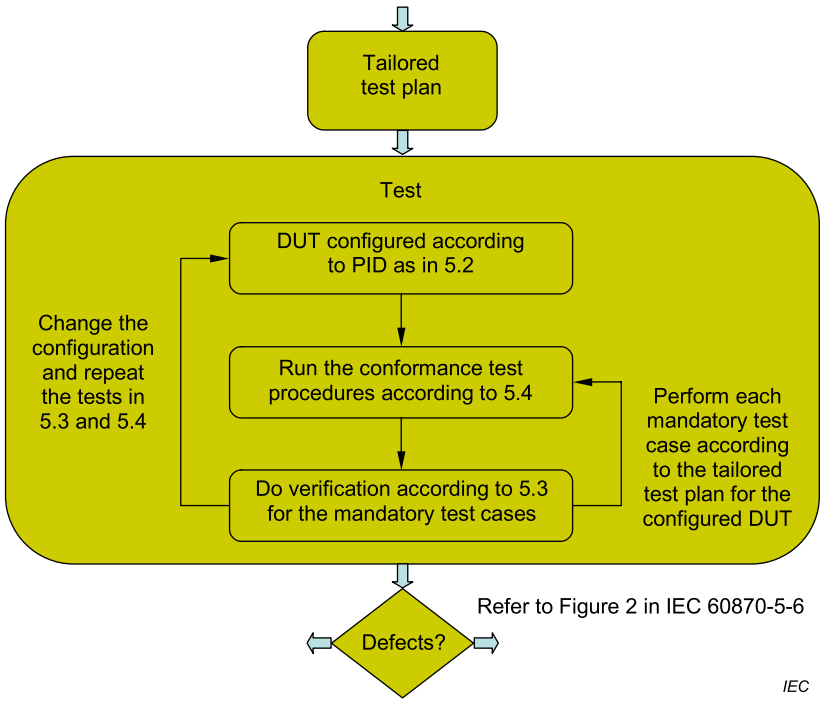

Figure 1 – Test procedure

5.2 Configuration parameters for IEC 60870-5-101

Since IEC 60870-5-101 contains a number of configuration parameters affecting protocol behaviour, it should be tested that the functionality in 5.3 and 5.4 is correct for the configuration(s) in Table 1.

Table 1 – Configuration Parameters for IEC 60870-5-101

Table 1a – Configuration Parameter Values

Test No.	Test	Description	Reference	Required
5.2.1.1	System definition	Controlling station test (Master)		PICS, 8.1
5.2.1.2		Controlled station test (Slave)		PICS, 8.1
5.2.1.20	Physical layer	Transmission speed(s) in control direction test maximum baud rate, minimum baud rate, and one other baud rate. Perform all applicable test cases for one baud rate. For the other tested baud rates, perform the following test cases: 5.4.15.1/5.4.15.10 and 5.4.22.1.	IEC 60870-5-101, 5.1	PICS, 8.3
5.2.1.21		Transmission speed(s) in monitor direction test maximum baud rate, minimum baud rate, and one other baud rate. Perform all applicable test cases for one baud rate. For the other tested baud rates, perform the following test cases: 5.4.15.1/5.4.15.10 and 5.4.22.1.	IEC 60870-5-101, 5.1	PICS, 8.3
5.2.1.30	Link Layer	Unbalanced transmission	IEC 60870-5-2, 6	PICS, 8.4
5.2.1.31		Balanced transmission	IEC 60870-5-2, 6	PICS, 8.4
5.2.1.40	Address field of the Link	Zero (0) octets for address field (balanced only)	IEC 60870-5-2, 5.1.3, 6.1.3	PICS, 8.4
5.2.1.41		One (1) octet for address field	IEC 60870-5-2, 5.1.3, 6.1.3	PICS, 8.4
5.2.1.42		Two (2) octets for address field	IEC 60870-5-2, 5.1.3, 6.1.3	PICS, 8.4
		If more than one link address length is supported (see PICS, 8.4), then perform all applicable test cases for one link address length. For the other link address lengths, perform the following test cases: 5.4.15.1/5.4.15.10 and 5.4.22.1.		PICS, 8.4
5.2.1.50	Frame length	Maximum length L (control direction)	IEC 60870-5-101, 6.2	PICS, 8.4
5.2.1.51		Maximum length L (monitor direction)	IEC 60870-5-101, 6.2	PICS, 8.4
5.2.1.60	Assignment Class 2 messages	Standard assignment of class 2 messages	IEC 60870-5-101, 6.2, 7.4.2	PICS, 8.4
5.2.1.61		Special assignments of class 2 messages	IEC 60870-5-101, 6.2, 7.4.2	PIXIT

Table 1b – Conformance Test Procedures only for system testing (for example in the case of interoperability testing)

Test No.	Test	Description	Reference	Required
5.2.1.70	COMMON ADDRESS of ASDU	One (1) octet for Common Address of ASDU (CASDU)	IEC 60870-5-101, 7.2.4	PICS, 8.5
5.2.1.71		Two (2) octets for Common Address of ASDU (CASDU)	IEC 60870-5-101, 7.2.4	PICS, 8.5
		If more than one Common Address of ASDU length is supported (see PICS, 8.5), then perform all applicable test cases for one Common Address of ASDU length. For the other Common Address of ASDU length, perform the following test cases: 5.4.15.1/5.4.15.10 and 5.4.22.1.		PICS, 8.5
5.2.1.80	INFORMATION OBJECT ADDRESS	One (1) octet for Information Object Address (structured or unstructured)	IEC 60870-5-101, 7.2.5	PICS, 8.5
5.2.1.81		Two (2) octets for Information Object Address (structured or unstructured)	IEC 60870-5-101, 7.2.5	PICS, 8.5
5.2.1.82		Three (3) octets for Information Object Address (structured or unstructured)	IEC 60870-5-101, 7.2.5	PICS, 8.5
		If more than one Information Object Address length is supported (see PICS, 8.5), then perform all applicable test cases for one Information Object Address length. For the other Information Object Address lengths, perform the following test cases: 5.4.15.1/5.4.15.10 and 5.4.22.1.		PICS, 8.5
5.2.1.90	CAUSE OF TRANSMISSION	One (1) octet for COT field	IEC 60870-5-101, 7.2.3	PICS, 8.5
5.2.1.91		Two (2) octets for COT field (2nd octet is Originator address)	IEC 60870-5-101, 7.2.3	PICS, 8.5
		If more than one Cause of Transmission length is supported (see PICS, 8.5), then perform all applicable test cases for one Cause of Transmission length. For the other Cause of Transmission length, perform the following test cases: 5.4.15.1/5.4.15.10 and 5.4.22.1.		PICS, 8.5
5.2.1.95	Total address length	If multiple values for the lengths of the Link address, Common Address of ASDU, Information Object Address or Cause of Transmission can be configured, then perform test cases 5.4.15.1/5.4.15.10 and 5.4.22.1 for the minimum possible total length.	IEC 60870-5-101, 7.2.3	PICS, 8.4 PICS, 8.5
5.2.1.96		If multiple values for the lengths of the Link address, Common Address of ASDU, Information Object Address or Cause of Transmission can be configured, then perform test cases 5.4.15.1/5.4.15.10 and 5.4.22.1 for the maximum possible total length.	IEC 60870-5-101, 7.2.3	PICS, 8.4 PICS, 8.5
5.2.1.100	System definition	System test (in case of interoperability testing)		PICS, 8.1
5.2.1.110	Network configuration	Point-to-point	IEC 60870-5-101, 5.1	PICS, 8.2
5.2.1.111		Multiple point-to-point	IEC 60870-5-101, 5.1	PICS, 8.2
5.2.1.112		Multipoint party line	IEC 60870-5-101, 5.1	PICS, 8.2
5.2.1.113		Multipoint star	IEC 60870-5-101, 5.1	PICS, 8.2
5.2.1.120	Address field of the Link	Link address unstructured	IEC 60870-5-2, 5.1.3, 6.1.3	PICS, 8.4
5.2.1.121		Link address structured	IEC 60870-5-2, 5.1.3, 6.1.3	PICS, 8.4, PIXIT
5.2.1.130	INFORMATION OBJECT ADDRESS	Information Object Address unstructured	IEC 60870-5-101, 7.2.5	PICS, 8.5
5.2.1.131		Information Object Address structured	IEC 60870-5-101, 7.2.5	PICS, 8.5 PIXIT

5.3 Verification of IEC 60870-5-101 communication

This subclause lists the protocol specifications that should be verified automatically by the testing software or verified manually by review of the test history log after execution of the test procedures. Each test case describes a functionality that has passed the test if the functionality as in the description column was proved to be correct. Correct means: the functionality should 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 should be sent with the IV=1.This should be automatically checked by the test software or observed by the test engineer in the log-file. Each test case marked “Passed”, should 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 – Verification of the physical level

Test No.	Test	Description	Reference	Required
5.3.2.1	BYTEFRAME	Start-/stop-bit, even parity	IEC 60870-5-1:1990, 6.2.4.2	M

Table 3 – Verification of the Link Level *(1 of 4)*

Test No.	Test	Description	Reference	Required
5.3.3.10	FT1.2 FRAME LAYOUT (Single, Fixed and Variable)	Single control character I: $E5_H$	IEC 60870-5-1:1990, 6.2.4.2	PIXIT
5.3.3.11		Start character of fixed length frames: 10_H	IEC 60870-5-1:1990, 6.2.4.2	M
5.3.3.12		0 octets (No User data) as Link User data length of fixed length frames	IEC 60870-5-1:1990, 6.2.4.2	M
5.3.3.13		Start character of variable length frames: 68_H	IEC 60870-5-1:1990, 6.2.4.2	M
5.3.3.14		Configured number of octets L (repeated) as the maximum number of User Data octets from Controlling to Controlled station in variable length frames: max. 255	IEC 60870-5-1:1990, 6.2.4.2	PICS, 8.4 *Frame length*
5.3.3.15		Configured number of octets L (repeated) as the maximum number of User Data octets from Controlled to Controlling station in variable length frames: max. 255	IEC 60870-5-1:1990, 6.2.4.2	PICS, 8.4 *Frame length*
5.3.3.16		Second start character of variable length frames: 68_H	IEC 60870-5-1:1990, 6.2.4.2	M
5.3.3.17		Single octet Control Field	IEC 60870-5-1:1990, 6.2.4.2	M
5.3.3.18		Configured number of octets for Link address field	IEC 60870-5-1:1990, 6.2.4.2	M
5.3.3.19		Checksum (8-bit arithmetic sum)	IEC 60870-5-1:1990, 6.2.4.2	M
5.3.3.20		Stop character of fixed and variable length frames: 16_H	IEC 60870-5-1:1990, 6.2.4.2	M

Table 3 *(2 of 4)*

Test No.	Test	Description	Reference	Required
5.3.3.30	BYTELAG	Line idle intervals (stream of "1" bits) between characters of a frame do not exceed one bit time (octets are received within 110 % of raw transmission time)	IEC 60870-5-1:1990, 6.2.4.2 IEC 60870-5-101:2003, 6.1	M
5.3.3.40	CONTROL FIELD	High order bit RES = 0 (unbalanced only)	IEC 60870-5-2:1992, 5.1.2	PICS, 8.4 *Unbalanced*
5.3.3.41		DIR = 1 for messages from Controlling station (A) to Controlled station (B) (balanced only)	IEC 60870-5-2:1992, 6.1.2	PICS, 8.4 *Balanced*
5.3.3.42		DIR = 0 for messages from Controlled station (B) to Controlling station (A) (balanced only)	IEC 60870-5-2:1992, 6.1.2	PICS, 8.4 *Balanced*
5.3.3.43		PRM = 0 in messages from the Controlled station	IEC 60870-5-2:1992, 5.1.2, 6.1.2	M
5.3.3.44		PRM = 0: only FCODEs 0, 1, 8, 9, 11, 14, or 15 (unbalanced only)	IEC 60870-5-2:1992, 5.1.2	PICS, 8.4 *Unbalanced*
5.3.3.45		PRM = 0: only FCODEs 0, 1, 11, 14, or 15 (balanced only)	IEC 60870-5-2:1992, 6.1.2	PICS, 8.4 *Balanced*
5.3.3.46		PRM = 1 in messages from the Controlling station	IEC 60870-5-2:1992, 5.1.2, 6.1.2	M
5.3.3.47		PRM = 1: only Primary FCODEs 0, 1, 3, 4, 8, 9, 10 or 11 (unbalanced only)	IEC 60870-5-2:1992, 5.1.2	PICS, 8.4 *Unbalanced*
5.3.3.48		PRM = 1: only Primary FCODEs 0, 1, 2, 3, 4 or 9 (balanced only)	IEC 60870-5-2:1992, 6.1.2	PICS, 8.4 *Balanced*
5.3.3.49		In case of FCV = 1 and FCB unchanged, the last message is repeated	IEC 60870-5-2:1992, 5.1.2, 6.1.2	M
5.3.3.50		In case of reset commands F-CODE 0 or 1 FCB = 0 (expect next FCB=1)	IEC 60870-5-2:1992, 5.1.2, 6.1.2	M
5.3.3.51		DFC = 0: further messages are acceptable	IEC 60870-5-2:1992, 5.1.2, 6.1.2	M

Table 3 *(3 of 4)*

Test No.	Test	Description	Reference	Required
5.3.3.52		DFC = 1: further messages may cause data overflow. Only applicable for Balanced communication	IEC 60870-5-2:1992, 5.1.2, 6.3.3	PICS, 8.4 *Balanced*
NOTE The following tests are only for Unbalanced systems (PICS 8.4). If 'M' is mentioned, the test case is mandatory for unbalanced systems.				
5.3.3.60	UNBALANCED TRANSMISSION PROCEDURE	Unbalanced transmission	IEC 60870-5-2:1992, Clause 5	PICS, 8.4 *Unbalanced*
5.3.3.61		Service S1 – SEND/No reply	IEC 60870-5-2:1992, 4.1	PIXIT
5.3.3.62		Service S2 – SEND/CONFIRM expected	IEC 60870-5-2:1992, 4.2	M
5.3.3.63		Service S3 – REQUEST/RESPOND expected	IEC 60870-5-2:1992, 4.3	M
5.3.3.64		Primary F-CODE 0: answered with Secondary F-CODE 0,1,14,15	IEC 60870-5-2:1992, 4.2.2, 5.1.2	PIXIT
5.3.3.65		Primary F-CODE 1: answered with Secondary F-CODE 0,1,14,15	IEC 60870-5-2:1992, 4.2.2, 5.1.2	PIXIT
5.3.3.66		Primary F-CODE 3: answered with Secondary F-CODE 0,1,14,15	IEC 60870-5-2:1992, 4.2.2, 5.1.2	PIXIT
5.3.3.67		Primary F-CODE 4: not answered by Secondary	IEC 60870-5-2:1992, 4.1.2, 5.1.2	PIXIT
5.3.3.68		Primary F-CODE 8: answered with Secondary F-CODE 11, 14, 15	IEC 60870-5-2:1992, 4.3.2, 5.1.2	PIXIT
5.3.3.69		Primary F-CODE 9: answered with Secondary F-CODE 11, 14, 15	IEC 60870-5-2:1992, 4.3.2, 5.1.2	PIXIT
5.3.3.70		Primary F-CODE 10: answered with Secondary F-CODE 8, 9, 14, 15	IEC 60870-5-2:1992, 4.3.2, 5.1.2	PIXIT
5.3.3.71		Primary F-CODE 11: answered with Secondary F-CODE 8, 9, 14, 15	IEC 60870-5-2:1992, 4.3.2, 5.1.2	PIXIT
5.3.3.72		Primary F-CODE 2, 5...7, 12...15: answered with Secondary F-CODE 15	IEC 60870-5-2:1992, 4.2.2, 5.1.2	PIXIT
5.3.3.73		A not supported or implemented F-code is answered with Secondary F-CODE 14 or 15	IEC 60870-5-2:1992, 4.2.2, 5.1.2	M

Table 3 *(4 of 4)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only for Balanced systems (PICS 8.4). If 'M' is mentioned, the test case is mandatory for balanced systems.				
5.3.3.80	BALANCED TRANSMISSION PROCEDURE	Balanced transmission	IEC 60870-5-2:1992, Clause 6	PICS, 8.4 *Balanced*
5.3.3.81		Service S1 – SEND/No reply	IEC 60870-5-2:1992, 4.1	PIXIT
5.3.3.82		Service S2 – SEND/CONFIRM expected	IEC 60870-5-2:1992, 4.2	M
5.3.3.83		Service S3 – REQUEST/RESPOND expected	IEC 60870-5-2:1992, 4.3	M
5.3.3.84		Primary F-CODE 0: answered with Secondary F-CODE 0,1,14,15	IEC 60870-5-2:1992, 4.2.2, 6.1.2	PIXIT
5.3.3.85		Primary F-CODE 1: answered with Secondary F-CODE 0,1,14,15	IEC 60870-5-2:1992, 4.2.2, 6.1.2	PIXIT
5.3.3.86		Primary F-CODE 2: answered with Secondary F-CODE 0,1,14,15	IEC 60870-5-2:1992, 4.1.2, 6.1.2	PIXIT
5.3.3.87		Primary F-CODE 3: answered with Secondary F-CODE 0,1,14,15	IEC 60870-5-2:1992, 4.3.2, 6.1.2	PIXIT
5.3.3.88		Primary F-CODE 4: not answered by Secondary	IEC 60870-5-2:1992, 4.3.2, 6.1.2	PIXIT
5.3.3.89		Primary F-CODE 9: answered with Secondary F-CODE 11, 14, 15	IEC 60870-5-2:1992, 4.3.2, 6.1.2	PIXIT
5.3.3.90		Primary F-CODE 5...8, 10...15: answered with Secondary F-CODE 15	IEC 60870-5-2:1992, 4.2.2, 6.1.2	PIXIT
5.3.3.91		A not supported or implemented F-code is answered with Secondary F-CODE 14 or 15	IEC 60870-5-2:1992, 4.2.2, 6.1.2	M
5.3.3.100	TIME OUT INTERVAL	Maximum time out interval (calculated) – Controlling station does a retry when no answer is received – Controlled station answers always within specified time	IEC 60870-5-2:1992, Clause A.1, case 1, Figure A.2	PICS, 8.4
5.3.3.101		Controlling station uses the configured maximum number of retries for data link services that are unanswered within the time out interval	IEC 60870-5-2:1992, Clause 4	PICS, 8.4

Table 4 – Verification of the Data Unit Identifier

Test No.	Test	Description	Reference	Required
5.3.4.1	TYPE IDENTIFICATION	Compatible ASDU type used/accepted for all ASDUs as in the PICS	IEC 60870-5-101:2003, 7.2.1.1	PICS, 8.5
5.3.4.10	VARIABLE STRUCTURE QUALIFIER	Variable structure qualifier SQ=0 (Sequence or Set) as defined for each ASDU		M
5.3.4.11		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. Make sure SQ=1 is only used for ASDU types that admit sequential packing.	IEC 60870-5-101:2003, 7.2.2	PIXIT
5.3.4.12		Variable structure qualifier I (Number of elements) according to transmitted number of information elements for each ASDU	IEC 60870-5-101:2003, 7.2.2	M
5.3.4.13		The number of octets for ASDU are supported as in the PICS	IEC 60870-5-101:2003, 7.2	M
5.3.4.20	CAUSE OF TRANSMISSION	Originator address of Primary station is 0 if not used	IEC 60870-5-101:2003, 7.2.3	PICS, 8.5
5.3.4.21		Originator address identifies source application of Primary station	IEC 60870-5-101:2003, 7.2.3	PIXIT
5.3.4.22		Compatible Cause Of Transmission (COT) used/accepted. Check the PICS for the supported COT values	IEC 60870-5-101:2003, 7.2.3	PICS, 8.5
5.3.4.23		P/N bit = 0: positive confirmation of activation	IEC 60870-5-101:2003, 7.2.3	M
5.3.4.24		P/N bit = 1: negative confirmation of activation	IEC 60870-5-101:2003, 7.2.3	M
5.3.4.25		Test bit = 0: ASDU generated during normal conditions	IEC 60870-5-101:2003, 7.2.3	M
5.3.4.26		Test bit = 1: ASDU generated during test conditions	IEC 60870-5-101:2003, 7.2.3	PIXIT
5.3.4.40	COMMON ADDRESS of ASDU	The options of the Common Address of ASDU (CASDU) are tested and reported in 5.5	IEC 60870-5-101:2003, 7.2.4	PICS, 8.5

Table 5 – Verification of the object address

Test No.	Test	Description	Reference	Required
5.3.5.50	INFORMATION OBJECT ADDRESS	The options of the Information Object Address are tested and reported in 5.5	IEC 60870-5-101:2003, 7.2.5	PICS, 8.5

Table 6 – Verification of ASDUs for process information in monitor (Normal) direction *(1 of 19)*

Test No.	Test	Description	Reference	Required
5.3.6.10	M_SP_NA_1	SIQ with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.1	PICS, 8.5
5.3.6.11	ASDU 1 Single-point information	SIQ with SQ = 1, with only the IOA of the first 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
5.3.6.12		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.1	PICS, 8.5
5.3.6.13	SIQ	SPI = 0 (OFF), 1 (ON)	IEC 60870-5-101:2003, 7.2.6.1	PICS, 8.5
5.3.6.14		RES = 0	IEC 60870-5-101:2003, 7.2.6.1	PICS, 8.5
5.3.6.15		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.6.16		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.6.17		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.6.18		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PICS, 8.5
5.3.6.30	M_SP_TA_1	SIQ with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.2	PICS, 8.5
5.3.6.31	ASDU 2 Single-point information with time-tag	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.2	PICS, 8.5
5.3.6.32	SIQ	SPI = 0 (OFF), 1 (ON)	IEC 60870-5-101:2003, 7.2.6.1	PICS, 8.5
5.3.6.33		RES = 0	IEC 60870-5-101:2003, 7.2.6.1	PICS, 8.5
5.3.6.34		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.6.35		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.6.36		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.6.37		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PICS, 8.5
5.3.6.38	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.39		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.40		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.41		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5

Table 6 *(2 of 19)*

Test No.	Test	Description	Reference	Required
5.3.6.50	M_DP_NA_1	DIQ with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.3	PICS, 8.5
5.3.6.51	ASDU 3 Double-point information	DIQ with SQ = 1, with only the IOA of the first 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
5.3.6.52		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.3	PICS, 8.5
5.3.6.53	DIQ	DPI = 0 (indeterminate or intermediate state), 1 (OFF), 2 (ON), 3 (indeterminate state)	IEC 60870-5-101:2003, 7.2.6.2	PICS, 8.5
5.3.6.54		RES = 0	IEC 60870-5-101:2003, 7.2.6.2	PICS, 8.5
5.3.6.55		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.6.56		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.6.57		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.6.58		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PICS, 8.5
5.3.6.70	M_DP_TA_1	DIQ with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.4	PICS, 8.5
5.3.6.71	ASDU 4 Double-point information with time-tag	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.4	PICS, 8.5
5.3.6.72	DIQ	DPI = 0 (indeterminate or intermediate state), 1 (OFF), 2 (ON), 3 (indeterminate state)	IEC 60870-5-101:2003, 7.2.6.2	PICS, 8.5
5.3.6.73		RES = 0	IEC 60870-5-101:2003, 7.2.6.2	PICS, 8.5
5.3.6.74		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.6.75		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.6.76		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.6.77		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PICS, 8.5
5.3.6.78	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.79		Minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.80		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.81		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5

Table 6 *(3 of 19)*

Test No.	Test	Description	Reference	Required
5.3.6.90	M_ST_NA_1	VTI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.5	PICS, 8.5
5.3.6.91	ASDU 5 Step-position information	VTI with SQ = 1, with only the IOA of the first 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
5.3.6.92		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.5	PICS, 8.5
5.3.6.93	VTI	Value valid range -64..+63	IEC 60870-5-101:2003, 7.2.6.5	PICS, 8.5
5.3.6.94		Transient = 0,1	IEC 60870-5-101:2003, 7.2.6.5	PICS, 8.5
5.3.6.95	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.96		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.97		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.98		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.99		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.100		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.110	M_ST_TA_1	VTI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.6	PICS, 8.5
5.3.6.111	ASDU 6 Step-position information with time-tag!	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.6	PICS, 8.5
5.3.6.112	VTI	Value valid range -64..+63	IEC 60870-5-101:2003, 7.2.6.5	PICS, 8.5
5.3.6.113		Transient = 0,1	IEC 60870-5-101:2003, 7.2.6.5	PICS, 8.5
5.3.6.114	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.115		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.116		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.117		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.118		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.119		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.120	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.121		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.122		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.123		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.130	M_BO_NA_1	BSI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.7	PICS, 8.5
5.3.6.131	ASDU 7 Bitstring of 32 bit	BSI with SQ = 1, with only the IOA of the first 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
5.3.6.132		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.7	PICS, 8.5
5.3.6.133	BSI	BSI = 0,1	IEC 60870-5-101:2003, 7.2.6.13	PICS, 8.5
5.3.6.134	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.135		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.136		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.137		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.138		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.139		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.150	M_BO_TA_1	BSI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.8	PICS, 8.5
5.3.6.151	ASDU 8 Bitstring of 32 bit with time-tag	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.8	PICS, 8.5
5.3.6.152	BSI	BSI = 0,1	IEC 60870-5-101:2003, 7.2.6.13	PICS, 8.5
5.3.6.153	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.154		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.155		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.156		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.157		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.158		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.159	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.160		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.161		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.162		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5

Table 6 *(5 of 19)*

Test No.	Test	Description	Reference	Required
5.3.6.170	M_ME_NA_1	NVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.9	PICS, 8.5
5.3.6.171	ASDU 9 Measured value, normalised value	NVA with SQ = 1, with only the IOA of the first 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
5.3.6.172		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.9	PICS, 8.5
5.3.6.173	NVA	Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5 PIXIT
5.3.6.174		Range -1 to $+1-2^{-15}$	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5
5.3.6.175	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.176		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.177		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.178		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.179		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.180		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.190	M_ME_TA_1	NVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.10	PICS, 8.5
5.3.6.191	ASDU 10 Measured value, normalised value with time-tag!	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.10	PICS, 8.5
5.3.6.192	NVA	Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5 PIXIT
5.3.6.193		Range -1 to $+1-2^{-15}$	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5
5.3.6.194	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.195		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.196		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.197		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.198		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.199		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.200	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.201		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.202		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.203		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5

Table 6 *(6 of 19)*

Test No.	Test	Description	Reference	Required
5.3.6.210	M_ME_NB_1	SVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.11	PICS, 8.5
5.3.6.211	ASDU 11 Measured value, scaled value	SVA with SQ = 1, with only the IOA of the first 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
5.3.6.212		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.11	PICS, 8.5
5.3.6.213	SVA	Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.7	PICS, 8.5 PIXIT
5.3.6.214		Range -2^{15} to $2^{15} - 1$	IEC 60870-5-101:2003, 7.2.6.7	PICS, 8.5
5.3.6.215	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.216		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.217		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.218		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.219		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.220		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.230	M_ME_TB_1	SVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.12	PICS, 8.5
5.3.6.231	ASDU 12 Measured value, scaled value with time-tag!	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.12	PICS, 8.5
5.3.6.232	SVA	Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.7	PICS, 8.5 PIXIT
5.3.6.233		Range -2^{15} to $2^{15} - 1$	IEC 60870-5-101:2003, 7.2.6.7	PICS, 8.5
5.3.6.234	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.235		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.236		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.237		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.238		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.239		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.240	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.241		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.242		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.243		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.250	M_ME_NC_1	IEEE STD 754 with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.13	PICS, 8.5
5.3.6.251	ASDU 13 Measured value, short floating point number	IEEE STD 754 with SQ = 1, with only the IOA of the first 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
5.3.6.252		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.13	PICS, 8.5
5.3.6.253	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, 8.5
5.3.6.254		Exponent = 0 .. 255	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 8.5
5.3.6.255		Sign = 0,1	IEC 60870-5-101, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 8.5
5.3.6.256	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.257		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.258		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.259		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.260		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.261		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.270	M_ME_TC_1	IEEE STD 754 with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.14	PICS, 8.5
5.3.6.271	ASDU 14 Measured value, short floating point number with time-tag	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.14	PICS, 8.5
5.3.6.272	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, 8.5
5.3.6.273		Exponent = 0 .. 255	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 8.5
5.3.6.274		Sign = 0,1	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 8.5
5.3.6.275	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.276		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.277		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.278		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.279		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.280		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.281	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.282		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.283		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.284		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.300	M_IT_NA_1	BCR with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.15	PICS, 8.5
5.3.6.301	ASDU 15 Integrated totals	BCR with SQ = 1, with only the IOA of the first 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
5.3.6.302		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.15	PICS, 8.5
5.3.6.303	BCR	Value range -2^{31} to $+2^{31}-1$	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.304		Sequence Number SQ range 0 to 31	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.305		CY = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.306		CA = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.307		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.320	M_IT_TA_1	BCR test with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.16	PICS, 8.5
5.3.6.321	ASDU 16 Integrated totals with time tag	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.16	PICS, 8.5
5.3.6.322	BCR	Value range -2^{31} to $+2^{31}-1$	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.323		Sequence Number SQ range 0 to 31	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.324		CY = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.325		CA = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.326		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.327	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.328		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.329		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.330		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.340	M_EP_TA_1	SEP with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.17	PICS, 8.5
5.3.6.341	ASDU 17 Event of protection equipment with time-tag	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.17	PICS, 8.5
5.3.6.342	SEP	RES = 0	IEC 60870-5-101:2003, 7.2.6.10	PICS, 8.5
5.3.6.343		ES = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.6.344		RES = 0	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.6.345		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.6.346		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.6.347		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.6.348		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PICS, 8.5
5.3.6.349		EI = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PICS, 8.5
5.3.6.350	CP16Time2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.20	PICS, 8.5
5.3.6.351	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.352		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.353		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.354		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.360	M_EP_TB_1	SPE with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.18	PICS, 8.5
5.3.6.361	ASDU 18 Packed start events of protection equipment with time-tag	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.18	PICS, 8.5
5.3.6.362	SPE	RES = 0	IEC 60870-5-101:2003, 7.2.6.11	PICS, 8.5
5.3.6.363		GS = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.364		SL1 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.365		SL2 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.366		SL3 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.367		SIE = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.368		SRD = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT

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Test No.	Test	Description	Reference	Required
5.3.6.369	QDP	EI = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.370		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.371		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.372		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.373		EI = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.374		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PICS, 8.5
5.3.6.375	CP16Time2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.20	PICS, 8.5
5.3.6.376	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.377		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.378		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.379		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.390	M_EP_TC_1	OCI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.19	PICS, 8.5
5.3.6.391	ASDU 19 Packet output circuit information of protection equipment with time tag	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.19	PICS, 8.5
5.3.6.392	OCI	GC = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.393		CL1 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.394		CL2 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.395		CL3 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.396		RES = 0	IEC 60870-5-101:2003, 7.2.6.11	PICS, 8.5
5.3.6.397	QDP	RES = 0	IEC 60870-5-101:2003, 7.2.6.4	PICS, 8.5
5.3.6.398		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.399		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.400		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.401		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PICS, 8.5
5.3.6.402		EI = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PICS, 8.5
5.3.6.403	CP16Time2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.20	PICS, 8.5
5.3.6.404	CP24TIME2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.405		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.406		RES1 = 0	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5
5.3.6.407		IV = 0, 1	IEC 60870-5-101:2003, 7.2.6.19	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.420	M_PS_NA_1	SCD with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.20	PICS, 8.5
5.3.6.421	ASDU 20 Packed single-point information with status change detection	SCD with SQ = 1, with only the IOA of the first 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
5.3.6.422		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.20	PICS, 8.5
5.3.6.423	SCD	STi = 0,1	IEC 60870-5-101:2003, 7.2.6.40	PIXIT
5.3.6.424		CDi = 0,1	IEC 60870-5-101:2003, 7.2.6.40	PIXIT
5.3.6.425	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.426		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.427		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.428		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.429		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.430		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.440	M_ME_ND_1	NVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.21	PICS, 8.5
5.3.6.441	ASDU 21 Measured value, normalised value without quality descriptor	NVA with SQ = 1, with only the IOA of the first 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
5.3.6.442		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.21	PICS, 8.5
5.3.6.443	NVA	Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5 PIXIT
5.3.6.444		Range -1 to +1-2^{-15}	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5
5.3.6.450	M_SP_TB_1	SIQ with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.22	PICS, 8.5
5.3.6.451	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, 8.5
5.3.6.452	SIQ	SPI = 0 (OFF), 1 (ON)	IEC 60870-5-101:2003, 7.2.6.1	PICS, 8.5
5.3.6.453		RES = 0	IEC 60870-5-101:2003, 7.2.6.1	PICS, 8.5
5.3.6.454		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.6.455		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.6.456		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PIXIT
5.3.6.457		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.1	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.458	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.459		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.460		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.461		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.462		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.463		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.464		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.465		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.466		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.467		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.468		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.480	M_DP_TB_1	DIQ with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.23	PICS, 8.5
5.3.6.481	ASDU 31 Double-point information with time-tag CP56Time2a	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.23	PICS, 8.5
5.3.6.482	DIQ	DIQ = 0 (indeterminate or intermediate state), 1 (OFF), 2 (ON), 3 (indeterminate state)	IEC 60870-5-101:2003, 7.2.6.2	PICS, 8.5
5.3.6.483		RES = 0	IEC 60870-5-101:2003, 7.2.6.2	PICS, 8.5
5.3.6.484		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.6.485		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.6.486		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PIXIT
5.3.6.487		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.2	PICS, 8.5
5.3.6.488	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.489		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.490		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.491		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.492		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.493		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.494		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.495		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.496		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.497		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.498		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.510	M_ST_TB_1	VTI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.24	PICS, 8.5
5.3.6.511	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, 8.5
5.3.6.512	VTI	Value valid range –64..+63	IEC 60870-5-101:2003, 7.2.6.5	PICS, 8.5
5.3.6.513		Transient = 0,1	IEC 60870-5-101:2003, 7.2.6.5	PICS, 8.5
5.3.6.514	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.515		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.516		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.517		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.518		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.519		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.520	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.521		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.522		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.523		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.524		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.525		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.526		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.527		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.528		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.529		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.530		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.540	M_BO_TB_1	BSI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.25	PICS, 8.5
5.3.6.541	ASDU 33 Bitstring of 32 bit with time-tag CP56Time2a	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.25	PICS, 8.5
5.3.6.542	BSI	BSI = 0,1	IEC 60870-5-101:2003, 7.2.6.13	PICS, 8.5
5.3.6.543	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.544		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.545		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.546		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.547		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.548		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.549	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.550		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.551		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.552		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.553		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.554		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.555		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.556		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.557		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.558		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.559		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.570	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, 8.5
5.3.6.571		COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.26	PICS, 8.5
5.3.6.572	NVA	Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5 PIXIT
5.3.6.573		Range -1 to $+1-2^{-15}$	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5
5.3.6.574	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.575		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.576		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.577		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.578		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.579		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.580	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.581		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.582		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.583		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.584		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.585		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.586		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.587		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.588		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.589		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.590		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.600	M_ME_TE_1	SVA with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.27	PICS, 8.5
5.3.6.601	ASDU 35 Measured value, scaled value with time-tag CP56Time2a	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.27	PICS, 8.5
5.3.6.602	SVA	Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.7	PICS, 8.5 PIXIT
5.3.6.603		Range -2^{15} to $2^{15} - 1$	IEC 60870-5-101:2003, 7.2.6.7	PICS, 8.5
5.3.6.604	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.605		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.606		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.607		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.608		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.609		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.610	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.611		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.612		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.613		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.614		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.615		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.616		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.617		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.618		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.619		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.620		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.630	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, 8.5
5.3.6.631	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, 8.5

Table 6 *(16 of 19)*

Test No.	Test	Description	Reference	Required
5.3.6.632	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, 8.5
5.3.6.633		Exponent = 0 .. 255	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 8.5
5.3.6.634		Sign = 0,1	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 8.5
5.3.6.635	QDS	RES = 0	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.636		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.637		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.638		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PIXIT
5.3.6.639		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.640		OV = 0,1	IEC 60870-5-101:2003, 7.2.6.3	PICS, 8.5
5.3.6.641	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.642		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.643		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.644		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.645		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.646		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.647		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.648		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.649		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.650		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.651		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.660	M_IT_TB_1	BCR with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.29	PICS, 8.5
5.3.6.661	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, 8.5
5.3.6.662	BCR	range -2^{31} to $+2^{31}-1$	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.663		Sequence Number SQ range 0 to 31	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.664		CY = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.665		CA = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5
5.3.6.666		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.9	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.667	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.668		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.669		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.670		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.671		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.672		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.673		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.674		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.675		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.676		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.677		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.690	M_EP_TD_1	SEP with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.30	PICS, 8.5
5.3.6.691	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, 8.5
5.3.6.692	SEP	ES = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.6.693		RES = 0	IEC 60870-5-101:2003, 7.2.6.10	PICS, 8.5
5.3.6.694		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.6.695		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.6.696		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.6.697		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PICS, 8.5
5.3.6.698		EI = 0,1	IEC 60870-5-101:2003, 7.2.6.10	PIXIT
5.3.6.699	CP16Time2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.20	PICS, 8.5
5.3.6.700	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.701		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.702		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.703		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.704		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.705		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.706		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.707		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.708		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.709		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.710		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.720	M_EP_TE_1	SPE with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.31	PICS, 8.5
5.3.6.721	ASDU 39 Packed start events of protection equipment with time-tag CP56Time2a	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.31	PICS, 8.5
5.3.6.722	SPE	GS = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.723		SL1 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.724		SL2 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.725		SL3 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.726		SIE = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.727		SRD = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.728		RES = 0	IEC 60870-5-101:2003, 7.2.6.11	PICS, 8.5
5.3.6.729	QDP	RES = 0	IEC 60870-5-101:2003, 7.2.6.4	PICS, 8.5
5.3.6.730		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.731		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.732		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.733		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PICS, 8.5
5.3.6.734		EI = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.735	CP16Time2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.20	PICS, 8.5
5.3.6.736	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.737		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.738		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.739		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.740		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.741		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.742		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.743		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.744		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.745		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.746		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5

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Test No.	Test	Description	Reference	Required
5.3.6.760	M_EP_TF_1	OCI with SQ = 0, each element with its own IOA	IEC 60870-5-101:2003, 7.3.1.32	PICS, 8.5
5.3.6.761	ASDU 40 Packet output circuit information of protection equipment with time tag CP56Time2a	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.1.32	PICS, 8.5
5.3.6.762	OCI	GC = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.763		CL1 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.764		CL2 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.765		CL3 = 0,1	IEC 60870-5-101:2003, 7.2.6.11	PIXIT
5.3.6.766		RES = 0	IEC 60870-5-101:2003, 7.2.6.11	PICS, 8.5
5.3.6.767	QDP	RES = 0	IEC 60870-5-101:2003, 7.2.6.4	PICS, 8.5
5.3.6.768		BL = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.769		SB = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.770		NT = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PIXIT
5.3.6.771		IV = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PICS, 8.5
5.3.6.772		EI = 0,1	IEC 60870-5-101:2003, 7.2.6.4	PICS, 8.5
5.3.6.773	CP16Time2a	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.20	PICS, 8.5
5.3.6.774	CP56TIME2A	milliseconds = 0..59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.775		minutes = 0..59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.776		hours = 0..23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.777		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.778		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.779		IV = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.780		SU = 0..1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.781		day of week = 0 or 1..7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.782		day of month = 1..31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.783		month = 1..12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.784		year = 0..99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.6.800	PROCESS INFORMATION TIME TAGS	Either the set of Process Information ASDUs with CP24Time2a or the set of Process Information ASDUs with CP56Time2a is used.	IEC 60870-5-101:2003, 8.5	PICS, 8.5

Table 7 – Verification of ASDUs for process information in control (Normal) direction *(1 of 2)*

Test No.	Test	Description	Reference	Required
5.3.7.1	C_SC_NA_1 ASDU 45 Single command	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.2.1	PICS, 8.5
5.3.7.2	SCO	SCS = 0 (OFF), 1 (ON)	IEC 60870-5-101:2003, 7.2.6.15	PICS, 8.5
5.3.7.3		RES = 0	IEC 60870-5-101:2003, 7.2.6.15	PICS, 8.5
5.3.7.4		QU = 0 (no additional), 1 (short pulse), 2 (long pulse), 3 (persistent)	IEC 60870-5-101:2003, 7.2.6.26	PICS, 8.6
5.3.7.5		QU = 4 to 8, 9 to 15, 16 to 31	IEC 60870-5-101:2003, 7.2.6.26	PIXIT
5.3.7.6		S/E = 0, 1	IEC 60870-5-101:2003, 7.2.6.26	PICS, 8.6 PIXIT
5.3.7.10	C_DC_NA_1 ASDU 46 Double command	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.2.2	PICS, 8.5
5.3.7.11	DCO	DCS = 1 (OFF), 2 (ON)	IEC 60870-5-101:2003, 7.2.6.16	PICS, 8.5
5.3.7.12		QU = 0 (no additional), 1 (short pulse), 2 (long pulse), 3 (persistent)	IEC 60870-5-101:2003, 7.2.6.26	PICS, 8.6
5.3.7.13		QU = 4 to 8, 9 to 15, 16 to 31	IEC 60870-5-101:2003, 7.2.6.26	PIXIT
5.3.7.14		S/E = 0, 1	IEC 60870-5-101:2003, 7.2.6.26	PICS, 8.6 PIXIT
5.3.7.20	C_RC_NA_1 ASDU 47 Regulating step command	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.2.3	PICS, 8.5
5.3.7.21	RCO	RCS = 1 (next step LOWER), 2 (next step HIGHER)	IEC 60870-5-101:2003, 7.2.6.17	PICS, 8.5
5.3.7.22		QU = 0 (no additional), 1 (short pulse), 2 (long pulse), 3 (persistent)	IEC 60870-5-101:2003, 7.2.6.26	PICS, 8.6
5.3.7.23		QU = 4 to 8, 9 to 15, 16 to 31	IEC 60870-5-101:2003, 7.2.6.26	PIXIT
5.3.7.24		S/E = 0, 1	IEC 60870-5-101:2003, 7.2.6.26	PICS, 8.6 PIXIT
5.3.7.30	C_SE_NA_1 ASDU 48 Set point command, normalised value	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.2.4	PICS, 8.5
5.3.7.31	NVA	Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5 PIXIT
5.3.7.32		Range -1 to $+1-2^{-15}$	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5
5.3.7.33	QOS	QL = 0, 1…63 or 64…127	IEC 60870-5-101:2003, 7.2.6.39	PIXIT
5.3.7.34		S/E = 0, 1	IEC 60870-5-101:2003, 7.2.6.39	PICS, 8.6 PIXIT

Table 7 *(2 of 2)*

Test No.	Test	Description	Reference	Required
5.3.7.40	C_SE_NB_1 ASDU 49 Set point command, scaled value	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.2.5	PICS, 8.5
5.3.7.41	SVA	Value (with scaling factor)	IEC 60870-5-101:2003, 7.2.6.7	PICS, 8.5 PIXIT
5.3.7.42		Range -2^{15} to $2^{15} - 1$	IEC 60870-5-101:2003, 7.2.6.7	PICS, 8.5
5.3.7.43	QOS	QL = 0, 1…63 or 64…127	IEC 60870-5-101:2003, 7.2.6.39	PIXIT
5.3.7.44		S/E = 0, 1	IEC 60870-5-101:2003, 7.2.6.39	PICS, 8.6 PIXIT
5.3.7.50	C_SE_NC_1 ASDU 50 Set point command, short floating point value	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.2.6	PICS, 8.5
5.3.7.51	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, 8.5
5.3.7.52		Exponent = 0 … 255	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 8.5
5.3.7.53		Sign = 0,1	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 8.5
5.3.7.54	QOS	QL = 0, 1…63 or 64…127	IEC 60870-5-101:2003, 7.2.6.39	PIXIT
5.3.7.55		S/E = 0, 1	IEC 60870-5-101:2003, 7.2.6.39	PICS, 8.6 PIXIT
5.3.7.60	C_BO_NA_1 ASDU 51 Bitstring of 32 bits	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.2.7	PICS, 8.5
5.3.7.61	BSI	BSI = 0,1	IEC 60870-5-101:2003, 7.2.6.13	PICS, 8.5

Table 8 – Verification of ASDUs for system information in monitor (Normal) direction

Test No.	Test	Description	Reference	Required
5.3.8.1	M_EI_NA_1	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.3.1	PICS, 8.5
5.3.8.2	ASDU 70 End of initialisation	Information Object Address = 0	IEC 60870-5-101:2003, 7.3.3.1	PICS, 8.5
5.3.8.3	COI	UI =0, 1, 2, 3-31 or 32-127	IEC 60870-5-101:2003, 7.2.6.21	PIXIT
5.3.8.4		BS = 0,1	IEC 60870-5-101:2003, 7.2.6.21	PIXIT

Table 9 – Verification of ASDUs for system information in control (Normal) direction *(1 of 2)*

Test No.	Test	Description	Reference	Required
5.3.9.1	C_IC_NA_1	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.4.1	PICS, 8.5
5.3.9.2	ASDU 100 Interrogation command	Information Object Address = 0	IEC 60870-5-101:2003, 7.3.4.1	PICS, 8.5
5.3.9.3	QOI	QOI = 1 ... 19 or 20…36 or 37…63 or 64…255	IEC 60870-5-101:2003, 7.2.6.22	PIXIT
5.3.9.10	C_CI_NA_1	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.4.2	PICS, 8.5
5.3.9.11	ASDU 101 Counter interrogation command	Information Object Address = 0	IEC 60870-5-101:2003, 7.3.4.2	PICS, 8.5
5.3.9.12	QCC	RQT Counter request = 0…5	IEC 60870-5-101:2003, 7.2.6.23	PICS, 8.6
5.3.9.13		FRZ Counter freeze = 0…3	IEC 60870-5-101:2003, 7.2.6.23	PICS, 8.6
5.3.9.20	C_RD_NA_1 ASDU 102 Read command	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.4.3	PICS, 8.5
5.3.9.30	C_CS_NA_1	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.4.4	PICS, 8.5
5.3.9.31	ASDU 103 Clock synchronisation command	Information Object Address = 0	IEC 60870-5-101:2003, 7.3.4.4	PICS, 8.5

Table 9 *(2 of 2)*

Test No.	Test	Description	Reference	Required
5.3.9.32	CP56TIME2A	Milliseconds = 0…59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.9.33		Minutes = 0…59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.9.34		Hours = 0...23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.9.35		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.9.36		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.9.37		res1 = <0> genuine time or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.6
5.3.9.38		IV = 0...1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.9.39		SU = 0...1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5 PICS, 8.6
5.3.9.40		day of week = 0 or 1...7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.9.41		day of week = <1...7>	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.6
5.3.9.42		day of month = 1…31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.9.43		month = 1…12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.9.44		year = 0…99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.9.50	C_TS_NA_1	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.4.5	PICS, 8.5
5.3.9.51	ASDU 104 Test command	Information Object Address = 0	IEC 60870-5-101:2003, 7.3.4.5	PICS, 8.5
5.3.9.52	FBP	FBP = hex 55AA	IEC 60870-5-101:2003, 7.2.6.14	PICS, 8.5
5.3.9.60	C_RP_NA_1	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.4.6	PICS, 8.5
5.3.9.61	ASDU 105 Reset process command	Information Object Address = 0	IEC 60870-5-101:2003, 7.3.4.6	PICS, 8.5
5.3.9.62	QRP	QRP = 1, 2 (zero is not permitted)	IEC 60870-5-101:2003, 7.2.6.27	PIXIT
5.3.9.70	C_CD_NA_1	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.4.7	PICS, 8.5
5.3.9.71	ASDU 106 Delay acquisition command	Information Object Address = 0	IEC 60870-5-101:2003, 7.3.4.7	PICS, 8.5
5.3.9.72	CP16Time2a	Milliseconds = 0…59999	IEC 60870-5-101:2003, 7.2.6.20	PICS, 8.5

Table 10 – Verification of ASDUs for parameters in control (Normal) direction *(1 of 2)*

Test No.	Test	Description	Reference	Required
5.3.10.1	P_ME_NA_1 ASDU 110 Parameter of measured value, normalised value	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.5.1	PICS, 8.5
5.3.10.2	NVA	Value (translation considering the scaling factor)	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5 PIXIT
5.3.10.3		Range -1 to $+1-2^{-15}$	IEC 60870-5-101:2003, 7.2.6.6	PICS, 8.5
5.3.10.4	QPM	KPA = 0-4	IEC 60870-5-101:2003, 7.2.6.24	PICS, 8.6 PIXIT
5.3.10.5		LPC = 0,1	IEC 60870-5-101:2003, 7.2.6.24	PIXIT
5.3.10.6		POP = 0,1	IEC 60870-5-101:2003, 7.2.6.24	PIXIT
5.3.10.10	P_ME_NB_1 ASDU 111 Parameter of measured values, scaled value	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.5.2	PICS, 8.5
5.3.10.11	SVA	Value (with scaling factor)	IEC 60870-5-101:2003, 7.2.6.7 PID	PICS, 8.5 PIXIT
5.3.10.12		Range -2^{15} to $2^{15} – 1$	IEC 60870-5-101:2003, 7.2.6.7	PICS, 8.5
5.3.10.13	QPM	KPA = 0-4	IEC 60870-5-101:2003, 7.2.6.24	PICS, 8.6 PIXIT
5.3.10.14		LPC = 0,1	IEC 60870-5-101:2003, 7.2.6.24	PIXIT
5.3.10.15		POP = 0,1	IEC 60870-5-101:2003, 7.2.6.24	PIXIT
5.3.10.20	P_ME_NC_1 ASDU 112 Parameter of measured values, short floating point number	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.5.3	PICS, 8.5
5.3.10.21	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, 8.5
5.3.10.22		Exponent = 0 … 255	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 8.5
5.3.10.23		Sign = 0,1	IEC 60870-5-101:2003, 7.2.6.8 IEC 60870-5-4:1993, 6.5	PICS, 8.5

Table 10 *(2 of 2)*

Test No.	Test	Description	Reference	Required
5.3.10.24	QPM	KPA = 0-4	IEC 60870-5-101:2003, 7.2.6.24	PICS, 8.6 PIXIT
5.3.10.25		LPC = 0,1	IEC 60870-5-101:2003, 7.2.6.24	PIXIT
5.3.10.26		POP = 0,1	IEC 60870-5-101:2003, 7.2.6.24	PIXIT
5.3.10.30	P_AC_NA_1 ASDU 113 Parameter activation	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.5.4	PICS, 8.5
5.3.10.31	QPA	QPA = 3 (other values not permitted)	IEC 60870-5-101:2003, 7.2.6.25	PIXIT

Table 11 – Verification of ASDUs for file transfer (in monitor (Normal) and control direction) *(1 of 3)*

Test No.	Test	Description	Reference	Required
5.3.11.1	F_FR_NA_1 ASDU 120 File ready	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.6.1	PICS, 8.5
5.3.11.2	NOF	NOF = 0	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.3		NOF = 1...65535	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.4	LOF	LOF = 0	IEC 60870-5-101:2003, 7.2.6.35	PICS, 8.5
5.3.11.5		LOF = 1...16777215	IEC 60870-5-101:2003, 7.2.6.35	PICS, 8.5
5.3.11.6	FRQ	UI = 0	IEC 60870-5-101:2003, 7.2.6.28	PIXIT
5.3.11.7		BS = 0,1	IEC 60870-5-101:2003, 7.2.6.28	PIXIT
5.3.11.10	F_SR_NA_1 ASDU 121 Section ready	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.6.2	PICS, 8.5
5.3.11.11	NOF	NOF = 0	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.12		NOF = 1...65535	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.13	NOS	NOS = 0	IEC 60870-5-101:2003, 7.2.6.34	PICS, 8.5
5.3.11.14		NOS = 1...255	IEC 60870-5-101:2003, 7.2.6.34	PICS, 8.5
5.3.11.15	LOS	LOS = 0	IEC 60870-5-101:2003, 7.2.6.35	PICS, 8.5
5.3.11.16		LOS = 1...16777215	IEC 60870-5-101:2003, 7.2.6.35	PICS, 8.5

Table 11 *(2 of 3)*

Test No.	Test	Description	Reference	Required
5.3.11.17	SRQ	UI = 0	IEC 60870-5-101:2003, 7.2.6.29	PIXIT
5.3.11.18		BS = 0,1	IEC 60870-5-101:2003, 7.2.6.29	PIXIT
5.3.11.30	F_SC_NA_1 ASDU 122 Call directory, select file, call file, call section	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.6.3	PICS, 8.5
5.3.11.31	NOF	NOF = 0	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.32		NOF = 1...65535	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.33	NOS	NOS = 0	IEC 60870-5-101:2003, 7.2.6.34	PICS, 8.5
5.3.11.34		NOS = 1...255	IEC 60870-5-101:2003, 7.2.6.34	PICS, 8.5
5.3.11.35	SCQ	UI1 = 0...7	IEC 60870-5-101:2003, 7.2.6.30	PICS, 8.5
5.3.11.36		UI2 = 0...5	IEC 60870-5-101:2003, 7.2.6.30	PICS, 8.5
5.3.11.40	F_LS_NA_1 ASDU 123 Last section, last segment	COT as defined in the attached PICS	IEC 60870-5-101, 7.3.6.3	PICS, 8.5
5.3.11.41	NOF	NOF = 0	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.42		NOF = 1...65535	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.43	NOS	NOS = 0	IEC 60870-5-101:2003, 7.2.6.34	PICS, 8.5
5.3.11.44		NOS = 1...255	IEC 60870-5-101:2003, 7.2.6.34	PICS, 8.5
5.3.11.45	LSQ	LSQ = 0...4	IEC 60870-5-101:2003, 7.2.6.36	PICS, 8.5
5.3.11.46	CHS	CHS = 0...255	IEC 60870-5-101:2003, 7.2.6.37	PICS, 8.5
5.3.11.50	F_AF_NA_1 ASDU 124 ACK file, ACK section	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.6.5	PICS, 8.5
5.3.11.51	NOF	NOF = 0	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.52		NOF = 1...65535	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.53	NOS	NOS = 0	IEC 60870-5-101:2003, 7.2.6.34	PICS, 8.5
5.3.11.54		NOS = 1...255	IEC 60870-5-101:2003, 7.2.6.34	PICS, 8.5
5.3.11.55	AFQ	UI1 = 0...4	IEC 60870-5-101:2003, 7.2.6.32	PIXIT
5.3.11.56		UI2 = 0...5	IEC 60870-5-101:2003, 7.2.6.32	PIXIT

Table 11 *(3 of 3)*

Test No.	Test	Description	Reference	Required
5.3.11.60	F_SG_NA_1 ASDU 125 Segment	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.6.5	PICS, 8.5
5.3.11.61	NOF	NOF = 0	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.62		NOF = 1...65535	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.63	NOS	NOS = 0	IEC 60870-5-101:2003, 7.2.6.34	PICS, 8.5
5.3.11.64		NOS = 1...255	IEC 60870-5-101:2003, 7.2.6.34	PICS, 8.5
5.3.11.65	LOS	LOS = 0	IEC 60870-5-101:2003, 7.2.6.36	PICS, 8.5
5.3.11.66		LOS = 1...234 (1...240)	IEC 60870-5-101:2003, 7.2.6.36	PICS, 8.5
5.3.11.67	Segment	Segment data	IEC 60870-5-101:2003, 7.3.6.6	PICS, 8.5
5.3.11.70	F_DR_TA_1 ASDU 126 Directory	COT as defined in the attached PICS	IEC 60870-5-101:2003, 7.3.6.7	PICS, 8.5
5.3.11.71	NOF	NOF = 0	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.72		NOF = 1...65535	IEC 60870-5-101:2003, 7.2.6.33	PICS, 8.5
5.3.11.73	LOF	LOF = 0	IEC 60870-5-101:2003, 7.2.6.35	PICS, 8.5
5.3.11.74		LOF = 1...16777215	IEC 60870-5-101:2003, 7.2.6.35	PICS, 8.5
5.3.11.75	SOF	STATUS = 0	IEC 60870-5-101:2003, 7.2.6.38	PICS, 8.5
5.3.11.76		RES1 = 0,1	IEC 60870-5-101:2003, 7.2.6.38	PICS, 8.5
5.3.11.77		FOR = 0,1	IEC 60870-5-101:2003, 7.2.6.38	PICS, 8.5
5.3.11.78		FA = 0,1	IEC 60870-5-101:2003, 7.2.6.38	PICS, 8.5
5.3.11.79	CP56TIME2A	Milliseconds = 0...59999	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.11.80		Minutes = 0...59	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.11.81		Hours = 0...23	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.11.82		Res1 = <0> genuine time, or <1> substituted time	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.11.83		res2, res3, res4 = 0	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.11.84		IV = 0...1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.11.85		SU = 0...1	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.11.86		day of week = 0 or 1...7	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.11.87		day of month = 1...31	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.11.88		month = 1...12	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5
5.3.11.89		year = 0...99 (year 2000 = 00, year 1999 is 99)	IEC 60870-5-101:2003, 7.2.6.18	PICS, 8.5

5.4 Conformance Test Procedures

The conformance test procedures should be tested for all mandatory test cases in Subclause 5.3 and for each configuration as in Table 1. See Subclause 5.1 for the procedure to execute all mandatory test cases.

A test is passed if the described behaviour has been automatically verified by the test software or shown to the test engineer in a human readable format. A specific Function has passed completely if all mandatory test cases in that group have passed.

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

Table 12 – Link Layer Conformance Test Procedures

Test No.	Test	Description	Reference	Required
5.4.12.1	Frame Count Bit	In case of FCV = 1 and FCB unchanged, the last message is repeated by the controlled station	IEC 60870-5-2:1992, 5.1.2, 6.1.2	M

Table 13 – Data Unit Identifier Conformance Test Procedures *(1 of 2)*

Test No.	Test	Description	Reference	Required
5.4.13.1	TYPE IDENTIFICATION	If COT=44 is NOT supported, any undefined or not supported ASDU received by the controlled station should be mirrored with P/N=1 negative	IEC 60870-5-101:2003, 7.3	PICS, 8.5 *Type id and cot assignments: COT 44*
		Any undefined or not supported ASDU received by the controlling station is ignored (or discarded)	IEC 60870-5-101:2003, 7.3	PICS, 8.5
		If COT = 44 is supported, any undefined or not supported ASDU is mirrored by the controlled station with P/N = 1: negative confirmation of activation using COT = 44 (unknown type identification)	IEC 60870-5-101:2003, 7.3	PICS, 8.5 *Type id and cot assignments: COT 44*
		These tests are performed correctly for at least three undefined or not supported ASDUs. The test should include at least one undefined ASDU. If possible, the test should include at least one ASDU defined in the standard, but not supported by the DUT. Undefined ASDU = ASDU which is not defined by the standard. Unsupported ASDU = ASDU which is defined by the standard, but not supported by the DUT.		M
5.4.13.5	CAUSE OF TRANSMISSION	Test bit = 0: ASDU generated during normal conditions	IEC 60870-5-101:2003, 7.2.3	M
		Test bit = 1: ASDU generated during test conditions	IEC 60870-5-101:2003, 7.2.3	PIXIT
		If COT=45 is NOT supported, any message received by the controlled station containing an undefined or not supported COT should be mirrored with P/N=1 negative	IEC 60870-5-101:2003, 7.2.3	PICS, 8.5 *Type id and cot assignments: COT 45*
		Any message received by the controlling station containing an undefined or not supported COT is ignored (or discarded)	IEC 60870-5-101:2003, 7.2.3	PICS, 8.5
		If COT=45 is supported, any undefined or not supported ASDU is mirrored by the controlled station with P/N = 1: negative confirmation of activation using COT = 45 (unknown cause of transmission)	IEC 60870-5-101:2003, 7.2.3	PICS, 8.5 *Type id and cot assignments: COT 45*
		Originator address is zero or the applicable Originator address (if COT = 2 octets)	IEC 60870-5-101:2003, 7.2.3	PICS, 8.5 *Cause of transmission – Two octets*
		These tests are performed correctly for at least three undefined or not supported COTs. The test should include at least one undefined COT. If possible, the test should include at least one COT defined in the standard, but not supported by the DUT. Undefined COT = COT which is not defined by the standard. Unsupported COT = COT which is defined by the standard, but not supported by the DUT.		M

Table 13 *(2 of 2)*

Test No.	Test	Description	Reference	Required
5.4.13.10	COMMON ADDRESS of ASDU	If COT=46 is NOT supported, any message received by the controlled station containing an undefined CASDU should be mirrored with P/N=1 negative	IEC 60870-5-101:2003, 7.2.4	PICS, 8.5 *Type id and cot assignments: COT 46*
		Any message received by the controlling station containing an undefined CASDU is ignored (or discarded)	IEC 60870-5-101:2003, 7.2.4	PICS, 8.5
		If COT=46 is supported, any ASDU with undefined CASDU is mirrored by the controlled station with P/N = 1: negative confirmation of activation using COT = 46 (unknown CASDU)	IEC 60870-5-101:2003, 7.2.4	PICS, 8.5 *Type id and cot assignments: COT 46*
		Broadcast CASDU value (0xFF<FF>) only used in control direction with ASDU Types 100 (Interrogation), 101 (Counter interrogation), 103 (Clock Sync) or 105 (Reset Process).	IEC 60870-5-101:2003, 7.2.4	PIXIT
		The Controlled station rejects all other ASDU Types with a Broadcast CASDU value by mirroring the ASDU with P/N = 1 negative (and with COT = 46, if supported)	IEC 60870-5-101:2003, 7.2.4	M
		The Controlling station handles any received ASDU with a Broadcast CASDU as an ASDU with an undefined CASDU	IEC 60870-5-101:2003, 7.2.4	M

Table 14 – Information object address Conformance Test Procedures

Test No.	Test	Description	Reference	Required
5.4.14.1	OBJECT ADDRESS	If COT=47 is NOT supported, any message received by the controlled station containing an undefined IOA should be mirrored with P/N=1 negative	IEC 60870-5-101:2003, 7.2.3	PICS, 8.5 *Type id and cot assignments: COT 47*
		Any message received by the controlling station containing an undefined IOA is ignored (or discarded)	IEC 60870-5-101:2003, 7.2.3	PICS, 8.5
		If COT=47 is supported, any ASDU with undefined IOA in control direction is mirrored by the controlled station with P/N = 1: negative confirmation of activation using COT = 47 (unknown IOA)	IEC 60870-5-101:2003, 7.2.3	PICS, 8.5 *Type id and cot assignments: COT 47*
		These tests are performed correctly for each supported ASDU.		M

Table 15 – Station initialization function (unbalanced systems) Conformance Test Procedures *(1 of 4)*

Test No.	Test	Description	Reference	Required
NOTE The tests in this Table are only for Unbalanced systems (PICS 8.4). If 'M' is mentioned, the test case is mandatory for unbalanced systems.				
5.4.15.1	Initialization of the controlling station in **unbalanced** transmission systems: (re-)boot	After power on, hardware reset or warm boot the **Controlling station** initializes its local link layer and starts the link establishment to each configured Controlled station by issuing a Request Status of Link	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.2	M
		The Controlled station finishes the link establishment by responding with "Status of link"	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlling station responds with a Reset of Remote link to the Controlled station, to synchronize both ends of the new established link	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.2	M
		After acknowledgement, the Controlling station continues with a message containing FCB = 1	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlling station finishes the Station initialization by updating its internal process representation by issuing a General Interrogation command to each Controlled station. The normal Telecontrol operations may begin	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.2	M
		After link establishment, the controlling station optionally performs a clock synchronization before or after the GI	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.2	PIXIT

Table 15 *(2 of 4)*

Test No.	Test	Description	Reference	Required
5.4.15.10	Local initialization of the controlled station in **unbalanced** transmission systems: (re-)boot	After power on, hardware reset or warm boot the **Controlled station** waits for the "Request status of link" from the Controlling station after the link layer and internal application components are initialized	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlled station finishes the link establishment by responding with "Status of link".	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlling station sends "Reset of remote link" to the Controlled station to synchronize both ends of the new established link	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlled station confirms the correct reception of "Reset of remote link" to the Controlling station and sets the expected FCB to 1	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlling station continues with a message "Request user data class 1" or "Request user data class 2" containing FCB = 1.	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlled station finishes its local initialization by sending the M_EI (End of initialization) from each LRU after the Controlling station has sent subsequent polling messages NOTE 2 This is optional, but recommended, because it allows the Controlled station to distinguish between local initialization and other connection establishment procedures like lost connections.	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	PICS, 8.5 *System info in monitor direction*
		Each LRU in the Controlled station starts the General interrogation procedure to update the Controlling station with the actual process information after receipt of the General Interrogation command C_IC_ACT	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M

Table 15 *(3 of 4)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for Unbalanced systems supporting Remote initialization. If 'M' is mentioned, the test case is mandatory for Unbalanced systems with the relevant Remote initialization options marked in the PICS: – PICS, 8.5, "System information in control direction", "Reset process command". – PICS, 8.6, "Station initialization", "Remote initialization".				
5.4.15.20	Remote initialization of the controlled station in **unbalanced** transmission systems	The Controlling station forces one LRU (using a specific CASDU address in the C_RP_ECT) or all LRUs (using broadcast CASDU address in the C_RP_ACT) in the Controlled station to do a restart of the Application processes. QRP is set to 1 in the C_RP_ACT	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1	M
		The Controlled station confirms the forced restart by sending a C_RP_ACTCON to the Controlling station from each addressed LRU (with the LRUs specific CASDU address) and starts with its initialization of each addressed LRU ("Reset process" semantics are system-dependent)	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.4	M
		The Controlling station continues to try to start the link establishment to the Controlled station by issuing a Request Status of Link	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.4	M
		The Controlled station finishes the link establishment by responding with "Status of link" when its link is available again	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.4	M
		Optionally, the Controlling station sends "Reset of remote link" to the Controlled station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.4	M
		The Controlled station confirms the correct reception of "Reset of remote link" to the Controlling station and sets the expected FCB to 1	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.4	M
		The Controlling station continues with a message "Request user data class 1" or "Request user data class 2" containing FCB = 1.	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.4	M
		The Controlled station finishes its local initialization by sending the M_EI (End of initialization) to the Controlling station from each restarted LRU (with the LRUs specific CASDU address) NOTE 3 This is optional, but recommended, because it allows the Controlled station to distinguish between this initiated local initialization and other connection establishment procedures like lost connections.	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.4	PIXIT
		The Controlled station starts the General interrogation procedure from each restarted LRU to update the Controlling station with the actual process information after receipt of the General Interrogation command C_IC_ACT. The normal Telecontrol operations may begin	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.4	M

Table 15 *(4 of 4)*

Test No.	Test	Description	Reference	Required
5.4.15.21	Reset of pending information with time tag of the event buffer	The Controlling station forces one LRU (using a specific CASDU address in the C_RP_ECT) or all LRUs (using broadcast CASDU address in the C_RP_ACT) in the Controlled station to do a restart of the Application processes. QRP is set to 2 in the C_RP_ACT. Run this test while the Controlled station has pending events in the buffer.	IEC 60870-5-5:1995, 6.1 IEC 60870-5-101:2003, 7.2.6.27	PIXIT
		The Controlled station confirms the Reset of pending information with time tag of the event buffer by sending a C_RP_ACTCON to the Controlling station from each addressed LRU (with the LRUs specific CASDU address) and resets its pending information with time tag in the event buffer. The Controlled station does not send any events anymore (until new events are generated).	IEC 60870-5-5:1995, 6.1 IEC 60870-5-101:2003, 7.2.6.27	PIXIT
5.4.15.30	Re-establishing a broken link between the Controlling and the Controlled station in **unbalanced** transmission systems	After the communication link is disconnected for a longer period than time-out and retries allow, the Controlling Station starts a new establishment of the broken link by issuing “Request status of link” at regular intervals to the Controlled Station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlled station finishes the link establishment by responding with “Status of link”.	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlling station sends “Reset of remote link” to the Controlled station to synchronize both ends of the new established link	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlled station confirms the correct reception of “Reset of remote link” to the Controlling station and sets the expected FCB to 1	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		The Controlling station continues with a message containing FCB = 1.	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.3	M
		After re-establishment of the link between Controlling and Controlled station, **no** M_EI (End of initialization) is sent to the Controlling station. Normal operation continues, and begins the General Interrogation procedure and optional clock synchronization.	IEC 60870-5-101:2003, 7.4.5	M
5.4.15.40	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation.		M

Table 16 – Data acquisition by polling function (unbalanced systems) Conformance Test Procedures

Test No.	Test	Description	Reference	Required
5.4.16.1	Data acquisition by polling in **Unbalanced** transmission systems – sequential procedure	The Controlling/Primary/Master station (all these roles are fixed in the same station in unbalanced mode) uses REQUEST/RESPOND (S3) datalink service, Request User data Class 2 (FCODE 11) as the default polling procedure.	IEC 60870-5-101:2003, 6.2 IEC 60870-5-5:1995, 6.2.1	PICS, 8.6
		The Controlled/Secondary/Slave station (all these roles are fixed in the same station in unbalanced mode) responds with configured, available Class 2 data (default Periodic/cyclic and Background scan data) when available.	IEC 60870-5-101:2003, 6.2 IEC 60870-5-5:1995, 6.2.1	PICS, 8.6
		The Controlled station responds with Respond/NACK (FCODE 9 or Single Control Character) if no data of Class 2 is available. Instead, the Controlled station may also return configured, available Class 1 data (default all ASDUs other than those containing Periodic/cyclic data). See PIXIT if this supported.	IEC 60870-5-101:2003, 6.2 IEC 60870-5-5:1995, 6.2.1 IEC 60870-5-101:2003, 7.4.2	PICS, 8.6
		The Controlled station responds with a message with ACD-bit value 1 if Class 1 data is available.	IEC 60870-5-101:2003, 6.2 IEC 60870-5-5:1995, 6.2.1	PICS, 8.6
		The Controlling station uses REQUEST/RESPOND (S3) data link service, Request User data Class 1 (FCODE 10) at one point in time for Class 1 data if ACD=1 in a message from the Controlled station.	IEC 60870-5-101:2003, 6.2 IEC 60870-5-5:1995, 6.2.1	PICS, 8.6
		The Controlled station only transfers a link message with or without application user data when it receives a Class 2 or Class 1 poll from the Controlling station. This applies to ALL message transfers in Unbalanced mode!	IEC 60870-5-101:2003, 6.2 IEC 60870-5-5:1995, 6.2.1	PICS, 8.6
		The Controlled station does not alter the chronological correct sequence of data transferred as either Class 1 or Class 2 data. Class 1 data has precedence always.	IEC 60870-5-101:2003, 7.2.2.2 IEC 60870-5-101:2003, 7.4.2	PICS, 8.6
5.4.16.10	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation.		PICS, 8

Table 17 – Station initialization function (balanced systems) Conformance Test Procedures *(1 of 4)*

Test No.	Test	Description	Reference	Required
NOTE The tests in this Table are only for Balanced systems (PICS 8.4). If 'M' is mentioned, the test case is mandatory for balanced systems.				
5.4.17.1	Initialization of the controlling station in **balanced** transmission systems: (re-)boot	After power on, hardware reset or warm boot the **Controlling station** initializes its local link layer and sends "Request link status" to each configured Controlled station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		Each controlled station sends a "Status of link" to the Controlling station when the "Request Link status" was received	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		The Controlling station sends a "Reset of Remote link" to each Controlled station, to synchronize both ends of the newly established links	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		Each controlled station sends an "Ack" to the Controlling station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		If the controlling station was re-initialized before the controlled station detected the lost link, the controlled station can start sending data immediately	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		If the controlled station detected the lost link, the Controlled station starts its link establishment by issuing a Request Status of Link to the Controlling station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		The Controlling station sends a "Status of link" to that Controlled station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		The Controlled station sends a "Reset of Remote link" to the Controlling station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		The controlling station sends an "Ack" to the Controlled station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		Since both links are independent it is possible and allowed that both links will initialize simultaneously, resulting in an interleaved initiation process	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		The Controlled station sends the End of initialization (optional)	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	PICS, 8.5 *System info in monitor direction*
		After link establishment, the Controlling station finishes the Station initialization by updating its internal process representation by issuing a General Interrogation command to the Controlled station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	M
		The Controlling station optionally performs a clock synchronization before it starts the normal Telecontrol operations	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.5	PIXIT

Table 17 *(2 of 4)*

Test No.	Test	Description	Reference	Required
5.4.17.10	Local initialization of the controlled station in **balanced** transmission systems: (re-)boot	After power on, hardware reset or warm boot the **Controlled station** initializes its local link layer and starts the link establishment with the Controlling station by waiting for a "Request Link status"	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		The controlled station sends a "Status of link" to the Controlling station when the Request Link status was received	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		The Controlling station sends a Reset of Remote link to the Controlled station to synchronize both ends of the new established link	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		The controlled station sends an "Ack" to the Controlling station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		The Controlled station sends a request status of link to the Controlling station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		The Controlling station sends a status of link to the controlled station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		The Controlled station sends a Reset of Remote link to the Controlling station to synchronize both ends of the new established link	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		The Controlling station sends an acknowledge	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		Since both links are independent it is possible and allowed that both links will initialize simultaneously, resulting in an interleaved initiation process	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		The Controlled station finishes its local initialization by sending the M_EI (End of initialization) from each LRU NOTE 2 This is optional, but recommended; because it allows the Controlled station to distinguish between local initialization and other connection establishment procedures like lost connections.	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	PICS, 8.5 *System info in monitor direction*
		Each LRU in the Controlled station starts the General interrogation procedure to update the Controlling station with the actual process information after receipt of the General Interrogation command C_IC_ACT. The normal Telecontrol operations may begin.	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M

Table 17 *(3 of 4)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for Balanced systems supporting Remote initialization. If 'M' is mentioned, the test case is mandatory for Balanced systems with the relevant Remote initialization options marked in the PICS: – PICS, 8.5, "System information in monitor direction", "Reset process command". – PICS, 8.6, "Station initialization", "Remote initialization".				
5.4.17.20	Remote initialization of the controlled station in **balanced** transmission systems	The Controlling station forces one LRU (using a specific CASDU address in the C_RP_ECT) or all LRUs (using broadcast CASDU address in the C_RP_ACT) in the Controlled station to do a restart of the Application processes. QRP is set to 1 in the C_RP_ACT	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.7	M
		The Controlled station optionally confirms the forced restart by sending a C_RP_ACTCON to the Controlling station from each addressed LRU (with the LRUs specific CASDU address) and starts with the initialization of each addressed LRU ("Reset process" semantics are system-dependent)	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.7	M
		The Controlling station continues to try to start the link establishment to the Controlled station by issuing a Request Link Status	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.7	M
		The links are initialized similar as after a controlled station (re-)boot	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.7	M
		The Controlled station finishes its local initialization by sending the M_EI (End of initialization) to the Controlling station from each restarted LRU (with the LRUs specific CASDU address) NOTE 3 This is optional, but recommended, because it allows the Controlled station to distinguish between this initiated local initialization and other connection establishment procedures like lost connections.	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.4	PIXIT
		The Controlled station starts the General interrogation procedure from each restarted LRU to update the Controlling station with the actual process information after receipt of the General Interrogation command C_IC_ACT. The normal Telecontrol operations may begin.	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.4	M
5.4.17.21	Reset of pending information with time tag of the event buffer	The Controlling station forces one LRU (using a specific CASDU address in the C_RP_ECT) or all LRUs (using broadcast CASDU address in the C_RP_ACT) in the Controlled station to do a restart of the Application processes. QRP is set to 2 in the C_RP_ACT. Run this test while the Controlled station has pending events in the buffer.	IEC 60870-5-5:1995, 6.1 IEC 60870-5-101:2003, 7.2.6.27	PIXIT
		The Controlled station confirms the Reset of pending information with time tag of the event buffer by sending a C_RP_ACTCON to the Controlling station from each addressed LRU (with the LRUs specific CASDU address) and resets its pending information with time tag in the event buffer. The Controlled station does not send any events anymore (until new events are generated).	IEC 60870-5-5:1995, 6.1 IEC 60870-5-101:2003, 7.2.6.27	PIXIT

Table 17 *(4 of 4)*

Test No.	Test	Description	Reference	Required
5.4.17.30	Re-establishing a broken link between the Controlling and the Controlled station in **balanced** transmission systems	After the communication link is disconnected for a longer period than time-out and retries of an event allow, the Controlled Station starts a new establishment of the broken link by issuing “Request status of link” at regular intervals to the Controlling Station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.7	M
		The initialization continues as test item 5.4.17.1	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.7	M
		After the communication link is disconnected for a longer period than time-out and retries of a command allow, the Controlling Station starts a new establishment of the broken link by issuing “Request status of link” at regular intervals to the Controlled Station	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		The initialization continues as test item 5.4.17.10	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
		Since both links are independent it is possible and allowed that both links will initialize simultaneously, resulting in an interleaved initiation process	IEC 60870-5-101:2003, 7.4.1 IEC 60870-5-5:1995, 6.1.6	M
5.4.17.40	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		M

Table 18 – Redundant link conformance test procedures

Optional but recommended. Local issue, to be written on project basis.

Table 19 – Cyclic data transmission function Conformance Test Procedures

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Cyclic data transmission and/or Background Scan. If 'M' is mentioned, the test case is mandatory for systems with the relevant Cyclic and/or Background Scan options marked in the PICS: – PICS, 8.5, "Process information in monitor direction". At least one of the types should be selected. – PICS, 8.5, "Type identification and cause of transmission assignments", column COT 1 and COT 2. – PICS, 8.6, sections "Cyclic data transmission" and "Background scan".				
5.4.19.1	Cyclic data transmission and Background Scan – sequential procedure	The Controlled station transfers the configured Periodic, Cyclic process information data in ASDUs with COT=1 (PER/CYC) to the Controlling station	IEC 60870-5-101:2003, 7.4.3 IEC 60870-5-5:1995, 6.3.1	PICS, 8.6 *Cyclic data transmission*
		The Controlled station uses the configured period for process information transferred in ASDUs with COT=1 (PER/CYC)	IEC 60870-5-101:2003, 7.4.3 IEC 60870-5-5:1995, 6.3.1	PICS, 8.6 *Cyclic data transmission*
		The Controlled station transfers the configured Background Scan process information data in ASDUs with COT=2 (BACK) to the Controlling station	IEC 60870-5-101:2003, 7.4.13 IEC 60870-5-5:1995, 6.3.1	PICS, 8.6 *Background Scan*
		The Controlled station uses the configured period for process information transferred in ASDUs with COT=2 (BACK)	IEC 60870-5-5:1995, 6.3.1	PICS, 8.6 *Background Scan*
		The Controlled station transmits Periodic, Cyclic, Background Scan process information data of the same Type, COT and priority but with gaps in their addresses as a *Set of Information elements* (SQ:=0) in one single ASDU, filled up to but not exceeding the maximum configured ASDU or APDU length as in the PICS	IEC 60870-5-3:1992, 5.1.5 IEC 60870-5-101:2003, 7.2.2.2	M
		The Controlled station transmits Periodic, Cyclic, Background Scan process information data of the same type, COT and priority and with sequential addresses as a *Sequence of Information elements* (SQ:=1) in one single ASDU, filled up to but not exceeding the maximum configured ASDU or APDU length as in the PICS	IEC 60870-5-3:1992, 5.1.5 IEC 60870-5-101:2003, 7.2.2.2	PIXIT
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station		M
		The Controlled station may transmit a Single point information object (configurable IOA) with COT=3 (SPONT) if buffer overflow occurs (statusON=overflow, statusOFF=no overflow). Dependent on configuration the Controlled station deletes the newest or oldest event in buffer when overflow occurs. The action being taken by the controlling station after a buffer overflow is implementation specific.	IEC 60870-5-101:2003, 7.2.2.3	PIXIT
		The Controlling station activates or deactivates cyclic or periodic transmission of the addressed object by using P_AC_NA_1 (ASDU 113). The Controlled station acknowledges the activation or deactivation by mirroring the command with COT=7 (ACTCON)	IEC 60870-5-101:2003, 7.3.5.4	PICS, 8.6 *Parameter activation*
		The tests in this Table are performed correctly by each ASDU in the PICS that supports COT=1 (PER/CYC) and/or 2 (BACK)	IEC 60870-5-101:2003, 8.5, 8.6	M
5.4.19.10	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		M

Table 20 – Data acquisition through Read function Conformance Test Procedures

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Data acquisition through Read. If 'M' is mentioned, the test case is mandatory for systems with the relevant Acquisition of events options marked in the PICS: – PICS, 8.5, "Process information in control direction", "Read command". – PICS, 8.5, "Type identification and cause of transmission assignments", column COT 5. – PICS, 8.6, "Read procedure".				
5.4.20.1	Data acquisition through Read – sequential procedure:	The Controlling station sends a Read command (C_RD, ASDU 102) with COT = 5 (REQ) to the Controlled station	IEC 60870-5-101:2003, 7.3.4.3 IEC 60870-5-5:1995, 6.2.1	M
		The Controlled station sends the requested Information Object in the correct ASDU that is configured for the requested Information Object (look at PICS 8.5, "Type identification and cause of transmission assignments" for the supported ASDUs) to the Controlling station	IEC 60870-5-101:2003, 7.3.1 IEC 60870-5-101:2003, 7.4.2 IEC 60870-5-5:1995, 6.2.1	M
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station.		M
		The tests in this Table are performed correctly by each ASDU in the PICS that supports COT=5 (REQ)	IEC 60870-5-101:2003, 8.5, 8.6 IEC 60870-5-101:2003, 7.3.4.3	M
5.4.20.10	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		M

Table 21 – Acquisition of events function Conformance Test Procedures *(1 of 2)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Acquisition of events. If 'M' is mentioned, the test case is mandatory for systems with the relevant Acquisition of events options marked in the PICS: – PICS, 8.5, "Process information in monitor direction". At least one of the types should be selected. – PICS, 8.5, "Type identification and cause of transmission assignments", column COT 3. – PICS, 8.6, section "Spontaneous transmission".				
5.4.21.1	Acquisition of events - sequential procedure	When an event occurs in the Controlled station, The Controlled station transfers the configured process information data in ASDUs with COT=3 (SPONT) to the Controlling station	IEC 60870-5-101:2003, 7.4.4 IEC 60870-5-5:1995, 6.4.1	M
		Local buffer function to collect events that may appear faster than it is possible to transmit them to the Controlling station to prevent the loss of events	IEC 60870-5-101:2003, 7.4.4 IEC 60870-5-5:1995, 6.4	M
		Local buffer in the Controlling station to collect events that may arrive faster on the communication link than they can be processed and/or conveyed to higher layers or user processes (to prevent communication delays)		PIXIT
		Events of each Information Object Address *without* a time tag are transmitted in chronological order of occurrence to the Controlling station. Note: This test is only required for systems supporting events without time tag. (See PICS 8.5, "Type identification and cause of transmission assignments": COT 3 should be marked for at least one type without time tag)	IEC 60870-5-101:2003, 7.2.2.2	PICS, 8.5 *Type id and COT assignment*
		The Controlled station transmits events of the same Type, COT and priority but with gaps in their addresses as a *Set of Information elements* (SQ:=0) in one single ASDU, filled up to but not exceeding the maximum configured ASDU or APDU length as in the PICS	IEC 60870-5-3:1992, 5.1.5 IEC 60870-5-101:2003, 7.2.2.2	M

Table 21 *(2 of 2)*

Test No.	Test	Description	Reference	Required
		The Controlled station transmits events of the same type, COT and priority and with sequential addresses as a *Sequence of Information elements* (SQ:=1) in one single ASDU, filled up to but not exceeding the maximum configured ASDU or APDU length as in the PICS. Using SQ=1 is optional for a controlled station and a mandatory requirement for a controlling station	IEC 60870-5-3:1992, 5.1.5 IEC 60870-5-101:2003, 7.2.2.2	PIXIT
		The time label in ASDUs with a time tag represents the time of occurrence (plausibility test)		M
		The Controlled station sends a spontaneous clock synchronization message to indicate the date and hour of subsequent ASDUs with CP24Time2a and with COT=3 (SPONT) that contain events. The Controlled station sends a spontaneous clock synchronization message with COT=3 (SPONT) to indicate its internal date and hour shift immediately after the hour shift or before sending subsequent ASDUs with CP24Time2a	IEC 60870-5-101:2003, 7.3.4.4	PICS, 8.5 *Type id and COT assignment: COT 3 / ASDU 103*
		The time label in the clock synchronization message from the Controlled station represents the time of occurrence (plausibility test)		PICS, 8. 5 *Type id and COT assignment: COT 3 / ASDU 103*
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station.		M
		The Controlled station may transmit a Single point information object (configurable IOA) with COT=3 (SPONT) if buffer overflow occurs (statusON=overflow, statusOFF=no overflow). Dependent on configuration the Controlled station deletes the newest or oldest event in buffer when overflow occurs. Upon receipt of a buffer overflow message the Controlling station issues a GI command	IEC 60870-5-101:2003, 7.2.2.3	PIXIT
		The tests in this Table are performed correctly by each ASDU in the PICS that supports COT=3, spontaneous	IEC 60870-5-101:2003, 8.5, 8.6	M
5.4.21.10	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		M

Table 22 – General interrogation function Conformance Test Procedures *(1 of 5)*

Test No.	Test	Description	Reference	Required
5.4.22.1	General interrogation – Outstation interrogation – One Logical Remote Unit (LRU) available in the controlled station	The Controlling station sends an Interrogation Command (ASDU 100) with COT = 6, C_IC_ACT, to the Controlled station with QOI=20 (station) if: – the controlling station receives an ENDINIT message – the controlling station observes a loss of link and the link is available again – an interrogation procedure is initiated manually (for example by the operator)	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-101:2003, 7.2.6.22 IEC 60870-5-5:1995, 6.6.1	M
		The Controlled station mirrors the Interrogation Command with COT = 7, C_IC_ACTCON to the Controlling station if the Controlled station is ready to return the interrogation information	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-5:1995, 6.6.1	M
		The Controlled station mirrors the Interrogation Command with COT = 7, C_IC_ACTCONneg to the Controlling station if the Controlled station is NOT ready to return the interrogation information. In this case, the Controlling station may repeat the command	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-5:1995, 6.6.1	M
		All Information Objects that are part of the initiated GI with that QOI are sent with the corresponding COT (20-36) to the Controlling station	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-5:1995, 6.6.1	M
		The Controlled station sends GI data in ASDUs without time stamp	IEC 60870-5-101:2003, 7.4.5	M
		The Controlled station transmits Interrogated process information data of the same Type, COT and priority but with gaps in their addresses as a *Set of Information elements* (SQ:=0) in one single ASDU, filled up to but not exceeding the maximum configured ASDU or APDU length as in the PICS.	IEC 60870-5-3:1992, 5.1.5 IEC 60870-5-101:2003, 7.2.2.2	M
		The Controlled station transmits Interrogated process information data of the same type, COT and priority and with sequential addresses as a *Sequence of Information elements* (SQ:=1) in one single ASDU, filled up to but not exceeding the maximum configured ASDU or APDU length as in the PICS.	IEC 60870-5-3:1992, 5.1.5 IEC 60870-5-101:2003, 7.2.2.2	PIXIT
		The controlling station should be able to handle both SQ=0 and SQ=1	IEC 60870-5-3:1992, 5.1.5 IEC 60870-5-101:2003, 7.2.2.2	M
		The Controlled station sends an Interrogation Command with COT = 10, C_IC_ACTTERM, to the Controlling station after *all configured* GI data is sent	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-5:1995, 6.6.1	M
		GI messages contain actual status information. Test by sending an event during the GI before the corresponding GI message. The value in the GI should be updated. With single transfer, buffered time tagged events are transmitted from the Controlled station before GI data	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-101:2003, 7.2.2.2 IEC 60870-5-5:1995, 6.6	M
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station. The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station		M
		The tests in this Table are performed correctly by each ASDU in the PICS that supports the applicable COT=20-36	IEC 60870-5-101:2003, 8.5, 8.6	M
		The tests in this Table are performed correctly for supported General Interrogation groups: The Controlling station sends an Interrogation Command (ASDU 100) with COT = 6, C_IC_ACT, to the Controlled station with QOI=21…36 (group 1…16). At least 3 groups need to be tested (unless only 1 or 2 groups are supported).	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-101:2003, 7.2.6.22	PICS, 8.6 *Station Interrogation*

Table 22 *(2 of 5)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for – systems supporting more than one Logical Remote Unit – systems supporting the broadcast CASDU address while only supporting one Logical Remote Unit. If 'M' is mentioned, the test case is mandatory for systems with the functionality above described as supported in the PIXIT.				
5.4.22.10	General interrogation – Outstation interrogation – more than one Logical Remote Unit (LRU) available in the controlled station	The Controlling station sends an Interrogation Command (ASDU 100) with COT = 6, C_IC_ACT, to the Controlled station with QOI=20 (station) with CASDU broadcast address (FF or FFFF) if: – the controlling station receives an ENDINIT message – the controlling station observes a loss of link and the link is available again – an interrogation procedure is initiated manually (for example by the operator)	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-101:2003, 7.2.6.22 IEC 60870-5-5:1995, 6.6.1	M
		Each LRU mirrors the Interrogation Command with COT = 7, C_IC_ACTCON to the Controlling station, containing its configured CASDU address	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-5:1995, 6.6.1	M
		It may be possible that one or more LRU(s) mirrors the Interrogation Command with COT = 7, C_IC_ACTCONneg to the Controlling station (for example if the LRU(s) is not ready to return the interrogated information), containing its configured CASDU address. Then the controlling station starts the normal GI procedure (for one LRU available) containing the CASDU address of that/those LRU(s) and finishes correctly the GI for each LRU as described	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-5:1995, 6.6.1	M
		It may be possible that one or more LRU(s) sends an ENDINIT to the Controlling station during or after the completion of the first initiated interrogation procedure (if the LRU(s) is restarted), containing the LRUs configured CASDU address. Then the controlling station starts the normal GI procedure (for one LRU available) containing the CASDU address of that/those LRU(s) and finishes correctly the GI for each LRU as described		PIXIT
		All Information Objects that are part of the initiated GI with that QOI are sent with the corresponding COT (20-36) to the Controlling station for each LRU, containing its configured CASDU address	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-5:1995, 6.6.1	M
		The Controlled station sends GI data in ASDUs without time stamp	IEC 60870-5-101:2003, 7.4.5	M
		The Controlled station transmits Interrogated process information data of the same Type, COT and priority but with gaps in their addresses as a *Set of Information elements* (SQ:=0) in one single ASDU, filled up to but not exceeding the maximum configured ASDU or APDU length as in the PICS.	IEC 60870-5-3:1992, 5.1.5 IEC 60870-5-101:2003, 7.2.2.2	M
		The Controlled station transmits Interrogated process information data of the same type, COT and priority and with sequential addresses as a *Sequence of Information elements* (SQ:=1) in one single ASDU, filled up to but not exceeding the maximum configured ASDU or APDU length as in the PICS.	IEC 60870-5-3:1992, 5.1.5 IEC 60870-5-101:2003, 7.2.2.2	PIXIT
		The controlling station should be able to handle both SQ=0 and SQ=1	IEC 60870-5-3:1992, 5.1.5 IEC 60870-5-101:2003, 7.2.2.2	M

Table 22 *(3 of 5)*

Test No.	Test	Description	Reference	Required
		The Controlled station sends an Interrogation Command with COT = 10, C_IC_ACTTERM, for each LRU to the Controlling station after *all configured* GI data of that LRU is sent, containing its configured CASDU address	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-5:1995, 6.6.1	M
		GI messages contain actual status information (an event before the corresponding GI message is not overwritten by that corresponding GI message)	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-5:1995, 6.6	M
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station. The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station.		M
		The tests in this Table are performed correctly by each ASDU in the PICS that supports the applicable COT=20-36.	IEC 60870-5-101:2003, 8.5, 8.6	M
		The tests in this Table are performed correctly for supported General Interrogation groups: The Controlling station sends an Interrogation Command (ASDU 100) with COT = 6, C_IC_ACT, to the Controlled station with QOI=21…36 (group 1…16) with CASDU broadcast address (FF or FFFF). At least 3 groups need to be tested (unless only 1 or 2 groups are supported).	IEC 60870-5-101:2003, 7.4.5 IEC 60870-5-101:2003, 7.2.6.22	PICS, 8.6 *Station Interrogation*

Table 22 *(4 of 5)*

Test No.	Test	Description	Reference	Required
The Controlled station shall fulfil one of the following 3 options. If the Controlling station supports activating a new interrogation while another interrogation is already running, then the Controlling station shall be able to handle each option.				
5.4.22.20	General interrogation – Re-activate a running Outstation interrogation Option 1: the running GI continues.	The Controlling station sends an Interrogation Command (ASDU 100) with COT = 6, C_IC_ACT, to the Controlled station with QOI=20 (station) or 21...36 (group 1...16) when a General Interrogation is already running. A running GI means that the controlling station has not received the C_IC_TERM after it has sent a C_IC_ACT.	IEC 60870-5-101:2003, 7.3.4.1	PIXIT
		The Controlled station mirrors the Interrogation Command with COT = 7, C_IC_ACTCONneg, to the Controlling station	IEC 60870-5-101:2003, 7.3.4.1 IEC 60870-5-101:2003, 7.4.5	PIXIT
		The Controlled station continues the already running General Interrogation	IEC 60870-5-101:2003, 7.4.5	PIXIT
5.4.22.30	General interrogation – Re-activate a running Outstation interrogation Option 2: the running GI is stopped and the second GI is started.	The Controlling station sends an Interrogation Command (ASDU 100) with COT = 6, C_IC_ACT, to the Controlled station with QOI=20 (station) or 21...36 (group 1...16) when a General Interrogation is already running. A running GI means that the controlling station has not received the C_IC_ACTTERM after it has sent a C_IC_ACT.	IEC 60870-5-101:2003, 7.3.4.1 PICS, PID	PIXIT
		The Controlled station stops the running General Interrogation (this may be indicated by the Controlled station by sending a C_IC_ACTTERM or a C_IC_ACTCONneg) and mirrors the Interrogation Command with COT = 7, C_IC_ACTCON to the Controlling station.	IEC 60870-5-101:2003, 7.3.4.1 IEC 60870-5-101:2003, 7.4.5	PIXIT
		The Controlled station continues with a new General Interrogation procedure	IEC 60870-5-101:2003, 7.4.5 PICS, PID	PIXIT
5.4.22.40	General interrogation – Re-activate a running Outstation interrogation Option 3: the running GI continues and after activation termination (COT=10) the second GI is started.	The Controlling station sends an Interrogation Command (ASDU 100) with COT = 6, C_IC_ACT, to the Controlled station with QOI=20 (station) or 21...36 (group 1...16) when a General Interrogation is already running. A running GI means that the controlling station has not received the C_IC_TERM after it has sent a C_IC_ACT.	IEC 60870-5-101:2003, 7.3.4.1 PICS, PID	PIXIT
		The Controlled station continues the running General Interrogation and mirrors the second Interrogation Command with COT = 7, C_IC_ACTCON to the Controlling station.	IEC 60870-5-101:2003, 7.3.4.1 IEC 60870-5-101:2003, 7.4.5	PIXIT
		The Controlled station continues with the first General Interrogation procedure. After activation termination (COT=10) the Information Objects that are part of the second initiated GI are sent with the correct COT (20-36) to the Controlling station.	IEC 60870-5-101:2003, 7.4.5 PICS, PID	PIXIT

Table 22 *(5 of 5)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting General interrogation Deactivation. If 'M' is mentioned, the test case is mandatory for systems with the relevant General interrogation options marked in the PICS: – PICS, 8.5, "Type identification and cause of transmission assignments", column COT 8 and 9 for ASDU Type 100.				
5.4.22.50	General interrogation – Deactivate a running Outstation interrogation	The Controlling station sends an Interrogation Command with COT = 8, C_IC_DEACT to the Controlled station with QOI=20 (station) or 21...36 (group 1...16)	IEC 60870-5-101:2003, 7.3.4.1 PICS, PID	M
		The Controlled station sends an Interrogation Command with COT = 9, C_IC_DEACTCON to the Controlling station	IEC 60870-5-101:2003, 7.3.4.1 PICS, PID	M
		No further Information Objects that are part of the GI for that QOI are sent to the Controlling station. No Interrogation Command with COT = 10 (ACTTERM) to the Controlling station	IEC 60870-5-101:2003, 7.3.4.1 PICS, PID	M
5.4.22.60	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation.		PICS, 8.5 *Process info for control dir.*

Table 23 – Clock synchronization function conformance test procedures *(1 of 2)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Clock synchronization. If 'M' is mentioned, the test case is mandatory for systems with the relevant Clock synchronization options marked in the PICS: – PICS, 8.5, "Process information in control direction" – PICS, 8.6, section "Clock synchronization".				
5.4.23.1	Clock synchronization - sequential procedure	The Controlling station sends a Clock Synchronization message (ASDU 103) with COT = 6, C_CS_ACT, to the Controlled station	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		The time label in the clock synchronization message from the Controlling station represents the time of occurrence (plausibility test)		M
		The current local time in the Controlled station is adjusted with the time label in the clock synchronization message in previous test case increased with the time correction (time correction, either derived from the transmission speed and message length and/or the Loaded Delay value (if this BAF is used), is subtracted from the old local value)	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		The Controlled station mirrors ASDU 103 with COT=7, C_CS_ACTCON, containing the *local time minus the value of time correction* in the Controlled station before it was adjusted back to the Controlling station	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		Any events waiting in the Controlled station BEFORE the Time Sync arrives still have their previous, unadjusted time tags	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		Events occurring AFTER the Time Sync has arrived in the Controlled station use the new, corrected time value	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		Events occurring before the FIRST Time Sync arrives in the Controlled station after a Reset Process or Local initialization have the IV (Invalid) bit in the time label set	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		Events occurring after the configured clock accuracy interval in the Controlled station has passed without a Time Sync from the Controlling station have the IV (Invalid) bit in the time label set	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		The clock synchronization is executed after station initialization and at configured intervals		M

Table 23 *(2 of 2)*

Test No.	Test	Description	Reference	Required
5.4.23.10	Clock synchronization – Change the clock	The Controlling station increases its internal time one day and one hour ahead	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		Sequential Clock synchronization procedure continues	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		Events occurring AFTER the Time Sync has arrived in the Controlled station use the new, corrected time value	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		The Controlling station increases its internal time one day and one hour back	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		Sequential Clock synchronization procedure continues	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
		Events occurring AFTER the Time Sync has arrived in the Controlled station use the new, corrected time value	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-5:1995, 6.7	M
5.4.23.15	Clock synchronisation – Broadcast	The Controlling station sends a Clock Synchronisation message (ASDU 103) with COT = 6, C_CS_ACT and with the Broadcast CASDU, to the Controlled station. The Controlled station replies with its own CASDU(s)	IEC 60870-5-101:2003, 7.4.6 IEC 60870-5-101:2003, 7.2.4 IEC 60870-5-5:1995, 6.7	PIXIT
5.4.23.20	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation.		M

Table 24 – Command transmission function Conformance Test Procedures *(1 of 7)*

These procedures are passed only if the mandatory procedures and test cases are passed for each supported ASDU described in the PICS. The detailed result should be reported as in 5.6.

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Command transmission with Select and Execute. If 'M' is mentioned, the test case is mandatory for systems with the relevant command options marked in the PICS: – PICS, 8.5, "Process information in control direction" – PICS, 8.6, "Select and execute command" and "Select and execute set point command".				
5.4.24.1	Command transmission – sequential procedure: Select and Execute	The Controlling station sends a Single, Double, Regulating step or Setpoint Command message (look at PICS 8.5 "Process information for control direction" for the supported ASDUs) with COT = 6, C_SC/DC/SE/RC_ACT, and S/E=1 (SELECT) to the Controlled station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlled station mirrors the same ASDU with COT=7, C_SC/DC/SE/RC_ACTCON, to the Controlling station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-101:2003, 7.2.1 IEC 60870-5-5:1995, 6.8.1	M
		The Controlling station sends the same Command message with COT=6, C_SC/DC/SE/RC_ACT, and S/E=0 (EXECUTE) to the Controlled station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlled station mirrors the same ASDU with COT=7, C_SC/DC/SE/RC_ACTCON, to the Controlling station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-101:2003, 7.2.1 IEC 60870-5-5:1995, 6.8.1	M
		The Controlled station generates an event (RETURN_INF) with COT=11(RETURN_INF caused by a remote command) or COT=12 (RETURN_INF caused by a local command), when the status of the (Process) Information Object that is associated with the command object changes as a result of the command. The controlled station may send the RETURN_INF with COT=3, 11, or 12 *after* the ACTTERM. The Controlling station performs an overall check on the correct command procedure and corresponding status change, regardless of the order in which they occur.	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	PICS, 8.6 *Type id and COT assignments:* *COT 11/12*

Table 24 *(2 of 7)*

Test No.	Test	Description	Reference	Required
		The Controlled station mirrors the previous Command message with COT=10, C_SC/DC/SE/RC_ACTTERM (for SE if supported as in the PICS), to the Controlling station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	PICS, 8.6 *C_SE ACTTERM used*
		Command function EXECUTE after SELECT should be received within the configured delay in the controlled station.	IEC 60870-5-5:1995, 6.8.1	M
		Command execution in progress should be completed with status change and ACTTERM (for SE if supported as in the PICS) within the configured delay in the controlling station. The controlled station may send the RETURN_INF with COT=3, 11, or 12 *after* the ACTTERM if and only if the Controlling station performs an overall check on the correct command procedure and corresponding status change, regardless of the order in which they occur.		PICS, 8.6 *Type id and COT assignments:* *COT 3/11/12*
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station		M
		If the SELECT message from the Controlling station is not correctly mirrored by the Controlled station, then the Controlling station should not proceed with sending the EXECUTE message	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-101:2003, 7.2.1	M
		If the EXECUTE message from the Controlling does not contain exactly the same information as the SELECT message, then the Controlled mirrors the same ASDU with COT=7, C_SC/DC/SE/RC_ACTCONneg (Negative ACTCON), to the Controlling station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-101:2003, 7.2.1	M

Table 24 *(3 of 7)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Command transmission with Select and Execute and with Deactivation. If 'M' is mentioned, the test case is mandatory for systems with the relevant command options marked in the PICS: – PICS, 8.5, "Process information in control direction" – PICS, 8.6 section Command transmission, "Select and execute command", "Select and execute set point command" and "Type id and COT assignments": column COT 8/9.				
5.4.24.10	Command transmission – sequential procedure: Select and Deactivation	The Controlling station sends a Single, Double, Regulating step or Setpoint Command message (look at PICS 8.5 "Process information for control direction" for the supported ASDUs) with COT = 6, C_SC/DC/SE/RC_ACT, and S/E=1 (SELECT) to the Controlled station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlled station mirrors the same ASDU with COT=7, C_SC/DC/SE/RC_ACTCON, to the Controlling station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlling station sends the same Command message with COT=8, C_SC/DC/SE/RC_DEACT, and S/E=1 (SELECT) to the Controlled station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlled station mirrors the same ASDU with COT=9, C_SC/DC/SE/RC_DEACTCON, to the Controlling station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		Both the Controlling and Controlled station have deactivated the Command transmission procedure	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The value of the Object(s) does not change at all during this command procedure		M

Table 24 *(4 of 7)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Command transmission with Direct Execute. If 'M' is mentioned, the test case is mandatory for systems with the relevant command options marked in the PICS: – PICS, 8.5, "Process information in control direction" – PICS, 8.6 section Command transmission, "Direct command" and "Direct set point command".				
5.4.24.20	Command transmission – sequential procedure: Direct Execute	The Controlling station sends a Single, Double, Regulating step, Setpoint or Bitstring Command message (look at PICS 8.5 "Process information for control direction" for the supported ASDUs) with COT = 6, C_SC/DC/SE/RC_ACT and S/E=0 (EXECUTE) to the Controlled station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlled station mirrors the same ASDU with COT=7, C_SC/DC/SE/RC_ACTCON, to the Controlling station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlled station generates an event (RETURN_INF) with COT=11 (RETURN_INF caused by a remote command)or 12 (RETURN_INF caused by a local command), when the status of the (Process) Information Object that is associated with the command object changes as a result of the command. The controlled station may send the RETURN_INF with COT=3 (SPONT), 11 (RETURN_INF caused by a remote command), or 12 (RETURN_INF caused by a local command) *after* the ACTTERM if the Controlling station performs an overall check on the correct command procedure and corresponding status change, regardless of the order in which they occur	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	PICS, 8.6 *Type id and COT assignments:* *COT 11/12*
		The Controlled station mirrors the previous Command message with COT=10, C_SC/DC/SE/RC_ ACTTERM (for SE if supported as in the PICS), to the Controlling station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	PICS, 8.6 C_SE_ACTTER M used
		Command execution in progress should be completed with status change and ACTTERM (for SE if supported as in the PICS) within the configured delay in the controlling station. The controlled station may send the RETURN_INF with COT=3 (SPONT), 11 (RETURN_INF caused by a remote command), or 12 (RETURN_INF caused by a local command) *after* the ACTTERM if the Controlling station performs an overall check on the correct command procedure and corresponding status change, regardless of the order in which they occur.		PICS, 8.6 *Type id and COT assignments:* *COT 3/11/12*
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station		M

Table 24 *(5 of 7)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Command transmission with Select and Execute. If 'M' is mentioned, the test case is mandatory for systems with the relevant command options marked in the PICS: – PICS, 8.5, "Process information in control direction" – PICS, 8.6 section Command transmission, "Select and execute command" and "Select and execute set point command".				
5.4.24.30	Command transmission – sequential procedure: Select with Negative Confirmation by Controlled station (Abort)	The Controlling station sends a Single, Double, Regulating step or Setpoint Command message (look at PICS 8.5 "Process information for control direction" for the supported ASDUs) with COT = 6, C_SC/DC/SE/RC_ACT, and S/E=1 (SELECT) to the Controlled station for a not-controllable or not existing Information object	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlled station mirrors the same ASDU with COT=7, C_SC/DC/SE/RC_ACTCONneg (Negative ACTCON) to the Controlling station. In case of a not existing Information object, the controlled station could instead mirror the same ASDU with COT=47 (unknown Information Object Address) to the Controlling station (if supported (see PICS clause 8.5 "Type id and COT assignments, COT 47),	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-101:2003, 7.2.3 IEC 60870-5-5:1995, 6.8.1 IEC 60870-5-101:2003, 7.2.1.1	M
		The Controlling station stops the Command function with an indication at user level	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	PIXIT
		The value of the Object(s) does not change at all during this command procedure		M
		The controlled station does not accept and responds with a P/N=1 if a not allowed command (for example DCO=0 or 3; RCO=0 or 3) is received	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-101:2003, 7.2.3 IEC 60870-5-5:1995, 6.8.1	M

Table 24 *(6 of 7)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Command transmission with Select and Execute. If 'M' is mentioned, the test case is mandatory for systems with the relevant command options marked in the PICS: – PICS, 8.5, "Process information in control direction" – PICS, 8.6 section Command transmission, "Select and execute command" and "Select and execute set point command".				
5.4.24.40	Command transmission – sequential procedure: Select with Negative Execute Confirmation by Controlled station if Execute is received after configured delay in the controlling station	The Controlling station sends a Single, Double, Regulating step or Setpoint Command message (look at PICS 8.5 "Process information for control direction" for the supported ASDUs) with COT = 6, C_SC/DC/SE/RC_ACT, and S/E=1 (SELECT) to the Controlled station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlled station mirrors the same ASDU with COT=7, C_SC/DC/SE/RC_ACTCON, to the Controlling station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlling station sends the same Command message with COT=6, C_SC/DC/SE/RC_ACT, and S/E=0 (EXECUTE) to the Controlled station AFTER the configured delay in the controlling station.	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	M
		The Controlled station mirrors the same ASDU with COT=7, C_SC/DC/SE/RC_ACTCONneg (Negative ACTCON) to the Controlling station	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1 IEC 60870-5-101:2003, 7.2.3	M
		Alternatively, the Controlled station can first accept the command with a Positive ACTCON and then send a Negative Termination by mirroring the previous Command message with COT=10, C_SC/DC/SE/RC_ ACTTERM (for SE if supported as in the PICS) and P/N=1, to the Controlling station	IEC 60870-5-101:2003, 7.2.3	PIXIT PICS, 8.6 *C_SE ACTTERM used*
		The Controlling station stops the Command function with an indication at user level	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	PIXIT
		The value of the Object(s) does not change at all during this command procedure.		M

Table 24 *(7 of 7)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Command transmission with Direct Execute. If 'M' is mentioned, the test case is mandatory for systems with the relevant command options marked in the PICS: – PICS, 8.5, "Process information in control direction" – PICS, 8.6 section Command transmission, "Direct command" and "Direct set point command".				
5.4.24.50	Command transmission – sequential procedure: Direct Execute with Negative Confirmation by Controlled station	The Controlling station sends a Single, Double, Regulating step, Setpoint or Bitstring Command message (look at PICS 8.5 "Process information for control direction" for the supported ASDUs) with COT = 6, C_SC/DC/SE/RC_ACT, and S/E=0 (EXECUTE) to the Controlled station for a not-controllable or not existing Information object	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1 PICS, PID	M
		The Controlled station mirrors the same ASDU with COT=7, C_SC/DC/SE/RC_ACTCONneg (Negative ACTCON), to the Controlling station. In case of a not existing Information object, the controlled station could instead mirror the same ASDU with COT=47 (unknown Information Object Address) to the Controlling station (if supported (see PICS clause 8.5 "Type id and COT assignments, COT 47)	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-101:2003, 7.2.3 IEC 60870-5-5:1995, 6.8.1 IEC 60870-5-101:2003, 7.2.1.1	M
		Alternatively, in case of a not-controllable Information object, the Controlled station can first accept the command with a Positive ACTCON and then send a Negative Termination by mirroring the previous Command message with COT=10, C_SC/DC/SE/RC_ ACTTERM (for SE if supported as in the PICS) and P/N=1, to the Controlling station	IEC 60870-5-101:2003, 7.2.3	PIXIT PICS, 8.6 *C_SE ACTTERM used*
		The Controlling station stops the Command function with an indication at user level	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-5:1995, 6.8.1	PIXIT
		The Controlled station does NOT change the status of the (Process) Information Object that is associated with the command object		M
		The value of the Object(s) does not change at all during this command procedure		M
		The controlled station does not accept and responds with a P/N=1 if an invalid command (for example DCO=0 or 3; RCO=0 or3) is received	IEC 60870-5-101:2003, 7.4.7 IEC 60870-5-101:2003, 7.2.3 IEC 60870-5-5:1995, 6.8.1	M
5.4.24.55	Command transmission – Command received during GI	Command function during a running general interrogation is processed and executed without waiting for the GI to finish. This is performed correctly by every supported ASDU (look at PICS 8.5 "Process information for control direction" for the supported ASDUs). If ASDUs are configurable to use Select and Execute or Direct Execute, then test each ASDU once (with Select and Execute *or* Direct Execute) and one ASDU with both Select and Execute *and* Direct Execute.	IEC 60870-5-5:1995, 5 IEC 60870-5-101:2003, 7.4	PICS, 8.5 *Process info for control dir.*
5.4.24.60	Command transmission – Test for all supported ASDU's	The tests in this Table are performed correctly by each supported ASDU (look at PICS 8.5 "Process information for control direction" for the supported ASDUs). Results are shown in Subclause 5.6		PICS, 8.5 *Process info for control dir.*
5.4.24.70	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		PICS, 8.5 *Process info for control dir.*

Table 25 – Transmission of integrated totals (telecounting) function Conformance Test Procedures *(1 of 4)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Transmission of integrated totals using Mode A. If 'M' is mentioned, the test case is mandatory for systems with the relevant Transmission of integrated totals options marked in the PICS: – PICS, 8.5, "System information in control direction" – PICS, 8.6 section Transmission of integrated totals, "Mode A".				
5.4.25.1	Transmission of integrated totals – sequential procedure: Mode A – Local freeze with spontaneous transmission	The Controlled station sends a Counter value (look at PICS for the supported ASDUs) as an event with COT = 3 (SPONT), M_IT_SPONT, and, if applicable, correct time tag to the Controlling station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Counter values are sent by the Controlled station at the configured intervals	IEC 60870-5-101:2003, 7.4.8	M
		The Counter value is either the locally memorized increment during the past interval or the locally frozen integrated total (memorized counter) at the end of the past interval (plausibility test)		M
		The Sequence number of the transmitted Counter value (SQ) changes with each counter transmission interval (plausibility test)		M
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station		M
		The tests in this Table are performed correctly by each M_IT ASDU in the PICS that supports COT 3.	IEC 60870-5-101:2003, 8.5, 8.6	M

Table 25 *(2 of 4)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Transmission of integrated totals using Mode B. If 'M' is mentioned, the test case is mandatory for systems with the relevant Transmission of integrated totals options marked in the PICS: – PICS, 8.5, "System information in control direction" – PICS, 8.6 section Transmission of integrated totals, "Mode B".				
5.4.25.10	Transmission of integrated totals – sequential procedure: Mode B – Local freeze with Counter Interrogation	The Controlling station sends a Counter interrogation command (ASDU 101) with COT=6, C_CI_ACT, FRZ=0 (no freeze/reset) and RQT=5 (general) to the Controlled station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Controlling station sends the Counter Interrogation command at the configured intervals		M
		The Controlled station mirrors the counter interrogation command (ASDU 101) with COT=7, C_CI_ACTCON, to the Controlling station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		All Counter Information Objects that are part of the Counter Interrogation for the requested RQT are sent with the corresponding COT (37-41) to the Controlling station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Counter value is either the locally memorized increment during the past interval or the locally frozen integrated total (memorized counter) at the end of the past interval (plausibility test)		M
		The Sequence number of the transmitted Counter value (SQ) changes with each counter transmission interval (plausibility test)		M
		The Controlled station sends the same Counter interrogation command it received (ASDU 101) with COT = 10, C_CI_ACTTERM, to the Controlling station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station.		PIXIT
		The tests in this Table are performed correctly by each M_IT ASDU in the PICS that supports COT 37-41	IEC 60870-5-101:2003, 8.5, 8.6	M
		The tests in this Table are performed correctly for supported Counter Interrogation groups: The Controlling station sends a Counter Interrogation Command (ASDU 101) with COT = 6, C_CI_ACT, FRZ=0 (no freeze/reset) to the Controlled station with RQT=1…4 (group 1…4). At least 2 groups need to be tested (unless only 1 group is supported).	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	PICS, 8.6 *Transmission of integrated totals*
		If supported, the Counter interrogation command should also be tested with the Broadcast CASDU address. The Controlled station should reply with its own CASDU(s)	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	PIXIT

Table 25 *(3 of 4)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Transmission of integrated totals using Mode C. If 'M' is mentioned, the test case is mandatory for systems with the relevant Transmission of integrated totals options marked in the PICS: – PICS, 8.5, "System information in control direction" – PICS, 8.6 section Transmission of integrated totals, "Mode C".				
5.4.25.20	Transmission of integrated totals – sequential procedure: Mode C – Remote initiated freeze with Counter Interrogation	The Controlling station sends a Counter interrogation command (ASDU 101) with COT=6, C_CI_ACT, FRZ=1 (freeze) and RQT=5 (general) to the Controlled station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Freeze Counter interrogation command is sent at the configured interval		M
		The Controlled station sends a confirmation of the same counter interrogation command it received (ASDU 101) with COT=7, C_CI_ACTCON, to the Controlling station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Controlled station memorizes the counters indicated in the RQT field without affecting other counter values or counters pending for transmission	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Controlling station sends a Counter interrogation command (ASDU 101) with COT=6, C_CI_ACT, FRZ =0 (no freeze/reset) and RQT=1...5 to the Controlled station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Counter Interrogation command is sent at the configured intervals		M
		The Controlled station sends a confirmation of the same counter interrogation command it received (ASDU 101) with COT=7 (ACTCON) to the Controlling station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		All Information Objects that are part of the Counter Interrogation for the requested RQT are sent with the corresponding COT (37-41) to the Controlling station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Counter value is either the increment or the integrated total (memorized counter) that was memorized during the previous Memorize Counter command (plausibility test)		M
		The Sequence number of the transmitted Counter value (SQ) changes with each counter transmission interval (plausibility test)		M
		The Controlled station sends the same Counter interrogation command it received (ASDU 101) with COT = 10, C_CI_ACTTERM, to the Controlling station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station.		M
		The tests in this Table are performed correctly by each M_IT ASDU in the PICS that supports COT 37-41,	IEC 60870-5-101:2003, 8.5, 8.6	M
		The tests in this Table are performed correctly for supported Counter Interrogation groups: The Controlling station sends a Counter Interrogation Command (ASDU 101) with COT = 6, C_CI_ACT, FRZ=1 (freeze) to the Controlled station with RQT=1...4 (group 1...4). At least 2 groups need to be tested (unless only 1 group is supported).	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	PICS, 8.6 *Transmission of integrated totals*
		The tests in this Table are performed correctly for each supported Counter reset option: The Controlling station sends a Counter Interrogation Command (ASDU 101) with COT = 6, C_CI_ACT, FRZ=2 or 3 (freeze with reset or reset only) to the Controlled station with RQT=5 (general).	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	PICS, 8.6 *Transmission of integrated totals*
		If supported, the Counter interrogation command should also be tested with the Broadcast CASDU address. The Controlled station should reply with its own CASDU(s)	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	PIXIT

Table 25 *(4 of 4)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Transmission of integrated totals using Mode D. If 'M' is mentioned, the test case is mandatory for systems with the relevant Transmission of integrated totals options marked in the PICS: – PICS, 8.5, "System information in control direction" – PICS, 8.6 section Transmission of integrated totals, "Mode D".				
5.4.25.30	Transmission of integrated totals – sequential procedure: Mode D – Remote initiated freeze with spontaneous transmission	The Controlling station sends a Counter interrogation command (ASDU 101) with COT=6, C_CI_ACT, FRZ=1…3 (freeze, freeze with reset, reset) and RQT=1…5 (general or counter group 1…4) to the Controlled station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Freeze Counter interrogation command is sent at the configured interval		M
		The Controlled station sends a confirmation of the same counter interrogation command it received (ASDU 101) with COT=7, C_CI_ACTCON, to the Controlling station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Controlled station memorizes the counters indicated in the RQT field without affecting other counter values or counters pending for transmission	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Controlled station sends a Counter value (look at PICS for the supported ASDUs) as an event with COT = 3 (SPONT), M_IT_SPONT, and, if applicable, correct time tag to the Controlling station	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Counter values are sent by the Controlled station at the configured intervals		M
		The Counter value is either the increment or the integrated total (memorized counter) that was memorized during the previous Memorize Counter command (plausibility test)	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The Sequence number of the transmitted Counter value (SQ) changes with each counter transmission interval (plausibility test)	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	M
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station		M
		The tests in this Table are performed correctly by each M_IT ASDU in the PICS that supports COT 3	IEC 60870-5-101:2003, 8.5, 8.6	M
		The tests in this Table are performed correctly for supported Counter Interrogation groups: The Controlling station sends a Counter Interrogation Command (ASDU 101) with COT = 6, C_CI_ACT, FRZ=1 (freeze) to the Controlled station with RQT=1…4 (group 1…4). At least 2 groups need to be tested (unless only 1 group is supported).	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	PICS, 8.6 *Transmission of integrated totals*
		The tests in this Table are performed correctly for each supported Counter reset option: The Controlling station sends a Counter Interrogation Command (ASDU 101) with COT = 6, C_CI_ACT, FRZ=2 or 3 (freeze with reset or reset only) to the Controlled station with RQT=5 (general).	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	PICS, 8.6 *Transmission of integrated totals*
		If supported, the Counter interrogation command should also be tested with the Broadcast CASDU address. The Controlled station should reply with its own CASDU(s)	IEC 60870-5-101:2003, 7.4.8 IEC 60870-5-5:1995, 6.9.1	PIXIT
5.4.25.40	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		PICS, 8.5 *System info in control direction*

Table 26 – Parameter loading function Conformance Test Procedures *(1 of 2)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Parameter loading. If 'M' is mentioned, the test case is mandatory for systems with the relevant Parameter loading options marked in the PICS: – PICS, 8.5, "Parameter in control direction"				
5.4.26.1	Parameter loading – sequential procedure: Load and activate parameter	The Controlling station sends a Parameter command (look at PICS 8.5 "Parameter in control direction" for the supported ASDUs) with COT = 6 ACT to the Controlled station	IEC 60870-5-5:1995, 6.10.1	M
		The parameter is loaded and will be activated immediately (after check for feasibility and acceptance of being a valid value)	IEC 60870-5-5:1995, 6.10.1 IEC 60870-5-101:2003, 7.4.9	M
		The Controlled station mirrors the same ASDU, with COT=7_ACTCONpos, to the Controlling station, which contain the actual parameter value that is in operation. The actual value in this case is the "new" value and not the old parameter value!	IEC 60870-5-5:1995, 6.10.1 IEC 60870-5-101:2003, 7.4.9 Defined in IEC 60870-5-101:2003	M
		The actual parameter value in the ACTCON is equal to the operational parameter in the controlled station (plausibility test)	IEC 60870-5-101:2003, 7.4.9 PICS, PID	M
		The values of the object(s) transferred and stored on the controlling station should represent the actual values on the controlled station.		M
		The tests in this Table are performed correctly by each ASDU in the PICS that supports the applicable COT and for each supported parameter (Threshold, smoothing factor, high/low limit). Look at PICS 8.6 section Parameter loading for the supported parameters.	IEC 60870-5-101:2003, 8.5, 8.6	M
5.4.26.10	Parameter loading – sequential procedure: Load and activate parameter with Negative Confirmation by Controlled station	The Controlling station sends a Parameter command (look at PICS 8.5 "Parameter in control direction" for the supported ASDUs) with COT = 6 ACT to the Controlled station	IEC 60870-5-5:1995, 6.10.1	PICS, 8.6 *Parameter loading, supported parameters*
		The parameter is loaded but CANNOT be activated immediately (after check for feasibility and acceptance of being a valid value) Negative values for the parameters Threshold value and Smoothing factor always are considered as invalid and not activated. If all values for the supported parameters are considered valid, then this test can be skipped.	IEC 60870-5-5:1995, 6.10.1	PICS, 8.6 *Parameter loading, supported parameters*
		The Controlled station mirrors the same ASDU with COT=7(ACTCONneg) to the Controlling station, which indicates that the parameter could not be loaded and/or activated. The actual value in this case is the "old" existing value and not the parameter that could not be activated!	IEC 60870-5-5:1995, 6.10.1 IEC 60870-5-101:2003, 7.4.9	PICS, 8.6 *Parameter loading, supported parameters*

Table 26 *(2 of 2)*

Test No.	Test	Description	Reference	Required
5.4.26.15	Parameter loading – Parameter activation	The Controlled station rejects any received Parameter Activation command (ASDU 113) with QPA = 1 or 2. The Controlled station mirrors the same ASDU with P/N=<1> negative (and with COT = 44, if supported) to the Controlling station	IEC 60870-5-101:2003, 7.2.6.25	M
5.4.26.20	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation.		M

Table 27 – Test procedure function Conformance Test Procedures

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Test procedure. If 'M' is mentioned, the test case is mandatory for systems with the relevant Test procedure options marked in the PICS: – PICS, 8.5, "System information in control direction", "Test command" – PICS, 8.6 section Test procedure				
5.4.27.1	Test procedure – sequential procedure	The Controlling station sends a Test command (ASDU 104) with COT = 6, C_TS_ACT, to the Controlled station	IEC 60870-5-101:2003, 7.4.10 IEC 60870-5-5:1995, 6.11.1	M
		The Controlled station sends the same Test command (ASDU 104) with COT = 7, C_TS_ACTCON to the Controlling station	IEC 60870-5-101:2003, 7.4.10 IEC 60870-5-5:1995, 6.11.1	M
5.4.27.10	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		M

Table 28 – File transfer procedure function Conformance Test Procedures *(1 of 2)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting File transfer in monitor direction. If 'M' is mentioned, the test case is mandatory for systems with the relevant File transfer options marked in the PICS: – PICS, 8.5, "File transfer" – PICS, 8.6 section File transfer, File transfer in monitor direction				
5.4.28.1	File transfer procedure (monitor direction) – sequential procedure	The Controlling station sends a call directory command (ASDU 122) with COT = 5, F_SC_REQ, to the Controlled station	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	PICS, 8.5 *Type id and COT assignments:* *ASDU 122-COT 5* *ASDU 126-COT 5*
		The Controlled station sends a file directory (ASDU 126) with COT = 5, F_DR_REQ, to the Controlling station	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	PICS, 8.5 *Type id and COT assignments:* *ASDU 122-COT 5* *ASDU 126-COT 5*
		The Controlling station sends a select file (ASDU 122) with COT = 13, F_SC_FILE, to the Controlled station, SCQ=1	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlled station sends a file ready (ASDU 120) with COT = 13, F_FR_FILE, to the Controlling station, FRQ=0	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlling station sends a call file (ASDU 122) with COT = 13, F_SC_FILE, to the Controlled station, SCQ=2	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlled station sends a section ready (ASDU 121) with COT = 13, F_SR_FILE, to the Controlling station, SRQ=0	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlling station sends a call section (ASDU 122) with COT = 13, F_SC_FILE, to the Controlled station, SCQ=6	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlled station sends a number of segments (ASDU 125) with COT = 13, F_SG_FILE, to the Controlling station	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlled station sends a last segment (ASDU 123) with COT = 13, F_LS_FILE, to the Controlling station, LSQ=3	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlling station sends a acknowledge section (ASDU 124) with COT = 13, F_AF_FILE, to the Controlled station, AFQ=3. On negative acknowledge (AFQ=3) the same section is transmitted again.	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The procedure from ASDU 121 with COT=13, F_SR_FILE (SRQ=0) to ASDU 124 with COT=13, F_AF_FILE (AFQ=4) is repeated for all sections in the file	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlled station sends a last section (ASDU 123) with COT = 13, F_LS_FILE, to the Controlling station, LSQ=1	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlling station sends a acknowledge file (ASDU 124) with COT = 13, F_AF_FILE, to the Controlled station, AFQ=1	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		Select a specific section (ASDU 122, F_SC, SCQ=5) and abort section (ASDU 122, F_SC, SCQ=7) are supported	PID	PIXIT

Table 28 *(2 of 2)*

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting File transfer in control direction. If 'M' is mentioned, the test case is mandatory for systems with the relevant File transfer options marked in the PICS: – PICS, 8.5, "File transfer" – PICS, 8.6 section File transfer, File transfer in control direction				
5.4.28.10	File transfer procedure (control direction) – sequential procedure	The Controlling station sends a file ready command (ASDU 120) with COT = 13, F_FR_FILE, to the Controlled station	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlled station sends a call file (ASDU 122) with COT = 13, F_SC_FILE, to the Controlling station, SCQ=2	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlling station sends a section ready (ASDU 121) with COT = 13, F_SR_FILE, to the Controlled station, SRQ=0	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlled station sends a call section (ASDU 122) with COT = 13, F_SC_FILE, to the Controlling station, SCQ=6	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlling station sends a number of segments (ASDU 125) with COT = 13, F_SG_FILE, to the Controlled station	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlling station sends a last segment (ASDU 123) with COT = 13, F_LS_FILE, to the Controlled station, LSQ=3	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlled station sends a acknowledge section (ASDU 124) with COT = 13, F_AF_FILE, to the Controlling station, AFQ=3. On negative acknowledge (AFQ=4) the same section is transmitted again	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The procedure from ASDU 121 with COT=13, F_SR_FILE (SRQ=0) to ASDU 124 with COT=13, F_AF_FILE (AFQ=3) is repeated for all sections in the file	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlling station sends a last section (ASDU 123) with COT = 13, F_LS_FILE, to the Controlled station, LSQ=1	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		The Controlled station sends a acknowledge file (ASDU 124) with COT = 13, F_AF_FILE, to the Controlling station, AFQ=1	IEC 60870-5-101:2003, 7.4.11 IEC 60870-5-5:1995, 6.12	M
		Select a specific section (ASDU 122, F_SC, SCQ=5) and abort section (ASDU 122, F_SC, SCQ=7) are supported	PID	PIXIT
		ASDUs sent or received with the not configured or not applicable IOA are not accepted, ignored or negatively confirmed with P/N=<1> negative (and with COT=44, if supported)	IEC 60870-5-101:2003, 7.2.3	M
5.4.28.20	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		PICS, 8.6 *File transfer*

Table 29 – Delay acquisition procedure function conformance test procedures

Test No.	Test	Description	Reference	Required
NOTE The following tests are only required for systems supporting Delay acquisition. If 'M' is mentioned, the test case is mandatory for systems with the relevant Delay acquisition options marked in the PICS: – PICS, 8.5, "System information in control direction" – PICS, 8.6 section Acquisition of transmission delay				
5.4.29.1	Delay acquisition procedure – sequential procedure	The Controlling station sends a Delay acquisition command (ASDU 106) with COT = 6, C_CD_ACT, and a (local) SDT value (Clock time when the first bit hits the line, default: 0) to the Controlled station	IEC 60870-5-101:2003, 7.4.12 IEC 60870-5-5:1995, 6.13	M
		The Controlled station sends the Delay acquisition command (ASDU 106) with COT = 7, C_CD_ACTCON) and the SDT + local tR value (local reaction/processing time) to the Controlling station	IEC 60870-5-101:2003, 7.4.12 IEC 60870-5-5:1995, 6.13	M
		The Controlling station sends the Load Delay acquisition (ASDU 106) with COT = 3, C_CD_SPONT and in SDT the calculated delay to the Controlled station	IEC 60870-5-101:2003, 7.4.12 IEC 60870-5-5:1995, 6.13	M
		The value of SDT in the Load Delay acquisition message from the Controlling station represents the actual link transmission delay (plausibility test)	PID	M
5.4.29.10	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		M

Table 30 – Additional Conformance Test Procedures

Test No.	Test	Description	Reference	Required
5.4.30.1	Out of service behavior	Behavior on main voltage supply interruptions of the Controlled system. System is able to start automatically without any manual assistance		M
		Behavior on main voltage supply interruptions of the Controlling system. System is able to start automatically without any manual assistance		M
		Behavior on disconnection of the physical communication to the Controlled system. System is able to connect automatically without any manual assistance		M
		Behavior on disconnection of the physical communication to the Controlling system. System is able to connect automatically without any manual assistance		M
		These tests are performed correctly in the situation when there is no active Basic application function and when there is an active Basic application function (for example a running General Interrogation).		M
5.4.30.10	Miscellaneous	The controlled station responds with P/N=1 negative (with COT = 44, if supported) if a BAF is not implemented or used	IEC 60870-5-101:2003, 7.2.3	M
		The controlled station continues its function after receipt of a not implemented link or application function and no reset (reboot, reset or warm reboot) is necessary	IEC 60870-5-2:1992	M
		The controlling station detects the receipt of a P/N=1 negative and (optionally) shows this on a HMI or a test tool	IEC 60870-5-101:2003, 7.2.3	M
		The controlling station continues its function after receipt of a not implemented link or application function and no reset (reboot, reset or warm reboot) is necessary	IEC 60870-5-2:1992	M
		After resetting its DFC bit, the controlled station continues its normal operation without any manual interference or reset. Only applicable for Balanced communication	IEC 60870-5-2:1992	PICS, 8.4 *Balanced transmission*
		Either ASDUs of the set <2>, <4>, <6>, <8>, <10>, <12>, <14>, <16>, <17>, <18>, <19> or of the set <30> – <40> are used or configured at the same time	IEC 60870-5-101:2003, 8.5	M
5.4.30.20	Time invalid	After receipt of an ASDU with time stamp marked invalid (IV=1) the controlling station immediately initiates a Clock synchronization procedure (if supported) after the Clock synchronization procedure has been completed as part of the Initialization procedure	IEC 60870-5-101:2003, 7.4.6	PIXIT
5.4.30.30	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		M

Table 31 – Negative Conformance Test Procedures

Test No.	Test	Description	Reference	Required
5.4.31.1	Negative tests	Invalid start frame octet	IEC 60870-5-2	M
5.4.31.2		Invalid first length octet	IEC 60870-5-2	M
5.4.31.3		Invalid second start frame octet	IEC 60870-5-2	M
5.4.31.4		Invalid second length octet	IEC 60870-5-2	M
5.4.31.5		Invalid length octets, more than actual	IEC 60870-5-2	M
5.4.31.6		Invalid length octets, less than actual	IEC 60870-5-2	M
5.4.31.7		Invalid checksum	IEC 60870-5-2	M
5.4.31.8		Invalid end frame octet	IEC 60870-5-2	M
5.4.31.9		Link address in message does not match configured link address	IEC 60870-5-2	M
		For each test in this table: Verify frame is not processed and no link or application layer response is generated		M
5.4.31.50	COMPATIBILITY WITH OTHER TEST CASES	All of the applicable items in Subclause 5.3 have been reviewed without any error during execution of the test cases in this Table and no manual intervention was required for continued normal operation		M

Table 32 can be used for specific PIXIT related test procedures. If there is no specific PIXIT related test cases, then this table can be skipped.

Table 32 – PIXIT related Conformance Test Procedures

Test No.	Test	Description	Reference	Required
5.4.32.1	Function		PIXIT, Clause	
5.4.32.2			PIXIT, Clause	
5.4.32.3			PIXIT, Clause	
5.4.32.4			PIXIT, Clause	
5.4.32.50	Function		PIXIT, Clause	
5.4.32.51			PIXIT, Clause	
5.4.32.52			PIXIT, Clause	
5.4.32.53			PIXIT, Clause	
5.4.32.100	Function		PIXIT, Clause	
5.4.32.101			PIXIT, Clause	
5.4.32.102			PIXIT, Clause	
5.4.32.103			PIXIT, Clause	
5.4.32.150	Function		PIXIT, Clause	
5.4.32.151			PIXIT, Clause	
5.4.32.152			PIXIT, Clause	
5.4.32.153			PIXIT, Clause	

5.5 Test results chart

The results of the test procedures in 5.2, 5.3, and 5.4 shall be listed in Table 33. For all configuration settings, the test procedures should be performed unless indicated otherwise.

Table 33 – Test results chart *(1 of 8)*

	Record the conformance test procedure result for each of the supported configuration parameter values on the right		Station type		Direction	
	√ ..... indicates the test procedure passed for that configuration value. FAIL..... indicates Test Procedure failed for at least one of the Test Cases. N.A..... indicates that configuration value is not supported by the device. Empty.... indicates the Test Procedure was not performed. (There should be no empty boxes when testing is complete).		Controlling station test (Master)	Controlled station test (Slave)	Normal direction	Reversed direction
Configuration Parameter Values	5.2.1.1	Controlling station test (Master)				
	5.2.1.2	Controlled station test (Slave)				
	5.2.1.20	Transmission speed(s) in control direction				
	5.2.1.21	Transmission speed(s) in monitor direction				
	5.2.1.40	Zero (0) octets for address field (balanced only)				
	5.2.1.41	One (1) octet for address field				
	5.2.1.42	Two (2) octets for address field				
	5.2.1.50	Maximum length L (control direction)				
	5.2.1.51	Maximum length L (monitor direction)				
	5.2.1.60	Standard assignment of class 2 messages				
	5.2.1.61	Special assignments of class 2 messages				
	5.2.1.70	One (1) octet for Common Address of ASDU (CASDU)				
	5.2.1.71	Two (2) octets for Common Address of ASDU (CASDU)				
	5.2.1.80	One (1) octet for Information Object Address (structured or unstructured)				
	5.2.1.81	Two (2) octets for Information Object Address (structured or unstructured)				
	5.2.1.82	Three (3) octets for Information Object Address (structured or unstructured)				
	5.2.1.90	One (1) octet for COT field				
	5.2.1.91	Two (2) octets for COT field (2nd octet is Originator address)				
	5.2.1.95	Minimum total address length				
	5.2.1.96	Maximum total address length				

Table 33 *(2 of 8)*

	Record the conformance test procedure result for each of the supported configuration parameter values on the right		Station type		Direction	
	√ indicates the test procedure passed for that configuration value. FAIL indicates Test Procedure failed for at least one of the Test Cases. N.A. indicates that configuration value is not supported by the device. Empty indicates the Test Procedure was not performed. (There should be no empty boxes when testing is complete).		Controlling station test (Master)	Controlled station test (Slave)	Normal direction	Reversed direction
Physical layer	5.3.2.1	Byte frame				
Verification of link level	5.3.3.10	FT1.2 Frame Layout				
	5.3.3.30	Byte lag				
	5.3.3.40	Control Field				
	5.3.3.60	Unbalanced Transmission Procedure				
	5.3.3.80	Balanced Transmission Procedure				
	5.3.3.100	Time Out Interval				
Verification of data unit identifier	5.3.4.1	Type Identification				
	5.3.4.10	Variable Structure Qualifier				
	5.3.4.20	Cause of Transmission				
Verification of ASDUs	5.3.6.10	ASDU 1 Single-point Information				
	5.3.6.30	ASDU 2 Single-point Information with Timetag				
	5.3.6.50	ASDU 3 Double-point Information				
	5.3.6.70	ASDU 4 Double-point Information with Timetag				
	5.3.6.90	ASDU 5 Step-position Information				
	5.3.6.110	ASDU 6 Step-position Information with Timetag				
	5.3.6.130	ASDU 7 Bitstring of 32 bit				
	5.3.6.150	ASDU 8 Bitstring of 32 bit with Timetag				
	5.3.6.170	ASDU 9 Measured value, normalised value				
	5.3.6.190	ASDU 10 Measured value, normalised value with Timetag				
	5.3.6.210	ASDU 11 Measured value, scaled value				
	5.3.6.230	ASDU 12 Measured value, scaled value with Timetag				
	5.3.6.250	ASDU 13 Measured value, short floating point number				

Table 33 *(3 of 8)*

	Record the conformance test procedure result for each of the supported configuration parameter values on the right	Station type		Direction	
	√ indicates the test procedure passed for that configuration value. FAIL indicates Test Procedure failed for at least one of the Test Cases. N.A. indicates that configuration value is not supported by the device. Empty indicates the Test Procedure was not performed. (There should be no empty boxes when testing is complete).	Controlling station test (Master)	Controlled station test (Slave)	Normal direction	Reversed direction
	5.3.6.270 ASDU 14 Measured value, short floating point number with Timetag				
	5.3.6.300 ASDU 15 Integrated Totals				
	5.3.6.320 ASDU 16 Integrated Totals with Timetag				
	5.3.6.340 ASDU 17 Event of protection equipment with Timetag				
	5.3.6.360 ASDU 18 Packed start events of protection equipment with time-tag				
	5.3.6.390 ASDU 19 Packet output circuit information of protection equipment with time tag				
	5.3.6.420 ASDU 20 Packed single-point information with status change detection				
	5.3.6.440 ASDU 21 Measured value, normalised value without quality descriptor				
	5.3.6.450 ASDU 30 Single-point information with time tag CP56Time2a				
	5.3.6.480 ASDU 31 Double-point information with time tag CP56Time2a				
	5.3.6.510 ASDU 32 Step-position information with time-tag CP56Time2a				
	5.3.6.540 ASDU 33 Bitstring of 32 bit with time-tag CP56Time2a				
	5.3.6.570 ASDU 34 Measured value, normalised value with time-tag CP56Time2a				
	5.3.6.600 ASDU 35 Measured value, scaled value with time-tag CP56Time2a				
	5.3.6.630 ASDU 36 Measured value, short floating point number with time-tag CP56Time2a				
	5.3.6.660 ASDU 37 Integrated totals with time tag CP56Time2a				
	5.3.6.690 ASDU 38 Event of protection equipment with time-tag CP56Time2a				
	5.3.6.720 ASDU 39 Packed start events of protection equipment with time-tag CP56Time2a				
	5.3.6.760 ASDU 40 Packet output circuit information of protection equipment with time tag CP56Time2a				
	5.3.7.1 ASDU 45 Single Command				
	5.3.7.10 ASDU 46 Double Command				
	5.3.7.20 ASDU 47 Regulating step command				
	5.3.7.30 ASDU 48 Set point command, normalised value				
	5.3.7.40 ASDU 49 Set point command, scaled value				

Table 33 *(4 of 8)*

	Record the conformance test procedure result for each of the supported configuration parameter values on the right		Station type		Direction	
	√ indicates the test procedure passed for that configuration value. FAIL indicates Test Procedure failed for at least one of the Test Cases. N.A. indicates that configuration value is not supported by the device. Empty indicates the Test Procedure was not performed. (There should be no empty boxes when testing is complete).		Controlling station test (Master)	Controlled station test (Slave)	Normal direction	Reversed direction
	5.3.7.50	ASDU 50 Set point command, short floating point value				
	5.3.7.60	ASDU 51 Bitstring of 32 bits				
	5.3.8.1	ASDU 70 End of Initialisation				
	5.3.9.1	ASDU 100 Interrogation command				
	5.3.9.10	ASDU 101 Counter interrogation command				
	5.3.9.20	ASDU 102 Read command				
	5.3.9.30	ASDU 103 Clock synchronisation command				
	5.3.9.50	ASDU 104 Test command				
	5.3.9.60	ASDU 105 Reset process command				
	5.3.9.70	ASDU 106 Delay acquisition command				
	5.3.10.1	ASDU 110 Parameter of measured value, normalised value				
	5.3.10.10	ASDU 111 Parameter of measured values, scaled value				
	5.3.10.20	ASDU 112 Parameter of measured values, short floating point number				
	5.3.10.30	ASDU 113 Parameter activation				
	5.3.11.1	ASDU 120 File ready				
	5.3.11.10	ASDU 121 Section ready				
	5.3.11.30	ASDU 122 Call directory, select file, call file, call section				
	5.3.11.40	ASDU 123 Last section, last segment				
	5.3.11.50	ASDU 124 ACK file, ACK section				
	5.3.11.60	ASDU 125 Segment				
	5.3.11.70	ASDU 126 Directory				
Link Layer	5.4.12.1	Frame Count Bit				
	5.4.12.2	Invalid Checksum				
	5.4.12.3	Time Out Interval				
	5.4.12.6	Address Field				

Table 33 *(5 of 8)*

	Record the conformance test procedure result for each of the supported configuration parameter values on the right		Station type		Direction	
	√ ..... indicates the test procedure passed for that configuration value. FAIL..... indicates Test Procedure failed for at least one of the Test Cases. N.A..... indicates that configuration value is not supported by the device. Empty... indicates the Test Procedure was not performed. (There should be no empty boxes when testing is complete).		Controlling station test (Master)	Controlled station test (Slave)	Normal direction	Reversed direction
Data Unit Identifier	5.4.13.1	Type Identification				
	5.4.13.5	Cause Of Transmission				
	5.4.13.10	Common Address of ASDU				
Information object address	5.4.14.1	Object Address				
Station initialization function (unbalanced systems)	5.4.15.1	Initialization of the controlling station in unbalanced transmission systems: (re-)boot				
	5.4.15.10	Local initialization of the controlled station in unbalanced transmission systems: (re-)boot				
	5.4.15.20	Remote initialization of the controlled station in unbalanced transmission systems				
	5.4.15.21	Reset of pending information with time tag of the event buffer				
	5.4.15.30	Re-establishing a broken link between the Controlling and the Controlled station in unbalanced transmission systems				
	5.4.15.40	Compatibility With Other Test Cases				
Data acquisition by polling function (unbalanced systems)	5.4.16.1	Data acquisition by polling in Unbalanced transmission systems – sequential procedure				
	5.4.16.10	COM Compatibility With Other Test Cases				
Station initialization function (balanced systems)	5.4.17.1	Initialization of the controlling station in Balanced transmission systems: (re-)boot				
	5.4.17.10	Local initialization of the controlled station in Balanced transmission systems: (re-)boot				
	5.4.17.20	Remote initialization of the controlled station in Balanced transmission systems				
	5.4.17.21	Reset of pending information with time tag of the event buffer				
	5.4.17.30	Re-establishing a broken link between the Controlling and the Controlled station in Balanced transmission systems				
	5.4.17.40	Compatibility With Other Test Cases				
Redundant link						
Cyclic data transmission function	5.4.19.1	Cyclic data transmission and Background Scan – sequential procedure				
	5.4.19.10	Compatibility With Other Test Cases				

Table 33 *(6 of 8)*

	Record the conformance test procedure result for each of the supported configuration parameter values on the right		Station type		Direction	
	√.....indicates the test procedure passed for that configuration value. FAIL....indicates Test Procedure failed for at least one of the Test Cases. N.A.....indicates that configuration value is not supported by the device. Empty...indicates the Test Procedure was not performed. (There should be no empty boxes when testing is complete).		Controlling station test (Master)	Controlled station test (Slave)	Normal direction	Reversed direction
Data acquisition through Read function	5.4.20.1	Data acquisition through Read – sequential procedure				
	5.4.20.10	Compatibility With Other Test Cases				
Acquisition of events function	5.4.21.1	Acquisition of events -sequential procedure				
	5.4.21.10	Compatibility With Other Test Cases				
General interrogation function	5.4.22.1	Outstation interrogation – one Logical Remote Unit (LRU) available in the controlled station -				
	5.4.22.10	Outstation interrogation – more than one Logical Remote Unit (LRU) available in the controlled station -				
	5.4.22.20	Re-activate a running Outstation interrogation – Option 1: the running GI continues.				
	5.4.22.30	Re-activate a running Outstation interrogation Option 2: the running GI is stopped and the second GI is started.				
	5.4.22.40	Re-activate a running Outstation interrogation Option 3: the running GI continues and after activation termination (COT=10) the second GI is started.				
	5.4.22.50	Deactivate a running Outstation interrogation				
	5.4.22.60	Compatibility With Other Test Cases				
Clock synchronization function	5.4.23.1	Clock synchronization -sequential procedure				
	5.4.23.10	Clock synchronization – Change the clock				
	5.4.23.15	Clock synchronization – Broadcast				
	5.4.23.20	Compatibility With Other Test Cases				

Table 33 *(7 of 8)*

	Record the conformance test procedure result for each of the supported configuration parameter values on the right		Station type		Direction	
	√ indicates the test procedure passed for that configuration value. FAIL indicates Test Procedure failed for at least one of the Test Cases. N.A. indicates that configuration value is not supported by the device. Empty indicates the Test Procedure was not performed. (There should be no empty boxes when testing is complete).		Controlling station test (Master)	Controlled station test (Slave)	Normal direction	Reversed direction
Command transmission function	5.4.24.1	Select and Execute				
	5.4.24.10	Select and Deactivation				
	5.4.24.20	Direct Execute				
	5.4.24.30	Select with Negative Confirmation by Controlled station (Abort)				
	5.4.24.40	Select with Negative Execute Confirmation by Controlled station if Execute is received after configured delay in the controlling station				
	5.4.24.50	Direct Execute with Negative Confirmation by Controlled station				
	5.4.24.55	Command received during GI				
	5.4.24.60	Test for all supported ASDU's				
	5.4.24.70	Compatibility With Other Test Cases				
Transmission of integrated totals (telecounting) function	5.4.25.1	Mode A – Local freeze with spontaneous transmission				
	5.4.25.10	Mode B – Local freeze with Counter Interrogation				
	5.4.25.20	Mode C – Remote initiated freeze with Counter Interrogation				
	5.4.25.30	Mode D – Remote initiated freeze with spontaneous transmission				
	5.4.25.40	Compatibility With Other Test Cases				
Parameter loading function	5.4.26.1	Load and activate parameter				
	5.4.26.10	Load and activate parameter with Negative Confirmation by Controlled station				
	5.4.26.15	Parameter activation				
	5.4.26.20	Compatibility With Other Test Cases				
Test procedure function	5.4.27.1	Test procedure – sequential procedure				
	5.4.27.10	Compatibility With Other Test Cases				
File transfer procedure function	5.4.28.1	File transfer procedure (monitor direction) – sequential procedure				
	5.4.28.10	File transfer procedure (control direction) – sequential procedure				
	5.4.28.20	Compatibility With Other Test Cases				

Table 33 *(8 of 8)*

	Record the conformance test procedure result for each of the supported configuration parameter values on the right		Station type		Direction	
	√ ..... indicates the test procedure passed for that configuration value. FAIL ..... indicates Test Procedure failed for at least one of the Test Cases. N.A. ..... indicates that configuration value is not supported by the device. Empty ... indicates the Test Procedure was not performed. (There should be no empty boxes when testing is complete).		Controlling station test (Master)	Controlled station test (Slave)	Normal direction	Reversed direction
Delay acquisition procedure function	5.4.29.1	Delay acquisition procedure – sequential procedure				
	5.4.29.10	Compatibility With Other Test Cases				
Additional Conformance Test Procedures	5.4.30.1	Out of service behaviour				
	5.4.30.10	Miscellaneous				
	5.4.30.20	Time invalid				
	5.4.30.30	Compatibility With Other Test Cases				
Negative Conformance Test Procedures	5.4.31.1	Negative tests				
	5.4.31.50	Compatibility With Other Test Cases				
PIXIT related Conformance Test Procedures	5.4.32.1	Function:				
	5.4.32.50	Function:				
	5.4.32.100	Function:				

5.6 Test results of command transmission

Tables 34 to 37 provide an example of the detailed results required by the test procedures specified in Table 25.

Test results: 'X' = tested '-' = not tested Detailed information on enclosures per Command type The datalink services are not shown in the details, only the command ASDUs Each IOA could be configured S/E or only E S+E on/off = Select and Execute command on/off S and D = Select and Deactivate command on/off E on/off = Direct Execute command on/off	ACTCONpos=Positive Activation Confirmation ACTCONneg=Negative Activation Confirmation DEACTCONpos=Deactivation Confirmation positive ACTTERM=Activation Termination If ACTTERM is stated in row 'message from the RTU', ACTCONpos with S/E=0 execute has been received before. In case of a S+E command also ACTCONpos with S/E=1 select has been received before the ACT with S/E=0! NOTE This Table shows the only correct behaviour. Other behaviour means the test failed!

Table 34 – Test results of single command transmission

ASDU type = 45	S+E on	S+E off	S+D on	S+D off	Eon	Eoff
QU=0 (no add. def.)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						
QU=1 (short pulse)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						
QU=2 (long pulse)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						
QU=3 (persistent)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						
General remarks						

Table 35 – Test results of double command transmission *(1 of 2)*

ASDU type = 46	S+E on	S+E off	S+D on	S+D off	Eon	Eoff
QU=0 (no add. def.)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						
QU=1 (short pulse)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						
QU=2 (long pulse)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						

Table 35 *(2 of 2)*

ASDU type = 46	S+E on	S+E off	S+D on	S+D off	Eon	Eoff
QU=3 (persistent)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						
General remarks:						

Table 36 – Test results of regulating step command transmission *(1 of 2)*

ASDU type = 47	S+E up	S+E down	S+D up	S+D down	E up	E down
QU=0 (no add. def.)	§					
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						
QU=1 (short pulse)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						
QU=2 (long pulse)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						

Table 36 *(2 of 2)*

ASDU type = 47	S+E up	S+E down	S+D up	S+D down	E up	E down
QU=3 (persistent)						
Message from RTU	ACTTERMpos	ACTTERMpos	DEACTCONpos	DEACTCONpos	ACTTERMpos	ACTTERMpos
Shown behaviour after Select / Execute	E	E	S or E	S or E	E	E
Status change RTU	Yes, HMI	Yes, HMI	No	No	Yes, HMI	Yes, HMI
Status change process	If available	If available	No	No	If available	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result						
Log file available (Y/N)?						
General remarks						

Table 37 – Test results of setpoint command transmission

ASDU type = 48	S+E	S+D	E
QL=0			
Message from RTU	ACTCONpos / ACTTERMpos[2]	DEACTCONpos	ACTCONpos / ACTTERMpos2
After S or E	E	S or E	E
Status change RTU	Yes, HMI	No	Yes, HMI
Status change process	If available	No	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result			
Log files available (Y/N)?			
General remarks			
ASDU type = 49	S+E	S+D	E
QL=0			
Message from RTU	ACTCONpos / ACTTERMpos[3]	DEACTCONpos	ACTCONpos / ACTTERMpos3
After S or E	E	S or E	E
Status change RTU	Yes, HMI	No	Yes, HMI
Status change process	If available	No	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result			
Log files available (Y/N)?			
General remarks			
ASDU type = 50	S+E	S+D	E
QL=0			
Message from RTU	ACTCONpos / ACTTERMpos[4]	DEACTCONpos	ACTCONpos / ACTTERMpos4
After S or E	E	S or E	E
Status change RTU	Yes, HMI	No	Yes, HMI
Status change process	If available	No	If available
Required	PICS, 8.5, 8.6	PICS, 8.5, 8.6	PICS, 8.5, 8.6
Result			
Log files available (Y/N)?			
General remarks			

[2] If the PICS states ACTTERM is used, ACTTERM is applicable, if not, ACTCON is applicable.

[3] If the PICS states ACTTERM is used, ACTTERM is applicable, if not, ACTCON is applicable.

[4] If the PICS states ACTTERM is used, ACTTERM is applicable, if not, ACTCON is applicable.

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