IO-Link Wireless System Extensions

Test Specification

Related to
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Specification V1.1.3
+ Corrigendum

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This specification has been prepared by the IO-Link Wireless technology subgroup of the IO-Link community for review.

Any comments, proposals, requests on this document are appreciated through the IO-Link CR database www.io-link-projects.com. Please provide name and email address.

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Important notes:

NOTE 1 The IO-Link Consortium Rules shall be observed prior to the development and marketing of IO-Link products. The document can be downloaded from the www.io-link.com portal.

NOTE 2 Any IO-Link device shall provide an associated IODD file. Easy access to the file and potential updates shall be possible. It is the responsibility of the IO-Link device manufacturer to test the IODD file with the help of the IODD-Checker tool available per download from www.io-link.com.

NOTE 3 Any IO-Link devices shall provide an associated manufacturer declaration on the conformity of the device with this specification, its related IODD, and test documents, available per download from www.io-link.com.

Disclaimer:

Conventions:

In this specification, the following key words (in **bold** text) will be used:

may: indicates flexibility of choice with no implied preference.

should: indicates flexibility of choice with a strongly preferred implementation.

shall: indicates a mandatory requirement. Designers **shall** implement such mandatory requirements to ensure interoperability and to claim conformity with this specification.

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0 Introduction

0.1 General

This document together with its parent IEC 61139-3 is part of a series of standards on programmable controllers and the associated peripherals and should be read in conjunction with the other parts of the series.

The IO-Link Wireless is related to the Single-Drop digital Communication Interface (IO-Link™) technology.

IEC 61131-9 specifies the Single-Drop digital Communication Interface (IO-Link™) technology as a generic interface for connecting digital/analog sensors and actuators to a Master unit, which may be combined with gateway capabilities to become a fieldbus remote I/O node.

This subpart specifies the test cases and associated test environments for IO-Link wireless W-Master and W-Devices designed and developed according to IEC 61139-3. It provides the necessary preconditions for conformity testing to ensure interoperability and enables manufacturers of Master and Devices to sign a corresponding conformity declaration.

The structure of this document is described in clause 4.2.

Where a conflict exists between this and other IEC standards (except basic safety standards), the provisions of this standard should be considered to govern in the area of programmable controllers and their associated peripherals.

Conformity with IEC 61139-3 cannot be claimed unless the requirements of this document are met.

Terms of general use are defined in IEC 61131-1 or in REF 1. More specific terms are de-fined in each part.

0.2 Patent declaration

There are no known patents related to the content of this document.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The IO-Link Community shall not be held responsible for identifying any or all such patent rights.

1 Scope

This subpart specifies the test cases and associated test environments for W-Master and W-Devices designed and developed according to IEC 61131-3 REF 2. It provides the necessary preconditions for conformity testing to ensure interoperability and allows manufacturers of W-Master and W-Devices to sign a corresponding conformity declaration.

2 Normative references

The higher communication layers of IO-link wireless are identical to IO-Link standardized under IEC 61131-9 REF 9.

IO-Link wireless IEC 61139-3 REF 2 in particularly defining the different physical layer.

Relationships to other standards are described in Figure 1 of the IO-Link wireless - System Extensions REF 2

3 Terms, definitions, symbols, abbreviated terms and conventions

The following terms and definitions related to test methodology shall -whenever possible- be aligned to the glossary defined by the ISTQB see REF 6. All terms in this document related to IO-Link wireless technology are defined in IO-Link wireless - System Extensions. see REF 1.

3.1 Terms and definitions

3.1.1 Anechoic chamber (AC)

An anechoic chamber is a shielded room designed to absorb reflections of electromagnetic waves for testing. See Appendix A for more details.

3.1.2 Error

The result of error is used for situations where it is not clear whether the problem is in

the test objects.

3.1.3 Negative Testing

Tests aimed at showing that a component or system does not work. Negative testing is related to the tester's attitude rather than a specific test approach or test design technique, e.g., testing with invalid input values or exceptions. See also “Test to Fail”.

3.1.4 Positive testing

The process of testing to determine the functionality of a system. See also “Test to Pass”.

3.1.5 Reverberation chamber (RC)

Environment for testing and other electromagnetic investigations. A reverberation chamber is a shielded room with a minimum of absorption of electromagnetic energy. See Appendix A for details.

3.1.6 Test case

According to ISO 29119, a test case is a set of preconditions, inputs, actions (where applicable), expected results and postconditions, developed based on test conditions.

3.1.7 Test case result

The final verdict on the execution of a test and its outcomes, such as pass, fail, or error. The result of error is used for situations where it is not clear whether the problem is in

the test objects.

3.1.8 Test Design

The activity of deriving and specifying test cases from test conditions.

3.1.9 Test to Fail

A function shall react for example with an error indication when boundary conditions are exceeded. See also “Negative Testing”.

3.1.10 Test to Pass

A function shall perform as specified. See also “Positive Testing”.

3.1.11 W-Device-Tester-System

A reference W-Master to test against a W-Device. See also “Test oracle”.

3.1.12 W-Master-Tester-System

A reference W-Device to test against a W-Master. See also “Test oracle”.

3.2 Symbols and abbreviated terms

CYCC	Cyclic Communication
EUT	Equipment under Test
TCD	Testcase Device
TCM	Testcase Master
DTU	Device-Tester-Unit
MTU	Master-Tester-Unit
WDTU	W-Device-Tester-Unit
WMTU	W-Master-Tester-Unit

3.3 Conventions

3.3.1 Test case template

This document uses a dedicated template as shown in Table 1 for the particular test cases.

Table 1 Test case template

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_ 001
Name	Characteristic name of the test case (see 3.3.1.1)
Purpose (short)	Short description of the purpose of the test case (one line maximum)
Equipment under test (EUT)	W-Master, W-Device, W-Bridge or IOLW communication
Test case version	Starts with 1.0. Incremented first number indicates significant changes due to new functionality, the second one indicates changes within the test case
Category / type	See 3.3.1.1
Specification (clause)	[Bibliography, nn], clause or subclause, figure, table, chart, etc.
Configuration / setup	E.g., Master-Tester ("Device") shall detect all transmission rates and measure the corresponding delays. It shall not react to the requests.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Comprehensive description of the purpose of the test case (can be several lines).
Precondition	a) Mode of the test set (EUT and test environment) or ID of previous test
Procedure	Step by step description of the test
Input parameter	For example, of an ISDU: Index, Subindex, Length, Data
Post condition	Mode of the EUT and its environment

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Describe expected reaction of the EUT with permitted ranges and allowed deviations
Test passed	Describe reaction in case of test has passed.
Test not passed (examples)	Describe reaction in case of test has not passed.
Report	Describe detailed timings, voltages, currents, pulses, messages, sequences, etc.

3.3.1.1 Name of a test case

Figure 1 shows the structure of the name of a test case.

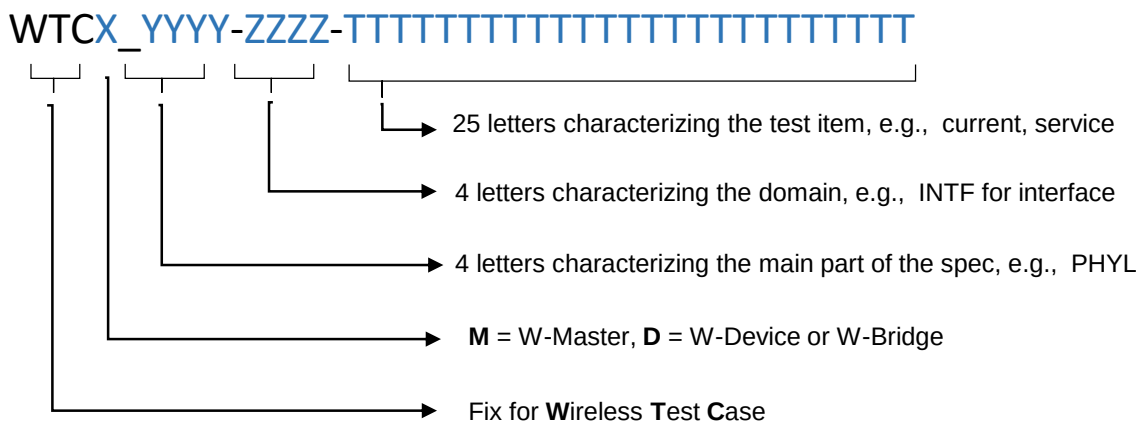

Figure 1 Structure of test case name

WTCM - Test Case W-Master

WTCD - Test Case Device or W-Bridge

109 **Table 2** shows the abbreviations used in name of test cases

110 **Table 2 Name of test cases**

Main Part		**Domain:**	
ALIC	Application	AERR	Error
		DERR	Derived ErrorType
		EVNT	Single event
		LIMT	Limit
		STOR	Data Storage delete
APPS	Applications	DSUP	Data Storage upload
		DSDN	Data Storage download
DLPC	Data Link Parameter	OPER	Operate
		PROP	Preoperate
		STDP	Read page
		STUP	Start-up
		WLSP	W-System Management
DLPD	Data Link ProcessData	CYCC	Cyclic Communication
DLIC	Data Link Cyclic Data	DEFP	Predefined W-Device parameter
		EVNT	Event
		DLMH	W-Message priority
DLIS	Data Link ISDU Data	ISDU	ISDU
DLST	Data Link Start-up	CHCK	Check
DS	Data Storage	APP	Application
DSBP	Data Storage Block Parameter	APPL	Applications
IODD		PARV	Parameter verification
PHYL	Physical Layer	AHT	Adaptive hopping table
		BLECONFORMITY	BLE conformity
		CARRIERFREQACC	Carrier frequency accuracy
		CARRIERFREQCAL	Carrier frequency calibration
		CONFIG	Configuration
		FREQTABLE	Frequency Table
		LQI	Link Quality Indicator
		PAIR	Pair
		RE-PAIRING	Re-pairing
		SCAN	Scan unpaired
		SENSITIVITY	Sensitivity
		SIMULTANEOUS	Simultaneous

Main Part		Domain:	
		TIMING	Timing
		TIMINGCONFORMITY	Timing conformity
		TRACK	Track
		TRANSPOWER	Transmitted power
		UNPAIRING	Unpairing
SMTH		SCAN	Scan
		PAIR	Pair
		UNPAIRING	Unpairing
SMAH	Adaptive Hopping	HPTB	Hopping Table

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113 **3.3.2 Behavioral descriptions**

114 For behavioral descriptions, the notations of UML 2 REF 5 are used, mainly timing diagrams.

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4 Test strategy for W-Master and W-Devices

4.1 Purpose of this specification

This specification describes the test cases and specifies the necessary test equipment for testing W-Master, W-Devices and W-Bridges as EUT. Another class of EUT are radio chips or -modules for the purpose of precertification testing and their declaration as "IOLW capable" or "IOLW qualified".

The requirements of following levels are built upon each other, i.e., all IOLW qualified modules shall be able to pass all of the relevant test cases for the chip level as well. All IOLW conform products shall be able to pass all of the relevant test cases for the module level and the chip level as well. In case of using pre-tested Chips or Modules, it is not required to explicitly carry out previous tests again. See Table 3 for details.

Declaration		Level	Relevant	Functionality
IOLW capable		Chip	Chip manufacturer	PHY Bluetooth IOLW timing
IOLW qualified		Module	Technology provider	PL Services optional: IOLW stack
IOLW conform		Product	Vendor	Module IOLW stack application antenna

The test levels are built upon each other.

Table 3 How to get an IOLW–Product

From	To	Chip Test	Module Test	Product Test
none	IOLW capable chip	mandatory	n/a	n/a
	IOLW qualified module	mandatory	mandatory	n/a
	IOLW conform product	mandatory	mandatory	mandatory
IOLW capable chip	IOLW qualified module	passed	mandatory	n/a
	IOLW conform product	passed	mandatory	mandatory
IOLW qualified module	IOLW conform product	passed	passed	mandatory

4.2 Test case design principles

The applied test case design techniques are as follows:

- End-to-End testing of the EUT without the need of specific test interfaces is always preferred.
- Only when testable analysis shows that no suitable interface for system stimulation or observation is available at the EUT, specific test interfaces may be defined in Annex A of this document for later enhancement of the IO-Link wireless - System Extensions REF 2 itself.

- Every product shall be able to pass the relevant type examination, defined by the test cases in this document.
- Test case minimization: When a test objective is already implicitly tested within another test case, no further test case is required.

4.3 Exception handling

If an Equipment Under Test (EUT) did not pass a certain test case due to measurement values close to the tolerance limits or similar situations it is possible to send an informal request to the organization listed in Annex D. This request shall be comprehensive enough for the experts to allow for an exception under certain conditions or clarification of the specifications. If an exception applies, it shall be documented in the user manual mentioning the possible implications.

Instead of pursuing such a time-consuming and uncertain way, it is highly recommended for an applicant to rather strive for a robust implementation and conformity of the Device.

4.4 Test of W-Device or W-Bridge

The set of test cases of PL-parameter for W-Bridges or W-Devices is defined in Table 4.

Table 4 Set of PL-parameter test cases for W-Devices or W-Bridges

Major feature	Level	Test cases	Remarks
BLE conformity	Chip	IOLW_TC_D_ 001	
Timing,	Chip	IOLW_TC_D_0002,	
Frequency accuracy and calibration	Module	IOLW_TC_D_0003 to IOLW_TC_D_0005	
Transmission power	Module	IOLW_TC_D_0006 or IOLW_TC_D_0007	
IOLW Sensitivity	Module	IOLW_TC_D_0008 or IOLW_TC_D_0009	
Jitter	Module	IOLW_TC_D_0010	
Ramp-Up/-Down	Module	IOLW_TC_D_0011	using time shift capability
		IOLW_TC_D_0012	without time shift capability
Frequencies	Module	IOLW_TC_D_0013 to IOLW_TC_D_0014	
LQI	Module	IOLW_TC_D_0015	
Transmission power	Product	IOLW_TC_D_0016	
IOLW Sensitivity	Product	IOLW_TC_D_0017 or IOLW_TC_D_0018	

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162 The set of protocol test cases for W-Bridges or W-Devices is defined in Table 5.

163 **Table 5 Set of protocol test cases for W-Devices or W-Bridges**

Major feature	Test cases	Remarks
STARTUP	IOLW_TC_0041	
PREOPERATE	IOLW_TC_0042	
Scan, Pairing, Roaming	IOLW_TC_0043 to IOLW_TC_0049	
Operate	IOLW_TC_0050	
ISDU	IOLW_TC_0051 to IOLW_TC_0067	
Events	IOLW_TC_0068 to IOLW_TC_0075	
Data Storage	IOLW_TC_0076 to 0087	
Direct Parameter page 1	IOLW_TC_0088 to IOLW_TC_0098	
Predefined Device parameters	IOLW_TC_0099 to IOLW_TC_0126	
Wireless Parameter	IOLW_TC_0127 to IOLW_TC_0133	
Process Data	IOLW_TC_0134 to IOLW_TC_0140	
Block parameter	IOLW_TC_0141 to IOLW_TC_0153	
Adaptive Hopping Table	IOLW_TC_0154 to IOLW_TC_0157	
IODD related tests	IOLW_TC_0158 to IOLW_TC_0169	

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4.5 Test of W-Master

The set of test cases of PL-parameter for W-Master is defined in Table 6.

Table 6 Set of PL-parameter test cases for W-Master

Major feature	Level	Test cases	Remark
BLE conformity	Chip	IOLW_TC_M_0019	
IOLW timing requirements	Chip	IOLW_TC_M_0020	
Frequency accuracy	Module	IOLW_TC_M_0021	
Transmission power	Module	IOLW_TC_M_0022	with antenna connector
		IOLW_TC_M_0023	for radiated measurements
Receiver Sensitivity	Module	IOLW_TC_M_0024	
		IOLW_TC_M_0025	
Timing, Jitter	Module	IOLW_TC_M_0026 to IOLW_TC_M_0027	
Frequency Table HT01, AHT	Module	IOLW_TC_M_0028 to IOLW_TC_M_0029	
Configuration Frequencies	Module	IOLW_TC_M_0030	
LQI	Module	IOLW_TC_M_0031	
Transmission power	Product	IOLW_TC_M_0032	
IOLW Sensitivity 10m (mandatory)	Product	IOLW_TC_M_0033 or IOLW_TC_M_0034 or IOLW_TC_M_0035	depending on antenna configuration
IOLW Sensitivity 20m (optional)	Product	IOLW_TC_M_0036 or IOLW_TC_M_0037 or IOLW_TC_M_0038	depending on antenna configuration
Track Synchronicity	Product	IOLW_TC_M_0039	
Simultaneous track switching	Product	IOLW_TC_M_0040	

The set of protocol test cases for W-Master is defined in Table 7.

Table 7 Set of protocol test cases for W-Master

Major feature	Test cases	Remarks
Process Data	IOLW_TC_0170 to IOLW_TC_0176	
STARTUP	IOLW_TC_0177 to IOLW_TC_0180	
ISDU	IOLW_TC_0181 to IOLW_TC_0212	
Scan, Pairing, Roaming	IOLW_TC_0213to IOLW_TC_0218	
Events	IOLW_TC_0219to IOLW_TC_0223	
Data Storage	IOLW_TC_0224 to IOLW_TC_0243	
Priority in Downlink	IOLW_TC_0244	
Adaptive Hopping Table	IOLW_TC_0245to IOLW_TC_0246	

5 Physical Layer (PL) tests

5.1 General

Physical layer tests are carried out at room temperature (15 °C to 35 °C). However, the tests shall pass within the whole operating temperature range for a Device specified by the manufacturer.

5.2 Test report template for PL tests

See 3.3.1

5.3 PL-parameters of the W-Device or W-Bridge

5.3.1 PL-parameters of the W-Device or W-Bridge: IOLW capable Chip

5.3.1.1 Test/Confirmation of BLE conform Radio

Table 8 defines the test conditions for this test case.

Table 8 Test/Confirmation of BLE conform Radio

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_ 001
Name	WTCD_PHYL_BLECONFORMITY
Purpose (short)	Confirmation of BLE 4.2 conform radio
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW capable chip W-Device Physical Layer, test to pass
Specification (clause)	REF 2, see 5.2,1
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The manufacturer of the EUT shall declare or proof that the radio is in conformance with BLE 4.2
Precondition	-
Procedure	a) Manufacturer shall present a BLE conformance certificate or shall declare that the radio is conform to BLE 4.2
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Certificate or declaration by the manufacturer
Test passed	Certificate or declaration that the radio is in conformance with BLE 4.2, in particular RFphy of BLE 4.2
Test not passed (examples)	Missing certificate or declaration
Report	Certificate or declaration is completely presented: <ok | nok>

5.3.1.2 Test/Confirmation of IOLW timing requirements

Table 9 defines the test conditions for this test case.

Table 9 Test/Confirmation of IOLW conform Timing

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0002
Name	WTCD_PHYL_TIMINGCONFORMITY
Purpose (short)	Confirmation of IOLW conform timing
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW capable chip W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.10
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Manufacturer shall declare that the EUT fulfils all IO-Link Wireless timing requirements
Precondition	-
Procedure	a) Manufacturer shall declare that the EUT fulfils all IO-Link Wireless timing requirements
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Certificate or declaration by the manufacturer
Test passed	Certificate or declaration that the radio is capable to fulfil all IO-Link Wireless timing requirements
Test not passed (examples)	Missing certificate or declaration
Report	Certificate or declaration is completely presented: <ok | nok>

198 ### 5.3.2 PL-parameters of the W-Device or W-Bridge: IOLW qualified Module

199 #### 5.3.2.1 Test of W-Device carrier frequency accuracy

200 Table 10 defines the test conditions for this test case.

201 **Table 10 Test of W-Device carrier frequency accuracy**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0003
Name	WTCD_PHYL_CARRIERFREQACC
Purpose (short)	Test the carrier frequency accuracy of W-Device or W-Bridge
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see Table 1
Configuration / setup	WDTU with the ability to readout the EUTs frequency offset is connected with the EUT via cable or an appropriate electromagnetic shielded setup. Alternatively, the carrier frequency can be measured using other measurement equipment (e.g., spectrum analyzer, generic communication tester). In this case the W-Master frequency should be calibrated. The accuracy of the measurement result should be ≤ 2 ppm. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, whether the carrier frequency deviation of the EUT to the nominal frequency is below the specified limit of +/- 20 ppm.
Precondition	EUT is paired to the WDTU and in normal operation
Procedure	a) WDTU readouts carrier frequency offset on each frequency ;*Test parameter* b) At least 100 Packets shall be transferred on each frequency ;*Test parameter*
Test parameter	Frequency = {Fmin,..., Fmax}- (according to the current frequency hopping table)
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check -20ppm ≤ carrier frequency offset ≤ 20 ppm
Test passed	Carrier frequency offset ≤ + 20 ppm, and Carrier frequency offset ≥ - 20 ppm
Test not passed (examples)	The check above failed
Report	Max. (of +/-) carrier frequency offset of the EUT: <value> <ok | nok>

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206 #### 5.3.2.2 Test of W-Device or W-Bridge carrier frequency calibration in ServiceMode

207 The assumption is that the total frequency difference between W- Master and W-Device can
208 be up to 100 ppm. We know that over lifetime the frequency difference between W-Master and
209 W-Device can be up to +/-100 ppm. The WTU should ideally have changed its frequency +/-
210 100 ppm, but that would make the frequency offset seen by the W-Device +/-120 ppm. This
211 since the W-Device is only required to be within +/-20 ppm at room temp, but offset is not
212 known. It would still be barely possible for the W-Device to tune to the W-Master with and
213 accuracy of +/-20 ppm, which is the pass criteria. But this would leave no margin for WTU
214 inaccuracies, estimation errors, and limited frequency resolution in the W-Device. The test
215 limit is hence reduced by 20 ppm to have some margin for the before mentioned inaccuracies
216 and tolerances.

217 Table 11 defines the test conditions for this test case.

218 **Table 11 Test of W-Device carrier frequency calibration in ServiceMode**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0004
Name	WTCD_PHYL_CARRIERFREQCAL_SERVICEMODE
Purpose (short)	Test the carrier frequency deviation of W-Device
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.4 and Annex H 3
Configuration / setup	WDTU capable of changing its transmission frequency and reading the EUT's frequency offset, is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

219

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, whether the EUT adjusts their carrier frequency to those of its W-Master
Precondition	EUT is unpaired
Procedure	a) The EUT shall wait at least two minutes on pairing request (see REF 1, 5.2.4) b) WDTU initiates a pairing procedure with the EUT c) For each pairing process, the WDTU alternates its transmit carrier frequency offset +/- 80 ppm around the nominal frequency *;Test parameter* d) The WDTU measures the frequency offset during the reception of the Uplink packet from the EUT
Test parameter	transmit carrier frequency offset = [-80 ppm … +80 ppm]
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check EUTs carrier frequency accuracy / offset (after calibration)
Test passed	Carrier frequency offset ≤ + 20 ppm, and Carrier frequency offset ≥ - 20 ppm
Test not passed (examples)	The check above failed
Report	Max. (of +/-) carrier frequency offset of the EUT: <value> <ok | nok>

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222 #### 5.3.2.3 Test of W-Device or W-Bridge carrier frequency calibration in normal operation

223 The assumption is that the total frequency difference between W-Master and W-Device can be
224 up to 100 ppm. We know that over lifetime the frequency difference between W-Master and
225 W-Device can be up to +/-100 ppm. The WDTU should ideally have changed its frequency +/-
226 100 ppm, but that would make the frequency offset seen by the W-Device +/-120 ppm. This
227 since the W-Device is only required to be within +/-20 ppm at room temp, but offset is not
228 known. It would still be barely possible for the W-Device to tune to the W-Master with and
229 accuracy of +/-20 ppm, which is the pass criteria. But this would leave no margin for WDTU
230 inaccuracies, estimation errors, and limited frequency resolution in the W-Device. The test
231 limit is hence reduced by 20 ppm to have some margin for the before mentioned inaccuracies
232 and tolerances.

233 Table 12 defines the test conditions for this test case.

234 **Table 12 Test of W-Device carrier frequency calibration in normal operation**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0005
Name	WTCD_PHYL_CARRIERFREQCAL_OPERATION
Purpose (short)	Test the carrier frequency deviation of W-Device or W-Bridge
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.4 and Annex H 3
Configuration / setup	WDTU capable of changing its transmission frequency and reading the EUT's frequency offset, is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, whether the EUT adjusts its carrier frequency to those of its W-Master
Precondition	EUT is paired
Procedure	a) The WDTU alternates its transmit carrier frequency within +/- 80 ppm around the nominal frequency with steps of 40ppm,;*Test parameter* b) WDTU waits at least 100ms c) The WDTU measures the frequency offset during the reception of the Uplink from the EUT
Test parameter	transmit carrier frequency offset = [-80 ppm … +80 ppm]
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check EUTs carrier frequency offset (after calibration)
Test passed	Carrier frequency offset ≤ + 20 ppm, and Carrier frequency offset ≥ - 20 ppm
Test not passed (examples)	The check above failed
Report	Max. (of +/-) carrier frequency offset of the EUT: <value> <ok | nok>

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5.3.2.4 Test of W-Device or W-Bridge transmission power (including antenna) for range and reliability

If the documentation for the transmission power test according to ETSI EN 300 328 certifies that the maximum transmit power is above +4 dBm EIRP peak, this test is automatically fulfilled. A measurement protocol from an accredited test laboratory is recommended for this purpose.

Table 13 defines the test conditions for this test case.

Table 13 Test of W-Device transmission power (including antenna) for range and reliability, conducted method

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0006
Name	WTCD_PHYL_TRANSPOWER_PERFORMANCE
Purpose (short)	Test the transmission power of W-Device or W-Bridge for range and reliability
Equipment under test (EUT)	W-Device or W-Bridge, with antenna connector
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.7 and 5.2.8
Configuration / setup	WDTU, alternatively, other measurement equipment (e.g., spectrum analyzer, generic communication tester) can be used additionally. **Module with antenna connector: conducted testing**

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, whether maximum transmission power (which is allowed due to regulatory requirements) is sufficient high to fulfil range and reliability requirements
Precondition	EUT is paired to WDTU, no blocklisting
Procedure	**Conducted method**: a) The transmit power of the EUT is set to the maximum level, which also fulfils regulatory requirements b) The transmit power is measured for all frequencies, which can be used for cyclic data exchange (minimum on all frequencies). *;Test parameter*
Test parameter	Frequency = {Fmin, …, Fmax } (according to the current hopping table)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check on each frequency: Transmit power >= +4 dBm for conducted measurements NOTE: These power limits are the absolute minimum values. For improved range and reliability, better (i.e., higher) values are recommended
Test passed	The check above passed
Test not passed (examples)	The check above failed, (too low transmission power on at least one frequency)
Report	Document evaluation Transmit power: <value> <ok | nok>

250 Table 14 defines the test conditions for this test case.

251 **Table 14 Test of W-Device transmission power (including antenna) for range and**
252 **reliability, radiated methods**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0007
Name	WTCD_PHYL_TRANSPOWER_PERFORMANCE
Purpose (short)	Test the transmission power of W-Device or W-Bridge for range and reliability
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.7 and 5.2.8
Configuration / setup	WDTU, alternatively, other measurement equipment (e.g., spectrum analyzer, generic communication tester) can be used additionally. **Module with integrated antenna: radiated testing**

253

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, whether maximum transmission power (which is allowed due to regulatory requirements) is sufficient high to fulfil range and reliability requirements
Precondition	EUT is paired to WDTU, no blocklisting
Procedure	**Module with integrated antenna:** **Radiated testing:** Radiated TX power [peak radiated power at maximum allowed power setting which still fulfill regulatory requirements (e.g., ETSI, FCC) >= +4 dBm (EIRP) Like ETSI EN 300 328 V2.2.2 Sect. 4.3.2.2 / 5.4.2. (radiated measurement only) (non-adaptive, non-FHSS) The aim here is to prove that a minimum transmit power is achievable. Therefore, it is NOT allowed to combine data sheet values of an antenna with the conducted measurement values of a module. Instead, at least the antenna in the later housing must be characterized by a measurement and offset against the Conducted measurement results of the module. However, it is preferable to measure the final module directly. **The following procedure is based on ETSI EN 300 328:** a) Utilize a measurement setup according to ETSI EN 300 328 or an appropriate alternative measurement setup. b) The EUT shall be configured, and antenna(s) positioned for maximum EIRP towards the measuring antenna. This position shall be recorded and documented to the EUT (e.g. in the EUT's manual). c) Test at least at frequencies 2401 MHz, 2440 MHz and 2480 MHz*; Test parameter* d) It is recommended, to test in continuous transmit mode with modulated signal pattern e) $P_{TX_{Peak}} \geq +4\ dBm\ EIRP$ shall be fulfilled for each frequency (2401 MHz, 2440 MHz and 2480 MHz) *;Test parameter*
Test parameter	Frequency = {2401 MHz, 2440 MHz, 2480 MHz}
Post condition	-

254

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check on each frequency: Transmit power >= +4 dBm EIRP in the main lobe NOTE: These power limits are the absolute minimum values. For improved range and reliability, better (i.e., higher) values are recommended
Test passed	The check above passed
Test not passed (examples)	The check above failed, (too low transmission power on at least one frequency)
Report	Document evaluation Transmit power: <value> <ok | nok>

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258 #### 5.3.2.5 W-Device or W-Bridge IOLW Receiver Sensitivity

259 Table 15 defines the test conditions for this test case.

260 **Table 15 W-Device IOLW Receiver Sensitivity, conducted method**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0008
Name	WTCD_PHYL_SENSITIVITY
Purpose (short)	Test of sufficient W-Device or W-Bridge IOLW receiver sensitivity
Equipment under test (EUT)	W-Device or W-Bridge, with antenna connector
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WDTU **Module with antenna connector: conducted testing**

261

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Device receiver sensitivity
Precondition	EUT is paired to the WDTU and in normal operation, HT01 and no blocklisting is used
Procedure	**Conducted method** a) The transmit power of the WDTU is set or reduced via attenuators that the received power at the connector of the EUT is -92 dBm NOTE: This value has been calculated after best knowledge. Further adjustment might be necessary after first implementations b) 1.000 packets (at least) per utilized frequency are sent from the WDTU to the EUT c) The packets have maximum packet length (i.e., full Downlink packets) d) The EUT acknowledge the correct reception of every packet via the Air-Interface in Uplink. Thereby the EUT transmit at maximum power and/or with less attenuation than in the Downlink, e) The WDTU calculates the Packet Error Probability (PEP) f) Alternatively, if the EUT has an external interface, it can be used to transfer the number of correctly received packets at every utilized frequency in order to calculate the PEP g) PEP shall be <= 0.3 at each frequency for the specified power level in a)
Test parameter	-
Post condition	-

262

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) The measured PEP shall be <= 0.3
Test passed	The check above passed
Test not passed (examples)	The check above failed (too low sensitivity)
Report	Document evaluation PEP: <value> <ok | nok>

263

264 Table 16 defines the test conditions for this test case.

265 **Table 16 W-Device IOLW Receiver Sensitivity, radiated methods**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0009
Name	WTCD_PHYL_SENSITIVITY
Purpose (short)	Test of sufficient W-Device or W-Bridge IOLW receiver sensitivity
Equipment under test (EUT)	W-Device or W-Bridge with integrated omnidirectional antenna
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WDTU **Module with integrated antenna: radiated testing** Reverberation Chamber (RC), Anechoic Chamber (AC)

266

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Device receiver sensitivity
Precondition	EUT is paired to the WDTU and in normal operation, HT01 and no blocklisting is used
Procedure	Either Anechoic Chamber Method or Reverberation Chamber Method **Anechoic Chamber Method** a) The transmit power of the WDTU is set or reduced via attenuators that the mean received power at the EUT is -89 dBm for a full azimuth and elevation scan in 15° steps each and both, horizontal as well as vertical polarizations, (measured at the connector of a reference antenna) b) 100 packets (at least) per utilized frequency and per azimuth/elevation step are sent from the WDTU to the EUT c) The packets have maximum packet length (i.e., full Downlink packets) d) The EUT acknowledge the correct reception of every packet via the Air-Interface in Uplink. Thereby the EUT transmit at maximum power and/or with less attenuation than in the Downlink, e) The WDTU calculates the (mean) Packet Error Probability (PEP) for a whole azimuth and elevation scan and both, horizontal as well as vertical polarizations, but for each frequency separately f) Alternatively, if the EUT has an external interface, it can be used to transfer the number of correctly received packets at every utilized frequency in order to calculate the PEP g) PEP shall be <= 0.3 **Reverberation Chamber Method ("TIS-Method")** a) Determine the mean chamber reference transfer function, i.e., measure utilizing a reference antenna and stepped-mode operation of the mode stirrers. b) Utilizing stepwise operation mode of the RC, the "sensitivity limit", related to a certain PEP (i.e., PEP = 0.3) is searched for: c) The packets have maximum packet length (i.e., full Downlink packets) d) For each mode-stirrer step combination, the power of the WDTU is lowered, as long as the EUT's receiver achieves a PEP <= 0.3. e) The estimated receiving power, i.e., the output power of the test companion achieving that certain PEP value minus the chamber reference transfer function is stored. f) Finally, the (harmonic) mean value of the stored, estimated receiving power levels obtained during the full mode stirring cycle (consisting of at least 150 steps) is calculated and referred to total isotropic sensitivity TIS value. g) TIS shall be <= -89 dBm
Test parameter	-
Post condition	-

267

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For Anechoic Chamber Method: 1) The measured PEP shall be <= 0.3 For Reverberation Chamber Method 1) TIS shall be <= -89 dBm See Annex A for tolerable measurement uncertainty.
Test passed	The check above passed
Test not passed (examples)	The check above failed (too low sensitivity)
Report	Document evaluation method (Anechoic Chamber or Reverberation Chamber) PEP: <value> <ok | nok> TIS: <value> <ok | nok>

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5.3.2.6 Test of W-Device or W-Bridge timing in W-cycle with jitter in Downlink

Table 17 defines the test conditions for this test case.

Table 17 Test of W-Device timing in W-cycle with jitter in Downlink

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0010
Name	WTCD_PHYL_TIMING_SUBCYCLE_FULLDOWNLINK
Purpose (short)	Test if the W-Device or W-Bridge is capable to receive Downlink packets with a Jitter
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.10
Configuration / setup	WDTU, capable to transmit Downlink packets with a timing jitter is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test if the W-Device is capable to receive Downlinks with a Jitter to test the robustness of the EUT
Precondition	EUT is paired to the WDTU and in normal operation
Procedure	a) The WDTU sends (at least) 100.000 downlinks with a timing jitter of (alternatingly) +1µs and –1µs (see Table 1 in REF 2). Timing reference shall be the start of the Downlink packets. b) EUT shall receive the Downlink packets c) .EUT sends an ACK for every correctly received Downlink packets. d) The WDTU calculates the Packet Error Probability (PEP) on basis of the sent Downlink packets, the received ACK and the minimum cycle time as well as max-retry parameter, respectively. e) This test is repeated 2 or 3 times.
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check PEP (calculated by the WDTU) ≤ 5 Packet errors for 100.000 W-Frames. 2 out of 3 repeated measurements shall show this result.
Test passed	The check above passed
Test not passed (examples)	The check above failed (too many packet errors, too high PEP)
Report	PEP for each of the 3 repeated measurements: <value> <ok | nok>

5.3.2.7 Test of W-Device and W-Bridge Ramp-Up/Ramp-Down

This document uses a dedicated template as shown in Table 1 for the particular test cases.

Figure 2 to Figure 5 illustrate the steps for this test case.

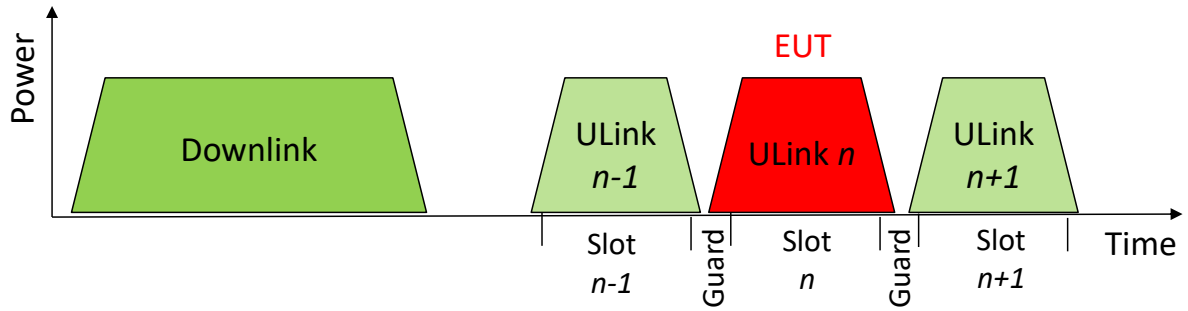

Figure 2 Timing: Ramp-Up / Ramp-Down of W-Device: Step a).

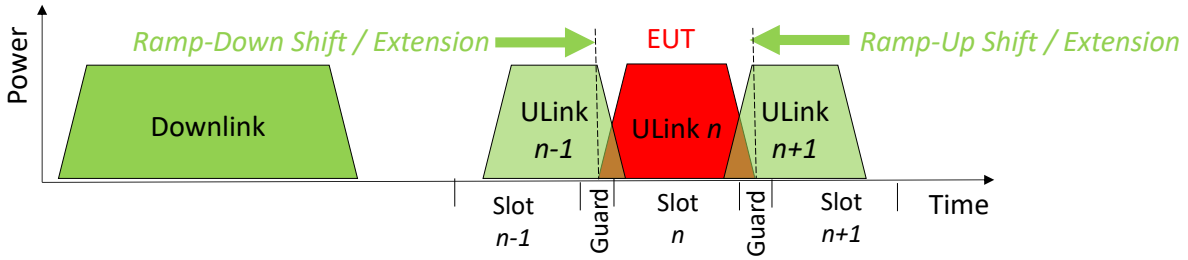

Figure 3 Timing: Ramp-Up / Ramp-Down of W-Device: Step e).

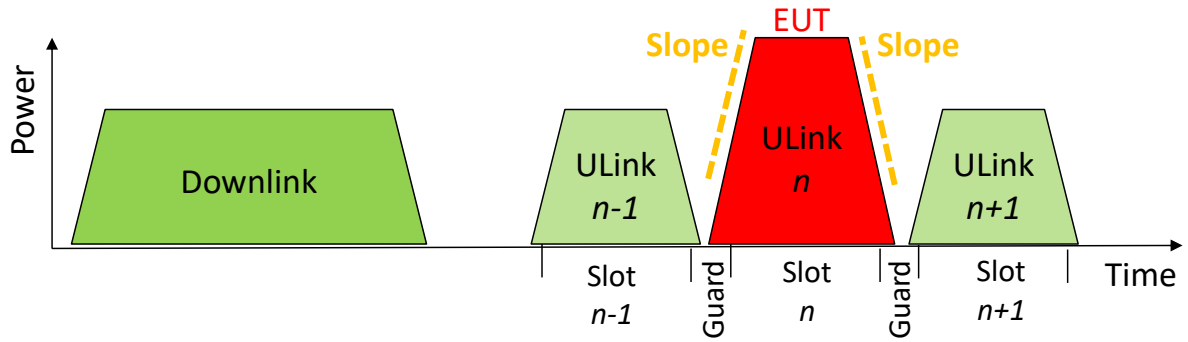

Figure 4 Timing: Ramp-Up / Ramp-Down of W-Device: Step i).

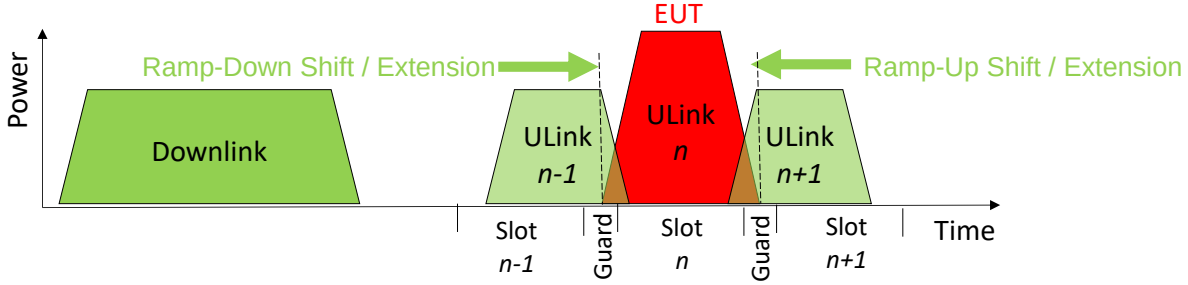

Figure 5 Timing: Ramp-Up / Ramp-Down of W-Device: Step m)

292 Table 18 defines the test conditions for this test case.

293 **Table 18 Test of W-Device Ramp-Up/Ramp-Down, using time shift capability**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0011
Name	WTCD_PHYL_TIMING_RAMP
Purpose (short)	Test of W-Device or W-Bridge Ramp-Up/Ramp-Down
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass Conformance testing,
Specification (clause)	REF 2 see 5.2.7…5.2.10
Configuration / setup	The WDTU System provides the uplink packets from the previous and subsequent slots with adjustable timing (quasi W-Device). If the EUT has an antenna connector, the EUT is connected with the WDTU via cables and variable attenuators (“Conducted testing”). If the EUT has no antenna connector, the EUT has to be placed in an electromagnetically shielded enclosure and its connector has to be connected with the WDTU via cables and variable attenuators. The WDTU System that provides the uplink packets from the previous and subsequent slots with adjustable timing (quasi W-Device) is connected via cables and variable attenuators.

294

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test if W-Device (EUT) transmits only in its assigned timeslot
Precondition	EUT is paired in slot n in the WDTU and provides the packets in the slots n-1 and n+1.
Procedure	**Using time shift capability** Approach: Test of “packet duration”, using same power levels during packet a) Set power levels via attenuators to e.g., -60 dBm at corresponding RX for both, WDTU System and EUT b) Measure PEP in Slots ULink n-1, ULink n, ULink n+1 c) Result should be: -> PEP <= 10^{-4} Approach: Test time duration at the critical points until overlapping d) The ULink in Slot n-1 and n+1 are shifted or extended by +4µs and ULink n+1 ramp-up timing are shifted or extended by -4µs (towards slot n), respectively e) Measure PEP in Slots ULink n-1, ULink n, ULink n+1: f) Result should be: -> PEP <=10^{-3} (If EUT affects prior guard: Increase of PEP in ULink n-1, ULink n; If EUT affects after guard: Increase of PEP in ULink n, ULink n+1) Approach: Slopes of the Ramp-Up/-Down may interfere with adjacent Slots g) Set power levels via attenuators to e.g., -45 dBm for EUT and -65 dBm for Test-Equipment at corresponding RX h) Measure PEP in Slots ULink n-1, ULink n, ULink n+1: i) Result should be: -> PEP <= 10^{-4} Approach: Due to the higher power of EUT than WDTU System, the time-duration of ULink n becomes virtually longer causes overlapping j) The ULink in Slot n-1 are shifted or extended by +4µs and ULink n+1 ramp-up timing are shifted or extended by -4µs (towards slot n), respectively k) Measure PEP in Slots ULink n-1, ULink n, ULink n+1 l) Result should be: -> PEP <= 10^{-3}
Test parameter	-
Post condition	EUT is still paired

295

TEST CASE RESULTS	CHECK/REACTION
Evaluation	**Using time shift capability** 1) Check PEP <= 10^{-4} in step c) 2) Check PEP <= 10^{-3} in step f) 3) Check PEP <= 10^{-4} in step i) 4) Check PEP <= 10^{-3} in step l)
Test passed	all checks of the chosen method passed
Test not passed (examples)	One of the check in the chosen method failed (e.g., PEP limits failed)
Report	Document evaluation option (i.e., Method I or Method II) **Using time shift capability** PEP of the EUT's transmission in step c): <value> <ok | nok> PEP in adjacent slots in step c): <value> <ok | nok> PEP of the EUT's transmission in step f): <value> <ok | nok> PEP in adjacent slots in step f): <value> <ok | nok> PEP of the EUT's transmission in step i): <value> <ok | nok> PEP in adjacent slots in step i): <value> <ok | nok> PEP of the EUT's transmission in step l): <value> <ok | nok> PEP in adjacent slots in step l): <value> <ok | nok>

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298 Table 19 defines the test conditions for this test case.

299 **Table 19 Test of W-Device Ramp-Up/Ramp-Down, without time shift capability**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0012
Name	WTCD_PHYL_TIMING_RAMP
Purpose (short)	Test of W-Device or W-Bridge Ramp-Up/Ramp-Down
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass Conformance testing,
Specification (clause)	REF 2 see 5.2.7…5.2.10
Configuration / setup	The WDTU System provides the uplink packets from the previous and subsequent slots with adjustable timing (quasi W-Device). If the EUT has an antenna connector, the EUT is connected with the WDTU via cables and variable attenuators (“Conducted testing”). If the EUT has no antenna connector, the EUT has to be placed in an electromagnetically shielded enclosure and its connector has to be connected with the WDTU via cables and variable attenuators. The WDTU System that provides the uplink packets from the previous and subsequent slots with adjustable timing (quasi W-Device) is connected via cables and variable attenuators.

300

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test if W-Device (EUT) transmits only in its assigned timeslot
Precondition	EUT is paired in slot n in the WDTU and provides the packets in the slots n-1 and n+1.
Procedure	**without time shift capability** EUT (slot n) and W-Device-Tester-System (slots n-1, n+1) are with the same power level of -60 dBm and no time shifters a) Measure PEP in ULink slot n-1, ULink slot n, ULink slot n+1: b) Result shall be: PEP <= 10^{-4} (in each slot) c) Set EUT (slot n) with power of -35dBm and WDTU (slots n-1, n+1) are with power level of -75dBm and no time shifts : d) Measure PEP in ULink slot n-1, ULink slot n, ULink slot n+1: e) Result shall be: PEP <= 10^{-3} (in each slot) Approach: Measurement of ULink packet duration using a spectrum analyzer in zero-span mode f) Use zero-span mode g) Trigger on Begin of DL packet of W-Device-Test-System h) Measure average packet power of EUT of according to time slot n i) Evaluation: At the time-point -4µs and +4µs (i.e., half guard interval) of the according slot n, the power shall be at least 30 dB below the average power of the ULink packet
Test parameter	-
Post condition	EUT is still paired

301

TEST CASE RESULTS	CHECK/REACTION
Evaluation	**without time shift** 1) Check PEP <= 10^{-4} in step b) 2) Check PEP <= 10^{-3} in step e) 3) Check: At the time-point -4µs and +4µs (i.e., half guard interval) of the according slot n, the power shall be at least 30 dB below the average power of the ULink packet in step i)
Test passed	all checks of the chosen method passed
Test not passed (examples)	One of the check in the chosen method failed (e.g., PEP limits failed)
Report	**without time shift** PEP of the EUT's transmission in step b): <value> <ok | nok> PEP in adjacent slots in step b): <value> <ok | nok> PEP of the EUT's transmission in step e): <value> <ok | nok> PEP in adjacent slots in step e): <value> <ok | nok> Power of the EUT's transmission at -4µs in step i): <value> <ok | nok> Power of the EUT's transmission at +4µs in step i): <value> <ok | nok>

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304 #### 5.3.2.8 Test of correct acceptance of frequency table by W-Device or W-Bridge

305 Table 20 defines the test conditions for this test case.

306 **Table 20 Test of correct acceptance of frequency table by W-Device**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0013
Name	WTCD_PHYL_FREQTABLE
Purpose (short)	Test of correct acceptance of frequency hopping table
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see Annex H
Configuration / setup	WDTU is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

307

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU shall start a pairing process with the EUT. The WDTU shall transfer invalid frequency entries. The EUT shall reject this.
Precondition	The EUT is unpaired
Procedure	a) The WDTU sends a frequency hopping table including frequency entries conform to HT01 and additional invalid frequency entries to EUT during pairing (this means, frequency entries outside the allowed range 3…78) b) Check whether EUT rejects pairing attempt with invalid frequencies . In particular, check out-of band frequencies (frequency entries).
Test parameter	-
Post condition	The EUT **is NOT** paired

308

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check, whether the EUT becomes paired
Test passed	EUT is not paired
Test not passed (examples)	EUT uses frequencies that are not allowed by band
Report	EUT rejects pairing <yes | no> <ok | nok>

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311 #### 5.3.2.9 Test of W-Device or W-Bridge configuration frequencies

312 Table 21 defines the test conditions for this test case.

313 **Table 21 Test of W-Device configuration frequencies**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0014
Name	WTCD_PHYL_CONFIG_FREQ
Purpose (short)	Test correct use of configuration frequencies by W-Device or W-Bridge
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see Annex H 3
Configuration / setup	WDTU is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

314

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test correct (alternating) use of configuration frequencies by W-Device
Precondition	EUT is unpaired
Procedure	a) WDTU utilizes only configuration channel f1 for pairing (the transmission on f80 is suppressed) b) WDTU sends pairing command on f1 *;Test parameter* c) EUT has to be paired d) WDTU sends unpairing command e) WDTU utilizes only configuration channel f80 for pairing (the transmission on f1 is suppressed) f) WDTU sends pairing command on f80 *;Test parameter* g) EUT has to be paired h) WDTU sends unpairing command i) WDTU utilizes both configuration channel f1 and f80 for pairing j) WDTU pairs the EUT k) WDTU set the EUT to roaming mode l) The alternating use of the configuration frequencies by the EUT is monitored by the WDTU
Test parameter	configuration channel = {f1, f80}
Post condition	EUT is paired

315

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check, whether the EUT can be paired on f1 2) Check, whether the EUT can be paired on f80 3) Check, whether the EUT uses both configuration frequencies alternatively
Test passed	All checks above passed
Test not passed (examples)	One of the checks above failed (e.g., the EUT uses only one configuration frequency)
Report	Correct alternating use of configuration frequencies: <yes | no> <ok | nok>

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318 **5.3.2.10 Test of W-Device or W-Bridge Link Quality Indicator**

319 Table 22 defines the test conditions for this test case.

320 **Table 22 Test of W-Device Link Quality Indicator**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0015
Name	WTCD_PHYL_LQI
Purpose (short)	Test correct calculation of Link Quality Indicator in W-Device or W-Bridge
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	IOLW qualified module W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.5.6.1
Configuration / setup	WDTU is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

321

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test correct calculation of Link Quality Indicator in W-Device
Precondition	EUT is paired to the WDTU and in normal operation
Procedure	a) WDTU sends periodically 4096 packets to EUT at least 2 times with an intended number of suppressed Downlink messages(fixed pattern). The fixed error distribution shall not cause loss of communication (e.g., due to large bursts b) Thereby a specific number of Downlink packets are suppressed (i.e., not sent or highly attenuated below the sensitivity level of the EUT by the WDTU in order to force the EUT to a retry and to degrade the PEP intentionally a) 0 Errors per 4096 packets *;Test parameter* b) 1 Errors per 4096 packets *;Test parameter* (e.g., suppress every 4096th Downlink packet) c) 4 Errors per 4096 packets *;Test parameter* (e.g., suppress every 1024th Downlink packet) d) 32 Errors per 4096 packets *;Test parameter* (e.g., suppress every 128th Downlink packet)) e) 256 Errors per 4096 packets *;Test parameter* (e.g., suppress every 16th Downlink packet) f) 1024 Errors per 4096 packets *;Test parameter* (e.g., suppress every 4th Downlink packet) c) After the WDTU has sent 8192 packets to EUT, the WDTU requests the EUT to report its LQI d) The procedure a)-c) is repeated with the next number of intended errors
Test parameter	Number of Errors per 4096 packets = {0, 1, 4, 32, 256, 1024}
Post condition	EUT is paired

322

<table>
<tr><th>TEST CASE RESULTS</th><th>CHECK / REACTION</th></tr>
<tr><td>Evaluation</td><td>1) Correct calculation of LQI for all intended PEP (which are provided by the WDTU)
Test limits:
<table>
<tr><th>(Intended) Number of errors</th><th>LQI max</th><th>LQI min</th></tr>
<tr><td>0</td><td>100</td><td>84</td></tr>
<tr><td>1</td><td>85</td><td>77</td></tr>
<tr><td>4</td><td>71</td><td>67</td></tr>
<tr><td>32</td><td>50</td><td>48</td></tr>
<tr><td>256</td><td>29</td><td>28</td></tr>
<tr><td>1024</td><td>15</td><td>14</td></tr>
</table>
NOTE: To account for measurement tolerances, one additional error is tolerated per 4096 packets, resulting in a range of allowable LQI in each case.</td></tr>
<tr><td>Test passed</td><td>The check above passed</td></tr>
<tr><td>Test not passed (examples)</td><td>The check above failed (e.g., wrong calculation of LQI, Test limits exceeded)</td></tr>
<tr><td>Report</td><td>Correct calculation of LQI by EUT: <yes | no> <ok | nok></td></tr>
</table>

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5.3.3 PL-parameters of the W-Device or W-Bridge: IOLW product

5.3.3.1 Test of W-Device transmission power including antenna for range and reliability

If the documentation for the transmission power test according to ETSI EN 300 328 certifies that the maximum transmit power is above +4 dBm EIRP peak, this test is automatically fulfilled. A measurement protocol from an accredited test laboratory is recommended for this purpose.

Table 23 defines the test conditions for this test case.

Table 23 Test of W-Device or W-Bridge transmission power including antenna for range and reliability

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0016
Name	WTCD_PHYL_TRANSPOWER_PERFORMANCE
Purpose (short)	Test the transmission power of W-Device or W-Bridge for range and reliability
Equipment under test (EUT)	W-Device or W-Bridge, including antenna
Test case version	1.0
Category / type	IOLW conform product W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.7…5.2.10
Configuration / setup	WDTU, Reverberation chamber (RC), Anechoic Chamber (AC)

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, whether transmission power (which is allowed due to regulatory requirements) is sufficient high to fulfil range and reliability requirements
Precondition	EUT is paired to WDTU, no blocklisting
Procedure	It has to be demonstrated, that the final product is capable to send with a TX power of at least +4 dBm EIRP peak. Procedure like ETSI EN 300 328 V2.2.2 Sect. 4.3.2.2 / 5.4.2. (radiated Measurement only) (non-adaptive, non-FHSS) The aim here is to prove that a minimum transmit power is achievable. Therefore, it is NOT allowed to combine data sheet values of an antenna with the conducted measurement values of a module. Instead, at least the antenna in the later housing must be characterized by a measurement and offset against the conducted measurement results of the module. However, it is preferable to measure the final module directly. **The following procedure is based on ETSI EN 300 328:** a) Utilize a measurement setup according to ETSI EN 300 328 or an appropriate alternative measurement setup. b) The EUT shall be configured, and antenna(s) positioned for maximum EIRP towards the measuring antenna. This position shall be recorded and documented to the EUT (e.g., in the EUT's manual). c) Test at least the frequencies 2401 MHz, 2440 MHz and 2480 MHz *;Test parameter* d) It is recommended, to test in continuous transmit mode with modulated signal pattern e) $P_{TX_{Peak}} \geq +4\,dBm\,EIRP$ shall be fulfilled for each frequency (2401 MHz, 2440 MHz and 2480 MHz)
Test parameter	Frequencies = {2401 MHz, 2440 MHz, 2480 MHz}
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check on each frequency: Transmit power >= +4 dBm EIRP in the main lobe NOTE: These power limits are the absolute minimum values. For improved range and reliability, better (i.e., higher) values are recommended
Test passed	The check above passed
Test not passed (examples)	The check above failed, (too low transmission power on at least one frequency)
Report	Transmit power at 2401 MHz: <value> <ok | nok> Transmit power at 2440 MHz: <value> <ok | nok> Transmit power at 2480 MHz: <value> <ok | nok>

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338 **5.3.3.2 W-Device or W-Bridge IOLW Receiver Sensitivity**

339 Table 24 defines the test conditions for this test case.

340 **Table 24 W-Device or W-Bridge IOLW Receiver Sensitivity, hybrid methods**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0017
Name	WTCD_PHYL_SENSITIVITY
Purpose (short)	Test of sufficient W-Device or W-Bridge IOLW receiver sensitivity
Equipment under test (EUT)	W-Device or W-Bridge, with antenna connector
Test case version	1.0
Category / type	IOLW conform product W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WDTU

341

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Device IOLW receiver sensitivity
Precondition	EUT is paired to the WDTU and in normal operation, HT01 and no blocklisting is used
Procedure	In order to allow to mount a W-Device in arbitrarily position or direction with respect to its W-Master, all directions and polarizations shall be considered. This is implicitly done by a RC. Alternatively, a full azimuth and elevation scan with two orthogonal polarizations has to be performed in an AC. **For a previously tested Module with antenna connector + Antenna in housing: Either Anechoic Chamber Method or Reverberation Chamber Method** NOTE: For a separate “Antenna in housing” measurement, if taken on its own there is no limit value for the antenna efficiency, which must be complied with, but instead a recommended value of - 2 dB(i) or better. **Separate antenna/housing measurement + conducted results** The antenna inclusive its housing of the final product needs to be accessible via connector in a way that does not influence the measurement results **Anechoic Chamber Method** a) The total antenna (in housing) efficiency is measured for a whole azimuth and elevation scan in 15° steps each and both, horizontal as well as vertical polarizations and for all frequencies, which can be used for cyclic data exchange b) The spatial mean over the azimuth and elevation scan and both, horizontal as well as vertical polarizations is calculated for each frequency separately c) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power *a) Example: The conducted sensitivity measurement for the module was PEP@-92dBm <= 0.3 . The received power shall be reduced by the antenna efficiency (e.g., -2 dB) thus, e.g., PEP@-90dBm <= 0.3* d) The calculated effective sensitivity, including the antenna, shall be less or equal -89dBm **Reverberation Chamber Method** e) The total antenna (in housing) efficiency is measured for a full mode-stirring cycle, consisting of (at least) 300 mode-stirrer combination steps f) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power *a) Example: The conducted sensitivity measurement for the module was PEP@-92dBm <= 0.3 . The received power shall be reduced by the antenna efficiency (e.g., -2 dB) thus, e.g., PEP@-90dBm <= 0.3* g) The calculated effective sensitivity, including the antenna, shall be less or equal - 89dBm
Test parameter	-
Post condition	-

342

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check the effective sensitivity. It shall be less or equal -89dBm
Test passed	The check above passed
Test not passed (examples)	The check above failed
Report	Document evaluation method (Anechoic Chamber or Reverberation Chamber) Effective sensitivity: <value> <ok | nok>

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345 Table 25 W-Device or W-Bridge IOLW Receiver Sensitivity

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347 Table 25 defines the test conditions for this test case.

348 **Table 25 W-Device or W-Bridge IOLW Receiver Sensitivity, radiated methods**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_D_0018
Name	WTCD_PHYL_SENSITIVITY
Purpose (short)	Test of sufficient W-Device or W-Bridge IOLW receiver sensitivity
Equipment under test (EUT)	W-Device or W-Bridge, with integrated omnidirectional antenna
Test case version	1.0
Category / type	IOLW conform product W-Device Physical Layer, test to pass
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WDTU

349

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Device IOLW receiver sensitivity
Precondition	EUT is paired to the WDTU and in normal operation, HT01 and no blocklisting is used
Procedure	In order to allow to mount a W-Device in arbitrarily position or direction with respect to its W-Master, all directions and polarizations shall be considered. This is implicitly done by a RC. Alternatively, a full azimuth and elevation scan with two orthogonal polarizations has to be performed in an AC. **For a previously tested Module with antenna connector + Antenna in housing: Either Method Anechoic Chamber or Reverberation Chamber** NOTE: For a separate “Antenna in housing” measurement, if taken on its own there is no limit value for the antenna efficiency, which must be complied with, but instead a recommended value of - 2 dB(i) or better. For product with integrated antenna or inaccessible antenna: radiated methods Direct measurement including antenna + housing and transceiver **Anechoic Chamber Method** a) The transmit power of the WDTU is set or reduced via attenuators that the mean received power at the EUT is -89 dBm for a full azimuth and elevation scan and both, horizontal as well as vertical polarizations, (measured at the connector of a reference antenna) NOTE: This values has been calculated after best knowledge. Further adjustment might be necessary after first implementations b) 100 packets (at least) per utilized frequency and each azimuth/elevation step are sent from the WDTU to the EUT c) The packets have maximum packet length (i.e., full Downlink packets) d) The EUT acknowledge the correct reception of every packet via the Air-Interface in Uplink. Thereby the EUT transmit at maximum power and/or with less attenuation than in the Downlink, e) The WDTU calculates the Packet Error Probability (PEP) for a whole azimuth and elevation scan and both, horizontal as well as vertical polarizations, f) PEP shall be <= 0.3 **Reverberation Chamber Method (“TIS Method”)** a) Determine the mean chamber reference transfer function, i.e., measure utilizing a reference antenna and stepped-mode operation of the mode stirrers. b) Utilizing stepwise operation mode of the RC, the “sensitivity limit”, related to a certain PEP (i.e., PEP = 0.3) is searched for: c) The packets have maximum packet length (i.e., full Downlink packets) d) For each mode-stirrer step combination, the power of the test companion is lowered, that the EUT’s receiver achieves a certain PEP of e.g., PEP = 0.3 . e) The estimated receiving power, i.e., the output power of the WDTU achieving that certain PEP value minus the chamber reference transfer function is stored. f) Finally, the (harmonic) mean value of the stored, estimated receiving power levels obtained during the full mode stirring cycle (consisting of at least 150 steps) is calculated and referred to total isotropic sensitivity TIS value. g) TIS shall be <= -89 dBm
Test parameter	-

TEST CASE	CONDITIONS / PERFORMANCE
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For Anechoic Chamber Method: 1) The measured PEP. shall be <= 0.3 For Reverberation Chamber Method: 1) TIS shall be <= -89 dBm
Test passed	The check above passed
Test not passed (examples)	The check above failed
Report	Document evaluation method (Anechoic Chamber or Reverberation Chamber) For Anechoic Chamber Method: PEP: <value> <ok | nok> For Reverberation Chamber Method: TIS: <value> <ok | nok>

353 ## 5.4 PL-parameters of the W-Master

354 ### 5.4.1 PL-parameters of the W-Master: IOLW capable Chip

355 #### 5.4.1.1 Test/Confirmation of BLE conform Radio

356 Table 26 defines the test conditions for this test case.

357 **Table 26 Test/Confirmation of BLE conform Radio**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0019
Name	WTCM_PHYL_BLECONFORMITY
Purpose (short)	Confirmation of BLE 4.2 conform radio
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	IOLW capable Chip W-Master Physical Layer, test to pass Conformance testing
Specification (clause)	REF 1, see 5.2,1
Configuration / setup	-

358

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The manufacturer of the EUT shall declare or proof that the radio is conform to BLE 4.2
Precondition	-
Procedure	a) Manufacturer shall present a BLE conformance certificate or shall declare that the radio is conform to BLE 4.2.
Test parameter	-
Post condition	-

359

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Certificate or declaration by the manufacturer
Test passed	Certificate or declaration that the radio is conform to BLE 4.2, in particular RFphy of BLE 4.2
Test not passed (examples)	Missing certificate or declaration
Report	Certificate or declaration is completely presented: <ok | nok>

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362 #### 5.4.1.2 Test/Confirmation of IOLW timing requirements

363 Table 27 defines the test conditions for this test case.

364 **Table 27 Test/Confirmation of IOLW conform Timing**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0020
Name	WTCD_PHYL_TIMINGCONFORMITY
Purpose (short)	Confirmation of IOLW conform timing
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	IOLW capable W-Master Physical Layer, test to pass Conformance testing
Specification (clause)	REF 1, see 5.2.10
Configuration / setup	-

365

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Manufacturer shall declare that the EUT fulfils all IO-Link Wireless timing requirements
Precondition	-
Procedure	a) Manufacturer shall declare that the EUT fulfils all IO-Link Wireless timing requirements
Test parameter	-
Post condition	-

366

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Certificate or declaration by the manufacturer
Test passed	Certificate or declaration that the radio is capable to fulfil all IO-Link Wireless timing requirements
Test not passed (examples)	Missing certificate or declaration
Report	Certificate or declaration is completely presented: <ok | nok>

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5.4.2 PL-parameters of the W-Master: IOLW qualified Module

5.4.2.1 Test of W-Master carrier frequency accuracy

Table 28 defines the test conditions for this test case.

Table 28 Test of W-Master carrier frequency accuracy

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0021
Name	WTCM_PHYL_CARRIERFREQACC
Purpose (short)	Test the carrier frequency accuracy of W-Master
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	IOLW qualified Module W-Master Physical Layer, test to pass Conformance testing
Specification (clause)	REF 1, see Table 1
Configuration / setup	WMTU with the ability to readout the EUTs frequency offset is connected with the EUT via cable or an appropriate electromagnetic shielded setup. Alternatively, the carrier frequency can be measured using other measurement equipment (e.g., spectrum analyzer, generic communication tester)). In this case the W-Master frequency should be calibrated. The accuracy of the measurement result should be better than 1 ppm. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, whether the carrier frequency deviation of the EUT to the nominal frequency is below the specified limit of +/- 20 ppm.
Precondition	EUT is paired to the WMTU and in normal operation
Procedure	a) WMTU readouts carrier frequency offset on each frequency *;Test parameter* b) At least 100 Packets shall be transferred on each frequency*; Test parameter*
Test parameter	Frequency = {Fmin,..., Fmax} (according to the current frequency hopping table)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check -20ppm ≤ carrier frequency offset ≤ 20 ppm
Test passed	Carrier frequency offset ≤ + 20 ppm, and Carrier frequency offset ≥ - 20 ppm
Test not passed (examples)	The check above failed
Report	Max. (of +/-) carrier frequency offset of the EUT: <value> <ok | nok>

5.4.2.2 Test of W-Master transmission power including antenna for range and reliability

If the documentation for the transmission power test according to ETSI EN 300 328 certifies that the maximum transmit power is above +6dBm EIRP peak, this test is automatically fulfilled. A measurement protocol from an accredited test laboratory is recommended for this purpose

Table 29 defines the test conditions for this test case.

Table 29 Test of W-Master transmission power including antenna for range and reliability, conducted method

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0022
Name	WTCM_PHYL_TRANSPOWER_PERFORMANCE
Purpose (short)	Test the transmission power of W-Master for range and reliability
Equipment under test (EUT)	W-Master with antenna connector
Test case version	1.0
Category / type	IOLW qualified Module W-Master Physical Layer, test to pass Performance testing
Specification (clause)	REF 1, see 5.2.7…5.2.10
Configuration / setup	WMTU Alternatively, other measurement equipment (e.g., spectrum analyzer, generic communication tester) can be used.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, whether transmission power (which is allowed due to regulatory requirements) is sufficient high to fulfil range and reliability requirements
Precondition	EUT is paired to WMTU, no blocklisting
Procedure	**Conducted method** a) The transmit power of the EUT is set to the maximum level, which also fulfils regulatory requirements b) The transmit power is measured for all frequencies, which can be used for cyclic data exchange on each frequency. *;Test parameter*
Test parameter	Frequency = {Fmin, …, Fmax } (according to the current hopping table)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Evaluation of transmit power emitted by EUT on each frequency (for every track separately) is above the limit 1) Check on each frequency: TX power >= +6 dBm (for modules intended also for single-track W-Masters) or 1) Check on each frequency: TX power >= +0 dBm (for modules intended for multi-track W-Masters) NOTE: These power limits are the absolute minimum values. For improved range and reliability, better (i.e., higher) values are recommended.
Test passed	The check above passed
Test not passed (examples)	The check above failed, (too low transmission power on at least one frequency)
Report	Document evaluation option (i.e., for which purpose is the module intended) Transmit power: <value> <ok | nok>

389 **Table 30** defines the test conditions for this test case.

390 **Table 30 Test of W-Master transmission power including antenna for range and**
391 **reliability, radiated methods**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0023
Name	WTCM_PHYL_TRANSPOWER_PERFORMANCE
Purpose (short)	Test the transmission power of W-Master for range and reliability
Equipment under test (EUT)	W-Master with integrated omnidirectional antenna
Test case version	1.0
Category / type	IOLW qualified Module W-Master Physical Layer, test to pass Performance testing
Specification (clause)	REF 1, see 5.2.7…5.2.10
Configuration / setup	WMTU, measurement equipment according to ETSI EN 300 328 Alternatively, other measurement equipment (e.g., spectrum analyzer, generic communication tester) can be used.

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, whether transmission power (which is allowed due to regulatory requirements) is sufficient high to fulfil range and reliability requirements
Precondition	EUT is paired to WMTU, no blocklisting
Procedure	**Module with integrated antenna:** Procedure like ETSI EN 300 328 V2.2.2 Sect. 4.3.2.2 / 5.4.2. (radiated measurement only) (non-adaptive, non-FHSS) The aim here is to prove that a minimum transmit power is achievable. Therefore, it is NOT allowed to combine data sheet values of an antenna with the conducted measurement values of a module. Instead, at least the antenna in the later housing must be characterized by a measurement and offset against the conducted measurement results of the module. However, it is preferable to measure the final module directly. **The following procedure is based on ETSI EN 300 328:** a) Utilize a measurement setup according to ETSI EN 300 328 or an appropriate alternative measurement setup. b) The EUT shall be configured, and antenna(s) positioned for maximum EIRP towards the measuring antenna. This position shall be recorded and documented to the EUT (e.g., in the EUT's manual). c) Test at least the frequencies 2401 MHz, 2440 MHz and 2480 MHz *;Test parameter* d) It is recommended, to test in continuous transmit mode with modulated signal pattern e) This test has to be repeated for each track
Test parameter	Frequency = {2401 MHz, 2440 MHz, 2480 MHz}
Post condition	-

393

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Evaluation of transmit power emitted by EUT on each frequency (for every track separately) is above the limit 1) Check on each frequency: Peak TX power >= +6 dBm EIRP (for modules intended also for single-track W-Masters) or 1) Check on each frequency: Peak TX power >= +0 dBm EIRP (for modules intended for multi-track W-Masters) NOTE: These power limits are the absolute minimum values. For improved range and reliability, better (i.e., higher) values are recommended.
Test passed	The check above passed
Test not passed (examples)	The check above failed, (too low transmission power on at least one frequency)
Report	Document evaluation option (for which purpose is the module intended) Transmit power: <value> <ok | nok>

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396 #### 5.4.2.3 W-Master IOLW Receiver Sensitivity

397 Table 31 defines the test conditions for this test case.

398 **Table 31 W-Master IOLW Receiver Sensitivity, conducted method**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0024
Name	WTCM_PHYL_SENSITIVITY
Purpose (short)	Test of sufficient W-Master IOLW receiver sensitivity
Equipment under test (EUT)	W-Master with antenna connector
Test case version	1.0
Category / type	IOLW qualified Module W-Master Physical Layer, test to pass Conformance testing, Performance testing
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WMTU **Module with antenna connector: conducted testing**

399

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Master receiver sensitivity
Precondition	EUT is paired to the WMTU and in normal operation, HT01 and no blocklisting is used
Procedure	**Conducted method** a) The transmit power of the WMTU is set or reduced via attenuators that the received power at the connector of the EUT is -92 dBm b) 1.000 packets (at least) per utilized frequency are sent from the WDTU to the EUT c) The packets have maximum packet length (i.e., full DSlot packets) d) The EUT acknowledge the correct reception of every packet via the Air-Interface in downLink. Thereby the EUT transmit at maximum power and/or with less attenuation than in the Downlink, e) The WDTU calculates the Packet Error Probability (PEP) Alternatively, if the EUT has an external interface, it can be used to transfer the number of correctly received packets at every utilized frequency in order to calculate the PEP f) PEP shall be <= 0.3
Test parameter	-
Post condition	-

400

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) The measured PEP shall be <= 0.3
Test passed	The check above passed
Test not passed (examples)	The check above failed (too low sensitivity)
Report	Document evaluation PEP: <value> <ok | nok>

401

402 Table 32 defines the test conditions for this test case.

403 **Table 32 W-Master IOLW Receiver Sensitivity, radiated methods**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0025
Name	WTCM_PHYL_SENSITIVITY
Purpose (short)	Test of sufficient W-Master IOLW receiver sensitivity
Equipment under test (EUT)	W-Master with integrated omnidirectional antenna
Test case version	1.0
Category / type	IOLW qualified Module W-Master Physical Layer, test to pass Conformance testing, Performance testing
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WMTU **Module with integrated antenna: radiated testing** Reverberation chamber (RC), Anechoic Chamber (AC)

404

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Master receiver sensitivity
Precondition	EUT is paired to the WMTU and in normal operation, HT01 and no blocklisting is used
Procedure	Either Anechoic Chamber Method or Reverberation Chamber Method **Anechoic Chamber Method** a) The transmit power of the WMTU is set or reduced via attenuators that the mean received power at the EUT is -89 dBm for a full azimuth and elevation scan in 15° steps each and both, horizontal as well as vertical polarizations, (measured at the connector of a reference antenna) b) At least 100 packets shall be sent for each frequency and each azimuth/elevation step c) The packets have maximum packet length (i.e., full DSlot packets) d) The EUT acknowledge the correct reception of every packet via the Air-Interface in downLink. Thereby the EUT transmit at maximum power and/or with less attenuation than in the Downlink, e) The WDTU calculates the Packet Error Probability (PEP) for a whole azimuth and elevation scan and both, horizontal as well as vertical polarizations, Alternatively, if the EUT has an external interface, it can be used to transfer the number of correctly received packets at every utilized frequency in order to calculate the PEP for the full azimuth and elevation scan and both, horizontal as well as vertical polarizations, f) PEP shall be <= 0.3 **Reverberation Chamber Method ("TIS Method")** a) Determine the mean chamber reference transfer function, i.e., measure utilizing a reference antenna and stepped-mode operation of the mode stirrers. b) Utilizing stepwise operation mode of the RC, the "sensitivity limit", related to a certain PEP (i.e., PEP = 0.3) is searched for: c) The packets have maximum packet length (i.e., full DSlot uplink packets) d) For each mode-stirrer step combination, the power of the test companion is lowered, that the EUT's receiver achieves a certain PEP of e.g., PEP = 0.3 . e) The estimated receiving power, i.e., the output power of the WMTU achieving that certain PEP value minus the chamber reference transfer function is stored. f) Finally, the (harmonic) mean value of the stored, estimated receiving power levels obtained during the full mode stirring cycle (consisting of at least 150 steps) is calculated and referred to total isotropic sensitivity TIS value. g) TIS shall be <= -89 dBm
Test parameter	-
Post condition	-

405

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For Anechoic Chamber Method: 1) The measured PEP shall be <= 0.3 For Reverberation Chamber Method: 1) TIS shall be <= -89 dBm
Test passed	The check above passed
Test not passed (examples)	The check above failed (too low sensitivity)
Report	Document evaluation method (Anechoic Chamber or Reverberation Chamber) For Anechoic Chamber Method: PEP: <value> <ok | nok> For Reverberation Chamber Method: TIS: <value> <ok | nok>

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5.4.2.4 Test of W-Master W-Sub-cycle duration

Table 33 defines the test conditions for this test case.

Table 33 Test of W-Master W-Sub-cycle duration

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0026
Name	WTCM_PHYL_TIMING_SUBCYCLE
Purpose (short)	Test if the duration of the W-Sub-cycle transmitted by the EUT is correct
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	IOLW qualified Module W-Master Physical Layer, test to pass Conformance testing,
Specification (clause)	REF 1, see 5.4
Configuration / setup	WMTU, capable to measure the duration of a W-Sub-cycle. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test if the duration of the W-Sub-cycle transmitted by the EUT is correct, i.e., 1.664 ms
Precondition	EUT is paired to the WMTU and in normal operation
Procedure	a) The EUT transmits at least 1000 W-Frames b) The duration of each W-Sub-cycle is observed by the WMTU, thereby the timing reference is the beginning of the Downlink packet.
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) The duration of each W-Sub-cycle is observed by the WMTU
Test passed	No duration of a W-Sub-cycle exceeds 1.664 ms +/- 1 µs
Test not passed (examples)	The duration of a W-Sub-cycle exceeds 1.664 ms +/- 1 µs
Report	W-Sub-cycle duration is correct: <yes | no> <ok | nok>

415 #### 5.4.2.5 Test of W-Master with applied jitter

416 Table 34 defines the test conditions for this test case.

417 **Table 34 Test of W-Master with applied jitter**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0027
Name	WTCM_PHYL_TIMING_JITTER
Purpose (short)	Test if the W-Master as EUT is capable to receive W-Devices with Jitter
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master Physical Layer, test to pass Conformance testing, Tolerance testing
Specification (clause)	REF 1, see 5.3
Configuration / setup	**IOLW qualified Module** WMTU, capable to transmit Uplinks with timing Jitter. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

418

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test if the W-Master as EUT is capable to receive W-Devices with Jitter
Precondition	EUT is paired to the WMTU and in normal operation using HT01 and no blocklisting. 4 SSlots and 2 DSlots are used as follows:
Procedure	a) The WMTU provides 4 SSlot W-Devices and 2 DSlots for a W-Track. b) The SSlots and DSlots have a fix timing jitter of +/-1µs each (Thereby the timing reference is the beginning of the Downlink packet). The jitter of first slot shall be -1µs. Consecutive slots shall have alternating jitter. c) For each slot the WMTU sends at least 20.000 data packets to the EUT d) The EUT acknowledge the correct reception of every packet via the Air-Interface. e) The WMTU calculates the Packet Error Probability (PEP) for each slot.
Test parameter	-
Post condition	-

419

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check PEP (calculated by the WMTU) ≤ 5 Packet errors for 20.000 W-Frames in each slot.
Test passed	The check above passed
Test not passed (examples)	The check above failed (too many packet errors, too high PEP, more than 5 packet errors for 20.000 W-Frames).
Report	Maximum of PEP (over slots): <value> <ok | nok>

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5.4.2.6 Test of correct calculation and transmission of frequency table by W-Master

Table 35 defines the test conditions for this test case.

Table 35 Test of correct calculation and transmission of frequency table by W-Master

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0028
Name	WTCM_PHYL_FREQTABLE
Purpose (short)	Test of correct calculation and transmission of frequency hopping table
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	IOLW qualified Module W-Master Physical Layer, test to pass Conformance testing, Tolerance testing
Specification (clause)	REF 1, see Annex H
Configuration / setup	WMTU is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	EUT shall start a pairing process, whereby the correct calculation of the frequency hopping table and is tested.
Precondition	The WMTU is unpaired
Procedure	a) MasterID, Track number are provided for WMTU to check the HT01 *;Test parameter* b) The EUT initiates a pairing process with the WMTU with no blocklisting c) The WMTU checks, whether No frequencies outside the range of 2403 MHz to 2478 MHz are in the hopping table and whether the table is correctly calculated according to the Test parameters and HT01 d) The EUT is unpaired e) MasterID, Track number and Blocklisting are provided for WMTU to check the HT01 *;Test parameter* f) The EUT initiates a pairing process with the WMTU with blocklisting g) The WMTU checks, whether No frequencies outside the range of 2403 MHz to 2478 MHz are in the hopping table and whether the table is correctly calculated according to the Test parameters and HT01
Test parameter	MasterID, Track number, Blocklisting
Post condition	The WMTU is paired to the EUT

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check the frequencies in the transferred table (by the WMTU)
Test passed	The check above has passed.
Test not passed (examples)	The check above has failed (i.e., the transferred frequency table is incorrect according to HT01)
Report	Document the parameters MasterID, Track number, Blocklisting Transfer only allowed and correctly calculated frequencies without blocklisting: <yes | no> <ok | nok> Transfer only allowed and correctly calculated frequencies with blocklisting: <yes | no> <ok | nok>

428 #### 5.4.2.7 Test of AHT for W-Master

429 Table 36 defines the test conditions for this test case.

430 **Table 36 Test of AHT for W-Master**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0029
Name	WTCM_PHYL_AHT
Purpose (short)	Test of AHT for W-Master
Equipment under test (EUT)	W-Master if the AHT option is supported
Test case version	1.0
Category / type	IOLW qualified Module W-Master Physical Layer, test to pass Conformance testing,
Specification (clause)	REF 1, Annex H 4
Configuration / setup	WMTU is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

431

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	EUT shall replace exiting hopping table which is according to HT01 to a new hopping table according to HT01 after activation of AHT (check conformity to HT01 also after AHT used for dynamic blocklisting)
Precondition	The WMTU is paired and in normal operation
Procedure	a) AHT Enable is activated for the EUT. b) WMTU is prompted to prepare an Event with EventCode = 0xFFB7 and EventQualifier = 0x54. c) WMTU sends the Event. d) W-Master writes the new hopping table via Index 0x5006 e) W-Master triggers a Jump-Command via MCMD (0xFE), see REF 1Table 173 Jump f) The WMTU observes whether the new hopping table is also calculated according to HT01 (see clause 9.4.3)
Test parameter	Track_N, MasterID, Blocklist, Spacing (NOTE: This parameter is defined in the documentation of the manufacturer.)
Post condition	New hopping table was activated

432

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check the correctness of the new hopping table according to HT01
Test passed	The check above has passed.
Test not passed (examples)	The check above has failed (e.g., new hopping table does not correspond to HT01)
Report	The EUT utilize AHT according to HT01: <yes | no> <ok | nok>

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5.4.2.8 Test of W-Master configuration frequencies

Table 37 defines the test conditions for this test case.

Table 37 Test of W-Master configuration frequencies

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0030
Name	WTCM_PHYL_CONFIG_FREQ
Purpose (short)	Test correct use of configuration frequencies by W-Master
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	IOLW qualified Module W-Master Physical Layer, test to pass Conformance testing,
Specification (clause)	REF 1, see Annex H 3
Configuration / setup	WMTU is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test correct (alternating) use of configuration frequencies by W-Master
Precondition	WMTU is unpaired for EUT
Procedure	a) EUT starts a pairing sequence to pair the WMTU b) WMTU observes alternating use of configuration frequencies according to REF 1, see 18.3
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check, whether the EUT uses both configuration frequencies alternatively and with the change on every 5th W-Sub-cycle
Test passed	The check above passed.
Test not passed (examples)	The check above failed.
Report	Correct alternating use of configuration frequencies: <yes | no> <ok | nok>

441 #### 5.4.2.9 Test of W-Master Link Quality Indicator

442 Table 38 defines the test conditions for this test case.

443 **Table 38 Test of W-Master Link Quality Indicator**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0031
Name	WTCM_PHYL_LQI
Purpose (short)	Test correct calculation of Link Quality Indicator in W-Master
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	IOLW qualified Module W-Master Physical Layer, test to pass Conformance testing,
Specification (clause)	REF 1, see C.4.8.2
Configuration / setup	WMTU is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

444

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test correct calculation of Link Quality Indicator in W- Master
Precondition	EUT is paired to the WDTU and in normal operation
Procedure	a) EUT sends cyclic data packets to WMTU b) Thereby a specific number of ACK are suppressed by the WMTU (using fixed pattern along 4096 received data packets) in order to force the EUT to a retry and to degrade the PEP intentionally The fixed error distribution shall not cause loss of communication (e.g., due to large bursts) a) 0 Errors per 4096 packets *;Test parameter* b) 1 Errors per 4096 packets *;Test parameter* (e.g., suppress every 4096th ACK) c) 4 Errors per 4096 packets *;Test parameter* (e.g., suppress every 1024th ACK) d) 32 Errors per 4096 packets *;Test parameter* (e.g., suppress every 128th ACK) e) 256 Errors per 4096 packets *;Test parameter* (e.g., suppress every 16th ACK) f) 1024 Errors per 4096 packets *;Test parameter* (e.g., suppress every 4th ACK) c) After the WMTU has sent 8192 packets to EUT, the EUT shall report its LQI d) The procedure a)-c) is repeated with the next number of intended errors
Test parameter	Number of Errors per 4096 packets = {0, 1, 4, 32, 256, 1024}
Post condition	EUT is paired

445

<table>
<tr><th>TEST CASE RESULTS</th><th>CHECK / REACTION</th></tr>
<tr><td>Evaluation</td><td>1) Correct calculation of LQI for all intended PEP (which are provided by the WDTU)
Test limits
<table>
<tr><th>(Intended) Number of errors</th><th>LQI max</th><th>LQI min</th></tr>
<tr><td>0</td><td>100</td><td>84</td></tr>
<tr><td>1</td><td>85</td><td>77</td></tr>
<tr><td>4</td><td>71</td><td>67</td></tr>
<tr><td>32</td><td>50</td><td>48</td></tr>
<tr><td>256</td><td>29</td><td>28</td></tr>
<tr><td>1024</td><td>15</td><td>14</td></tr>
</table>
NOTE: To account for measurement tolerances, one additional error is tolerated per 4096 packets, resulting in a range of allowable LQI in each case.</td></tr>
<tr><td>Test passed</td><td>The check above passed</td></tr>
<tr><td>Test not passed (examples)</td><td>The check above failed (e.g., wrong calculation of LQI, Test limits exceeded)</td></tr>
<tr><td>Report</td><td>Correct calculation of LQI by EUT: <yes | no> <ok | nok></td></tr>
</table>

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5.4.3 PL-parameters of the W-Master: IOLW conform Product

5.4.3.1 Test of W-Master transmission power including antenna for range and reliability

If the documentation for the transmission power test according to ETSI EN 300 328 certifies that the maximum transmit power is above +6 dBm EIRP peak in sum for all tracks), this test is automatically fulfilled. A measurement protocol from an accredited test laboratory is recommended for this purpose.

Table 39 defines the test conditions for this test case.

Table 39 Test of W-Master transmission power including antenna for range and reliability

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0032
Name	WTCM_PHYL_TRANSPOWER_PERFORMANCE
Purpose (short)	Test the transmission power of W-Master for range and reliability
Equipment under test (EUT)	W-Master including antenna
Test case version	1.0
Category / type	IOLW conform Product W-Master Physical Layer, test to pass Performance testing
Specification (clause)	REF 1, see 5.2.7…5.2.10
Configuration / setup	WMTU, Reverberation chamber (RC), Anechoic chamber (AC) Alternatively, other measurement equipment (e.g., spectrum analyzer, generic communication tester) can be used.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, whether transmission power (which is allowed due to regulatory requirements) is sufficient high to fulfil range and reliability requirements
Precondition	EUT is paired to WMTU, no blocklisting
Procedure	Procedure like ETSI EN 300 328 V2.2.2 Sect. 4.3.2.2 / 5.4.2. (radiated Measurement only) (non-adaptive, non-FHSS) The aim here is to prove that a minimum transmit power is achievable. Therefore, it is NOT allowed to combine data sheet values of an antenna with the conducted measurement values of a module. Instead, at least the antenna in the later housing must be characterized by a measurement and offset against the conducted measurement results of the module. However, it is preferable to measure the final module directly. **The following procedure is based on ETSI EN 300 328:** a) Utilize a measurement setup according to ETSI EN 300 328 or an appropriate alternative measurement setup. b) The EUT shall be configured, and antenna(s) positioned for maximum EIRP towards the measuring antenna. This position shall be recorded and documented to the EUT (e.g., in the EUT's manual). c) Activate only one track at time. d) Measure the transmission power at least the frequencies 2401 MHz, 2440 MHz and 2480 MHz *;Test parameter* e) It is recommended, to test in continuous transmit mode with modulated signal pattern f) Repeat the procedure for all available tracks *;Test parameter* g) Calculate the sum of the power of all tracks according to the following formula: $P_{TX_{Peak}} = \sum_{Tracks} P_{track},$
Test parameter	Frequencies = {2401 MHz, 2440 MHz, 2480 MHz}, Track_N
Post condition	

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check TX power of at least +6 dBm EIRP peak (in sum over all tracks) for each frequency (2401 MHz, 2440 MHz and 2480 MHz). NOTE: This power limits are the absolute minimum values. For improved range and reliability, better (i.e., higher) values are recommended.
Test passed	The check above passed
Test not passed (examples)	The check above failed, (too low transmission power on at least one frequency)
Report	Transmit power (in sum over all tracks) at 2401 MHz: <value> <ok | nok> Transmit power (in sum over all tracks) at 2440 MHz: <value> <ok | nok> Transmit power (in sum over all tracks) at 2480 MHz: <value> <ok | nok>

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5.4.3.2 W-Master IOLW Receiver Sensitivity for 10m range

The following tables describe the different test cases for W-Master IOLW Receiver Sensitivity for 10m range:

- The test case in Table 40 is a hybrid method to combine module level results with test results of a separate accessible antenna.
- Table 41 is the standard test case for the radiated measurement of a W-Master with omnidirectional antenna.
- Table 42 is a special test case only for W-Master using directional antennas.

Table 40 defines the test conditions for this test case.

Table 40 W-Master IOLW Receiver Sensitivity 10m range, hybrid methods

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0033
Name	WTCM_PHYL_SENSITIVITY10M
Purpose (short)	Test of sufficient W-Master IOLW receiver sensitivity
Equipment under test (EUT)	W-Master with antenna connector
Test case version	1.0
Category / type	IOLW conform Product W-Master Physical Layer, test to pass Conformance testing, Performance testing
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WMTU

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Master receiver sensitivity
Precondition	EUT is paired to the WMTU and in normal operation, HT01 and no blocklisting is used
Procedure	In order to allow to mount a W-Device in arbitrarily position or direction with respect to its W-Master, all directions and polarizations shall be considered. This is implicitly done by a RC. Alternatively, a full azimuth and elevation scan with two orthogonal polarizations has to be performed in an AC. Generally, the "Measurement procedure for EUT with omnidirectional antenna" shall be applied. This test has to be repeated for each track **For a previously tested Module with antenna connector + Antenna in housing:** **Separate antenna/housing measurement + conducted results** The antenna inclusive its housing of the final product needs to be accessible via connector in a way that does not influence the measurement results **Anechoic Chamber Method** a) The total antenna (in housing) efficiency is measured for a whole azimuth and elevation scan in 15° steps each and both, horizontal as well as vertical polarizations and for all frequencies, which can be used for cyclic data exchange b) The spatial mean over the azimuth and elevation scan and both, horizontal as well as vertical polarizations is calculated for each frequency separately c) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power d) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power e) The calculated effective sensitivity, including the antenna, shall be less or equal - 89dBm **Reverberation Chamber Method** a) The total antenna (in housing) efficiency is measured for a full mode-stirring cycle, consisting of (at least) 300 mode-stirrer combination steps b) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power c) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power d) The calculated effective sensitivity, including the antenna, shall be less or equal - 89dBm
Test parameter	-
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	For each track: 1) Check the effective sensitivity. It shall be less or equal -89dBm NOTE: The power limits are the absolute minimum values. For improved range and reliability, better (i.e., lower) values are recommended.
Test passed	The check above passed
Test not passed (examples)	The check above failed
Report	Document evaluation For each track: Effective sensitivity: <value> <ok | nok>

474

475 Table 41 defines the test conditions for this test case.

476 **Table 41 W-Master IOLW Receiver Sensitivity 10m range, radiated methods**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0034
Name	WTCM_PHYL_SENSITIVITY10M
Purpose (short)	Test of sufficient W-Master IOLW receiver sensitivity
Equipment under test (EUT)	W-Master with integrated omnidirectional antenna
Test case version	1.0
Category / type	IOLW conform Product W-Master Physical Layer, test to pass Conformance testing, Performance testing
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WMTU

477

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Master receiver sensitivity
Precondition	EUT is paired to the WMTU and in normal operation, HT01 and no blocklisting is used
Procedure	In order to allow to mount a W-Device in arbitrarily position or direction with respect to its W-Master, all directions and polarizations shall be considered. This is implicitly done by a RC. Alternatively, a full azimuth and elevation scan with two orthogonal polarizations has to be performed in an AC. Generally, the "Measurement procedure for EUT with omnidirectional antenna" shall be applied. This test has to be repeated for each track **For product with integrated antenna or inaccessible antenna ("omnidirectional"):** **Direct measurement including antenna + housing and transceiver** **Anechoic Chamber Method** a) The transmit power of the W- Master Tester is set or reduced via attenuators that the mean received power at the EUT is -89 dBm for a full azimuth and elevation scan and both, horizontal as well as vertical polarizations, (measured at the connector of a reference antenna) b) At least 100 packets (at least) per utilized frequency and each azimuth/elevation step are sent from the WDTU to the EUT c) The packets have maximum packet length (i.e., full Uplink packets) d) The EUT acknowledge the correct reception of every packet via the Air-Interface in Downlink. Thereby the EUT transmit at maximum power and/or with less attenuation than in the Uplink e) The WMTU calculates the Packet Error Probability (PEP) for a whole azimuth and elevation scan in 15° steps each and both, horizontal as well as vertical polarizations, f) PEP shall be <= 0.3 **Reverberation Chamber Method ("TIS Method")** a) Determine the mean chamber reference transfer function, i.e., measure utilizing a reference antenna and stepped-mode operation of the mode stirrers. b) Utilizing stepwise operation mode of the RC, the "sensitivity limit", related to a certain PEP (i.e., PEP = 0.3) is searched for: c) The packets have maximum packet length (i.e., full DSlot uplink packets) d) For each mode-stirrer step combination, the power of the test companion is lowered, that the EUT's receiver achieves a certain PEP of e.g., PEP = 0.3 . e) The estimated receiving power, i.e., the output power of the WMTU achieving that certain PEP value minus the chamber reference transfer function is stored. f) Finally, the (harmonic) mean value of the stored, estimated receiving power levels obtained during the full mode stirring cycle (consisting of at least 150 steps) is calculated and referred to total isotropic sensitivity TIS value. g) TIS shall be <= -89 dBm
Test parameter	-
Post condition	-

478

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For each track: For Anechoic Chamber Method: 1) Check the measured PEP. It shall be <= 0.3 For Reverberation Chamber Method: 1) Check the measured TIS. It shall be <= -89 dBm
Test passed	The check above passed
Test not passed (examples)	The check above failed
Report	Document evaluation method (Anechoic Chamber or Reverberation Chamber) For each track: For Anechoic Chamber Method: PEP: <value> <ok | nok> For Reverberation Chamber Method: TIS: <value> <ok | nok>

479

480 If the sensitivity test case for 20m range with directional antenna has been passed then this
481 test is not required

482 Table 42 defines the test conditions for this test case.

483 **Table 42 W-Master IOLW Receiver Sensitivity 10m range, hybrid method for directional**
484 **antenna**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0035
Name	WTCM_PHYL_SENSITIVITY10M
Purpose (short)	Test of sufficient W-Master IOLW receiver sensitivity
Equipment under test (EUT)	W-Master with directional antenna
Test case version	1.0
Category / type	IOLW conform Product W-Master Physical Layer, test to pass Conformance testing, Performance testing
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WMTU

485

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Master receiver sensitivity
Precondition	EUT is paired to the WMTU and in normal operation, HT01 and no blocklisting is used
Procedure	In order to allow to mount a W-Device in arbitrarily position or direction with respect to its W-Master, all directions and polarizations shall be considered. This is implicitly done by a RC. Alternatively, a full azimuth and elevation scan with two orthogonal polarizations has to be performed in an AC. The radiation pattern shall be specified by the manufacturer in the product manual. This test has to be repeated for each track **For a previously tested Module with antenna connector + Antenna in housing: Separate antenna/housing measurement + conducted results** a) The antenna inclusive its housing of the final product needs to be accessible via connector in a way that does not influence the measurement results b) The total antenna (in housing) gain and efficiency is measured for a whole azimuth and elevation scan in 15° steps each and both, horizontal as well as vertical polarizations and for all frequencies, which can be used for cyclic data exchange c) The half power width (3dB Beam width) has to be determined for each polarization and horizontal and vertical angle d) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna gain at the corners of the opening angles (maximum gain minus 3 dB) e) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power f) The calculated effective sensitivity, including the antenna, shall be less or equal - 89dBm
Test parameter	-
Post condition	-

486

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For each track: 1) Check the effective sensitivity. It shall be less or equal -89dBm 2) Check the measured PEP. It shall be <=0.001
Test passed	The check above passed
Test not passed (examples)	The check above failed
Report	Document evaluation For each track: Radiation pattern Effective sensitivity: <value> <ok | nok>

487

5.4.3.3 W-Master IOLW Receiver Sensitivity for 20m range

These test cases are applicable only for single track W-Masters with a range of up to 20 meters.

The following tables describe the different test cases for W-Master IOLW Receiver Sensitivity for 20m range:

- The test case in Table 43 is a hybrid method to combine module level results with test results of a separate accessible antenna.
- Table 44 is the standard test case for the radiated measurement of a W-Master with omnidirectional antenna.
- Table 45 is a special test case only for W-Master using directional antennas.

Table 43 defines the test conditions for this test case.

Table 43 W-Master IOLW Receiver Sensitivity 20m range, hybrid methods

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0036
Name	WTCM_PHYL_SENSITIVITY20M
Purpose (short)	Test of sufficient W-Master IOLW receiver sensitivity for 20 m range
Equipment under test (EUT)	W-Master with antenna connector
Test case version	1.0
Category / type	IOLW conform Product W-Master Physical Layer, test to pass Conformance testing, Performance testing
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WMTU

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Master receiver sensitivity
Precondition	EUT is paired to the WMTU and in normal operation, HT01 and no blocklisting is used
Procedure	In order to allow to mount a W-Device in arbitrarily position or direction with respect to its W-Master, all directions and polarizations shall be considered. This is implicitly done by a RC. Alternatively, a full azimuth and elevation scan with two orthogonal polarizations has to be performed in an AC. Generally, the "Measurement procedure for EUT with omnidirectional antenna" shall be applied. **For a previously tested Module with antenna connector + omnidirectional Antenna in housing:** **Separate omnidirectional antenna/housing measurement + conducted results** The antenna inclusive its housing of the final product needs to be accessible via connector in a way that does not influence the measurement results **Anechoic Chamber Method** a) The total antenna (in housing) efficiency is measured for a whole azimuth and elevation scan in 15° steps each and both, horizontal as well as vertical polarizations and for all frequencies, which can be used for cyclic data exchange b) The spatial mean over the azimuth and elevation scan and both, horizontal as well as vertical polarizations is calculated for each frequency separately c) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power d) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power e) The calculated effective sensitivity, including the antenna, shall be less or equal - 96dBm **Reverberation Chamber Method** a) The total antenna (in housing) efficiency is measured for a full mode-stirring cycle, consisting of (at least) 300 mode-stirrer combination steps b) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power c) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna efficiency to determine the PEP at the reduced receive power d) The calculated effective sensitivity, including the antenna, shall be less or equal - 96dBm
Test parameter	-
Post condition	-

502

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check the effective sensitivity. It shall be less or equal -96 dBm NOTE: The power limits are the absolute minimum values. For improved range and reliability, better (i.e., lower) values are recommended.
Test passed	The check above passed
Test not passed (examples)	The check above failed
Report	Document evaluation Effective sensitivity: <value> <ok | nok>

503

504 Table 44 defines the test conditions for this test case.

505 **Table 44 W-Master IOLW Receiver Sensitivity 20m range, radiated methods**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0037
Name	WTCM_PHYL_SENSITIVITY20M
Purpose (short)	Test of sufficient W-Master IOLW receiver sensitivity for 20 m range
Equipment under test (EUT)	W-Master with integrated omnidirectional antenna
Test case version	1.0
Category / type	IOLW conform Product W-Master Physical Layer, test to pass Conformance testing, Performance testing
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WMTU

506

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Master receiver sensitivity
Precondition	EUT is paired to the WMTU and in normal operation, HT01 and no blocklisting is used
Procedure	In order to allow to mount a W-Device in arbitrarily position or direction with respect to its W-Master, all directions and polarizations shall be considered. This is implicitly done by a RC. Alternatively, a full azimuth and elevation scan with two orthogonal polarizations has to be performed in an AC. Generally, the "Measurement procedure for EUT with omnidirectional antenna" shall be applied. **For product with integrated antenna or inaccessible antenna ("omnidirectional"):** **Direct measurement including antenna + housing and transceiver** **Anechoic Chamber Method** a) The transmit power of the W- Master Tester is set or reduced via attenuators that the mean received power at the EUT is -96 dBm for a full azimuth and elevation scan and both, horizontal as well as vertical polarizations, (measured at the connector of a reference antenna) b) At least 100 packets (at least) per utilized frequency and each azimuth/elevation step are sent from the WDTU to the EUT c) The packets have maximum packet length (i.e., full Uplink packets) d) The EUT acknowledge the correct reception of every packet via the Air-Interface in Downlink. Thereby the EUT transmit at maximum power and/or with less attenuation than in the Uplink e) The WMTU calculates the Packet Error Probability (PEP) for a whole azimuth and elevation scan in 15° steps each and both, horizontal as well as vertical polarizations, f) PEP shall be <= 0.3 **Reverberation Chamber Method ("TIS Method")** a) Determine the mean chamber reference transfer function, i.e., measure utilizing a reference antenna and stepped-mode operation of the mode stirrers. b) Utilizing stepwise operation mode of the RC, the "sensitivity limit", related to a certain PEP (i.e., PEP = 0.3) is searched for: c) The packets have maximum packet length (i.e., full DSlot uplink packets) d) For each mode-stirrer step combination, the power of the test companion is lowered, that the EUT's receiver achieves a certain PEP of e.g., PEP = 0.3 . e) The estimated receiving power, i.e., the output power of the WMTU achieving that certain PEP value minus the chamber reference transfer function is stored. f) Finally, the (harmonic) mean value of the stored, estimated receiving power levels obtained during the full mode stirring cycle (consisting of at least 150 steps) is calculated and referred to total isotropic sensitivity TIS value. g) TIS shall be <= -96 dBm
Test parameter	-
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	For Anechoic Chamber Method 1) Check the measured PEP. It shall be <= 0.3 For Reverberation Chamber Method 1) Check the measured TIS. It shall be <= -96 dBm
Test passed	The check above passed
Test not passed (examples)	The check above failed
Report	Document evaluation method (Anechoic Chamber or Reverberation Chamber) For Anechoic Chamber Method: PEP: <value> <ok | nok> For Reverberation Chamber Method: TIS: <value> <ok | nok>

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510 Table 45 defines the test conditions for this test case.

511 **Table 45 W-Master IOLW Receiver Sensitivity 20m range, hybrid method for directional**
512 **antenna**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0038
Name	WTCM_PHYL_SENSITIVITY20M
Purpose (short)	Test of sufficient W-Master IOLW receiver sensitivity for 20 m range
Equipment under test (EUT)	W-Master, with directional antenna
Test case version	1.0
Category / type	IOLW conform Product W-Master Physical Layer, test to pass Conformance testing, Performance testing
Specification (clause)	REF 1, see 5.2.9
Configuration / setup	WMTU

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of sufficient W-Master receiver sensitivity
Precondition	EUT is paired to the WMTU and in normal operation, HT01 and no blocklisting is used
Procedure	In order to allow to mount a W-Device in arbitrarily position or direction with respect to its W-Master, all directions and polarizations shall be considered. This is implicitly done by a RC. Alternatively, a full azimuth and elevation scan with two orthogonal polarizations has to be performed in an AC. The radiation pattern has to be specified by the manufacturer in the product manual. **For a previously tested Module with antenna connector + Antenna in housing: Separate antenna/housing measurement + conducted results** a) The antenna inclusive its housing of the final product needs to be accessible via connector in a way that does not influence the measurement results b) The total antenna (in housing) gain is measured for a whole azimuth and elevation scan in 15° steps each and both, horizontal as well as vertical polarizations and for all frequencies, which can be used for cyclic data exchange c) The half power width (3dB Beam width) has to be determined for each polarization and horizontal and vertical angle d) The previously obtained measurement results for the module (conducted measurement) are corrected by the measured antenna gain at the corners of the opening angles (maximum gain minus 3 dB) e) The calculated effective sensitivity, including the antenna gain, shall be less or equal -96dBm
Test parameter	-
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check the effective sensitivity. It shall be less or equal -96 dBm 2) Check the measured PEP. It shall be <=0.001 NOTE: The power limits are the absolute minimum values. For improved range and reliability, better (i.e., lower) values are recommended.
Test passed	The check above passed
Test not passed (examples)	The check above failed
Report	Document evaluation Radiation pattern Effective sensitivity: <value> <ok | nok>

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5.4.3.4 Test of track synchronicity for multi-track W-Master

Table 46 defines the test conditions for this test case.

Table 46 Test of track synchronicity for multi-track W-Master

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0039
Name	WTCM_PHYL_TRACK_SYNCHRONITY
Purpose (short)	Test of track synchronicity for multi-track W-Master in order to test of correctness of spacing for multi-track W-Master
Equipment under test (EUT)	**W-Master with more than one track (multi-track W-Master)**
Test case version	1.0
Category / type	IOLW conform Product W-Master Physical Layer, test to pass Conformance testing,
Specification (clause)	REF 1, see 5.1 Line 1233; REF 1, see 5.2.2 Line 1301; REF 1 5.4.1 Line 1456; REF 1, 5.4.2 Line 1480
Configuration / setup	WMTU is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of EUT track synchronicity for multi-track W-Master (in order to test correctness of frequency spacing for multi-track W-Master)
Precondition	The EUT in normal operation
Procedure	a) All tracks of the EUT are switched on in cyclic mode b) The synchronicity of the tracks is observed for at least 100.000 W-Sub-cycles (W-Frames) c) Thereby the timing reference is the beginning of the Downlink packet.
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check synchronicity of the tracks. For each Sub-Cycles (all time-overlapping downlink packets), the maximum difference between the “earliest” and the “latest” downlink packet has to be <= 4 µs
Test passed	The check above passed
Test not passed (examples)	The Downlink packet of the tracks differs more than 4 µs within at least one SubCycle
Report	Synchronicity of tracks: <yes | no> <ok | nok>

524 #### 5.4.3.5 Test of simultaneous track switching to new HT01 hopping table (AHT)

525 Table 47 defines the test conditions for this test case.

526 **Table 47 Test of simultaneous track switching to new HT01 hopping table (AHT)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_M_0040
Name	WTCM_PHYL_SIMULTANEOUS_SWITCHING
Purpose (short)	Test of simultaneous switching to new HT01 hopping table for multi-track W-Master
Equipment under test (EUT)	**W-Master with more than one track** (multi-track W-Master) if AHT option is supported.
Test case version	1.0
Category / type	IOLW conform Product W-Master Physical Layer, test to pass Conformance testing,
Specification (clause)	REF 1, see 5.4.3 As mentioned in REF 2, see H.4, this feature is optional for W-Master
Configuration / setup	WMTU is connected with the EUT via cable or an appropriate electromagnetic shielded setup. The RSSI at the EUT shall be -60 dBm (+/- 6 dB) during test. NOTE: This receive power level (about -60 dBm) is expected to be at a typical level for an IOLW-System in a real industrial environment. The tolerance given here indicates that this expected receive power level may not be exact, but rather an estimation.

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	EUT shall switch simultaneously in all tracks to new HT01 hopping table (AHT)
Precondition	The EUT is paired with the WMTU in all tracks and in normal operation
Procedure	a) AHT Enable is activated for the EUT. b) WMTU is prompted to prepare an Event with EventCode = 0xFFB7 and EventQualifier = 0x54. c) WMTU sends the Event. d) W-Master writes the new hopping table via Index 0x5006 e) W-Master triggers a Jump-Command via MCMD (0xFE), see REF 1 Table 173 Jump. f) The WMTU observes whether the new hopping tables are switches synchronously over all tracks
Test parameter	-
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check if all tracks switched synchronously to a new HT01 hopping table
Test passed	The check above passed
Test not passed (examples)	The check above failed (e.g., the hopping table is not synchronously changed over all tracks, i.e., the hopping table for one track is already changed, but not for at least one other track)
Report	Tracks synchronous switching to new hopping table: <yes | no> <ok | nok>

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6 W-Device Protocol tests

6.1 General

The protocol tests can be performed almost automatically with the help of a WDTU. The WDTU and the test sequences are described in 9.1.1 together with a list of the relevant test cases for W-Devices and W-Bridges in Table 5

Procedure results not mentioned in the evaluation part are assumed to be successful for passing the tests.

6.2 STARTUP

6.2.1 From OPERATE to STARTUP via Master command

Table 48 defines the test conditions for this test case.

Table 48 From OPERATE to STARTUP via Master command

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0041
Name	WTCD_DLPC_OPER_STUP
Purpose (short)	Test correct state transition from OPERATE to STARTUP
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device protocol test: test to pass
Specification (clause)	REF 2 clause 7.2.3, Annex C.2.2 Table 177
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct state transition from OPERATE to STARTUP via Master command
Precondition	WDTU: W-Device in OPERATE state EUT: OPERATE
Procedure	a) WDTU sends Master command 0x97 "DeviceStartup" b) Readback the actual state of the W-Device via ISDU index 0x5000
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check if the W-Device is in the correct state via index 0x5000
Test passed	The W-Device is in state STARTUP (read ISDU index 0x5000)
Test not passed (examples)	The W-Device is not in the state STARTUP (read ISDU index 0x5000)
Report	Transition from OPERATE state to STARTUP state: <ok | nok >

6.3 PREOPERATE

6.3.1 From STARTUP to PREOPERATE

Table 49 defines the test conditions for this test case.

Table 49 From STARTUP to PREOPERATE

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0042
Name	WTCD_DLPC_STUP_PROP
Purpose (short)	Set W-Device from STARTUP into PREOPERATE
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device PREOPERATE: test to pass
Specification (clause)	REF 2 clause 7.2.3, Annex C.2.2 Table 177
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Set W-Device from STARTUP into PREOPERATE state via Master command 0x9A and verify that the W-Device is in the correct state.
Precondition	WDTU: W-Device in STARTUP state EUT: STARTUP
Procedure	a) Read the actual state via ISDU index 0x5000. b) W-Device-Tester-System sends MasterCommand 0x9A to switch the W-Device into PREOPERATE state. c) Read the actual state via ISDU index 0x5000.
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Result from procedure step a): Check that the W-Device is in STARTUP state 2) Result from procedure step c): Check that the W-Device is in PREOPERATE state
Test passed	Evaluation 1) and 2): check the W-Device is in correct state
Test not passed (examples)	Evaluation 1) and 2): check the W-Device is not in correct state
Report	Read of ISDU index 0x5000 in STARTUP state: <ok | nok > Read of ISDU index 0x5000 in PREOPERATE state: <ok | nok >

6.4 Scan, Pairing, Roaming

6.4.1 Scan unpaired W-Device

Table 50 defines the test conditions for this test case.

Table 50 Scan unpaired W-Device

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0043
Name	WTCD_PHYL_SCAN_UNPAIRED
Purpose (short)	W-Device response to W-Master Scan Request
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	Device PL-Test, test to pass
Specification (clause)	See REF 2 clause 5.7.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test scan response of W-Device upon W-Master Scan Request within time SCAN_TIMEOUT
Precondition	EUT: Unpaired WDTU: Port inactive
Procedure	a) Set W-Device-Tester-System into scan operation b) W-Device Tester to wait for response from W-Device for time SCAN_TIMEOUT
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check received scan response
Test passed	Received scan response UniqueID matches EUT
Test not passed (examples)	Scan response not received UniqueID does not match EUT
Report	W-Device with correct UniqueID is detected <ok | nok>

6.4.2 Pairing Roaming (Temporary)

Table 51 defines the test conditions for this test case.

Table 51 W-Device Pairing Roaming

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0044
Name	WTCD_ PHYL_PAIR_ROAMING
Purpose (short)	W-Device temporary pairing in Roaming Mode
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	Device PL-Test, test to pass
Specification (clause)	See REF 2 clause 5.7.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test if W-Device is temporarily paired to W-Device Tester in Roaming Mode
Precondition	EUT: Unpaired WDTU: Port inactive
Procedure	a) Set W-Device Tester port configuration according to input parameter b) Set W-Device Tester into Roaming Mode c) Wait for detection of this W-Device within time SCAN_TIMEOUT d) W-Device Tester to invoke service SM_Port_Pairing(PAIRING_UNIQUE) e) Wait for connection with W-Device for time PAIRING_UNIQUE_TIMEOUT f) Set W-Device Tester into Stop Mode (interrupts connection) g) Wait for minimum 5*MaxRetry (COMLOST) h) Set W-Device Tester into Roaming Mode i) Wait for detection of this W-Device within time SCAN_TIMEOUT
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check connection in step e) 2) Check connection in step g) 3) Check scan response in step i)
Test passed	In 1) EUT is connected In 2) EUT is not connected In 3) EUT is detected
Test not passed (examples)	In 1) EUT is not connected In 2) EUT is connected In 3) EUT is not detected
Report	W-Device paired with roaming flag enabled <ok | nok> W-Device does not re-connect after COMLOST <ok | nok> W-Device is detected with scan request after COMLOST <ok | nok>

6.4.3 Pairing Cyclic (Permanent)

Table 52 defines the test conditions for this test case.

Table 52 Pairing by Unique-ID

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0045
Name	WTCD_PHYL_PAIR_UNIQUE
Purpose (short)	Permanent pairing of W-Device by UniqueID
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	Device PL-Test, test to pass
Specification (clause)	See REF 2 clause 5.7.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test pairing by UniqueID of W-Device within given timeouts. Further, check if W-Device is permanently paired to WDTU.
Precondition	EUT: Unpaired WDTU: Port inactive
Procedure	a) WDTU Sets port configuration (<PortMode= CYCLIC>) b) WDTU Invokes pairing by UniqueID c) Wait for connection with EUT for PAIRING_UNIQUE_TIMEOUT d) WDTU stops track transmission e) Wait for 5*MaxRetry W-Sub-Cycles (EUT COMLOST) f) WDTU resumes track transmission g) Wait for re-connection with EUT for PAIRING_UNIQUE_TIMEOUT
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check connection in step c) 2) Check connection in step g)
Test passed	In 1) EUT is connected In 2) EUT is connected
Test not passed (examples)	In 1) EUT is not connected In 2) EUT is not connected
Report	W-Device paired with roaming flag disabled <ok | nok> W-Device re-connects after COMLOST <ok | nok>

6.4.4 Scan paired W-Device

Table 53 defines the test conditions for this test case.

Table 53 Scan paired W-Device

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0046
Name	WTCD_PHYL_SCAN_PAIRED
Purpose (short)	Paired W-Device response to W-Master Scan Request
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	Device PL-Test, test to pass
Specification (clause)	See REF 2 clause 5.7.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test scan response of a paired W-Device upon W-Master Scan Request within time SCAN_TIMEOUT. A paired W-Device shall not respond to a Scan Request
Precondition	EUT: Paired WDTU: Port Cyclic
Procedure	a) WDTU invokes scan request b) Wait for detection of EUT within SCAN_TIMEOUT
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check received scan response
Test passed	Scan response not received
Test not passed (examples)	Received scan responses
Report	Paired W-Device is not detected in scan <ok | nok>

583 ### 6.4.5 W-Device Unpairing

584 Table 54 defines the test conditions for this test case.

585 **Table 54 W-Device Unpairing**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0047
Name	WTCD_PHYL_UNPAIRING
Purpose (short)	Unpairing of a paired W-Device
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	Device PL-Test, test to pass
Specification (clause)	See REF 2 clause 5.7.3
Configuration / setup	W-Device-Tester-System

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test unpairing of a paired W-Device
Precondition	EUT: Paired WDTU: Port Cyclic
Procedure	a) WDTU invokes unpairing of EUT b) wait for acknowledgement of unpairing c) WDTU invokes scan request d) Wait for detection of EUT within SCAN_TIMEOUT
Test parameter	-
Post condition	-

587

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check unpairing acknowledgment 2) Check received scan response
Test passed	In 1) Received Ack In 2) EUT is detected
Test not passed (examples)	In 1) Ack not received In 2) EUT is not detected
Report	Unpairing of W-Device <ok | nok>

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590 ### 6.4.6 Pairing by Button

591 Table 55 defines the test conditions for this test case.

592 **Table 55 Pairing by Button**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0048
Name	WTCD_PHYL_PAIR_BUTTON
Purpose (short)	Permanent pairing of W-Device by Button
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	Device PL-Test, test to pass
Specification (clause)	See REF 2 clause 5.7.3
Configuration / setup	W-Device-Tester-System

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test pairing by button of W-Device within given timeouts. Further, check if W-Device is permanently paired to W-Device Tester.
Precondition	EUT: Unpaired WDTU: Port inactive
Procedure	a) WDTU Sets port configuration (<PortMode= CYCLIC>) b) WDTU Invokes pairing by Button c) Invoke EUT “Pairing-Button” trigger (press button or similar mechanism) d) Wait for connection with EUT for PAIRING_BUTTON_TIMEOUT e) WDTU stops track transmission f) Wait for 5*MaxRetry W-Sub-Cycles (EUT COMLOST) g) WDTU resumes track transmission h) Wait for re-connection with EUT for PAIRING_UNIQUE_TIMEOUT
Test parameter	-
Post condition	-

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TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check connection in step d) 2) Check connection in step h)
Test passed	In 1) EUT is connected In 2) EUT is connected
Test not passed (examples)	In 1) EUT is not connected In 2) EUT is not connected
Report	W-Device paired permanently by button <ok | nok>

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6.4.7 Re-pairing

Table 56 defines the test conditions for this test case.

Table 56 Re-pairing

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0049
Name	WTCD_PHYL_RE-PAIRING
Purpose (short)	Re-pairing of W-Device by Button
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	Device PL-Test, test to pass
Specification (clause)	See REF 2 clause 5.7.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test re-pairing via button of W-Device. Check if W-Device is permanently paired to W-Device Tester.
Precondition	EUT: Paired WDTU: Port Cyclic
Procedure	a) WDTU restarts with different MasterID ;EUT COMLOST b) WDTU Invokes scan request c) Wait for detection of EUT within SCAN_TIMEOUT d) WDTU Invokes scan request e) Invoke EUT “Pairing-Button” trigger (press button or similar mechanism) f) Wait for detection of EUT within SCAN_TIMEOUT g) WDTU Invokes pairing by UniqueID h) Invoke EUT “Pairing-Button” trigger (press button or similar mechanism) i) Wait for connection with EUT within PAIRING_UNIQUE_TIMEOUT j) WDTU stops track transmission k) Wait for 5*MaxRetry W-Sub-Cycles (EUT COMLOST) l) WDTU resumes track transmission m) Wait for re-connection with EUT for PAIRING_UNIQUE_TIMEOUT
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check scan response in step c) 2) Check scan response in step f) 3) Check connection in step i) 4) Check connection in step m)
Test passed	In 1) EUT is not detected In 2) EUT is detected In 3) EUT is connected In 4) EUT is connected
Test not passed (examples)	In 1) EUT is detected In 2) EUT is not detected In 3) EUT is not connected In 4) EUT is not connected
Report	Paired W-Device is not detected in scan <ok | nok> Paired W-Device in “Re-Pairing” state is detected in scan <ok | nok> W-Device re-paired permanently by button <ok | nok>

6.5 OPERATE

6.5.1 From PREOPERATE to OPERATE

Table 57 defines the test conditions for this test case

Table 57 From PREOPERATE to OPERATE

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0050
Name	WTCD_DLPC_PROP_OPER
Purpose (short)	Set W-Device from PREOPERATE into OPERATE
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device OPERATE, test to pass
Specification (clause)	REF 2 clauses 7.2.3, Annex C.2.2, Table 177
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Set W-Device from PREOPERATE into OPERATE state via Master command 0x99 and verify that the W-Device is in the correct state.
Precondition	WDTU: W-Device in PREOPERATE state EUT: PREOPERATE
Procedure	a) Read the actual state via ISDU index 0x5000. b) W-Device Tester switches the W-Device into OPERATE state. c) Read the actual state via ISDU index 0x5000.
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Result from procedure step a): Check that the W-Device is in PREOPERATE state 2) Result from procedure step c): Check that the W-Device is in OPERATE state
Test passed	Evaluation 1) and 2): check the W-Device is in correct state
Test not passed (examples)	Evaluation 1) and 2): check the W-Device is not in correct state
Report	Read of ISDU index 0x5000 in PREOPERATE state: <ok | nok > Read of ISDU index 0x5000 in OPERATE state: <ok | nok >

6.6 ISDU (Indexed Service Data Unit)

6.6.1 Prearrangement measures and configuration

The possibility of write operations is a precondition for the ISDU test cases. The only possible writeable Index usable by all W-Device vendors is the "Application Specific Tag" parameter (Index = 0x0018). However, this parameter is optional.

Therefore, the vendor shall provide the necessary Index information for ISDU Write/Read operations (Config 1, 3, 4 and 7 within the IODD) of the W-Device:

- Config1 (No ExtLength): A readable and writeable ISDU Index of the W-Device that shall not provide data of type StringT, and data length shall be in the range of 2 <= length <=12 octets (ISDU read operation shall not use the "ExtLength").
- Config3 (With ExtLength): A readable ISDU Index of the W-Device providing more than 13 octets data for ISDU read operations with an "ExtLength" octet in an ISDU read response
- Config4 (List of Block Parameters): A list of Block Parameter Indices which are accessed via block parameterization (ListOfBlockParameters as UInt16). The list shall contain at least two entries. If the W-Device supports only one parameter, an additional parameter shall be implemented for testing purposes.
- Config7 (IndexToGenerateEvent): This Index is a parameter for W-Devices supporting Events. It can be used to stimulate up to two specific Test Events within the W-Device. Four values shall be supported by the W-Device:
  - EventA_Appear,
  - EventA_Disappear,
  - EventB_Appear, and
  - EventB_Disappear.

  A Write of this parameter causes the W-Device to stimulate the corresponding Event with the corresponding Event mode. The data type of the parameter is UIntegerT, bitLength = 8.

6.6.2 Read ISDU with ExtLength

Table 58 defines the test conditions for this test case.

Table 58 Read ISDU with ExtLength

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0051
Name	WTCD_DLIS_ISDU_READ_EXTLENGTH
Purpose (short)	Read request to an index which response with ExtLength
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.3; REF 1 Annex A.5.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends ISDU Read request using "Config3". EUT responds according "Config3" (ISDU response with ExtLength octet possible)
Precondition	WDTU: W-Device in PREOPERATE or OPERATE state EUT: PREOPERATE or OPERATE
Procedure	a) WDTU sends ISDU Read request to Index defined in "Config3" b) Save Received Read response, I-Service, Length, ExtLength, Data and Checksum in variables
Input parameter	“Config3” according to clause 6.6.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether the I-Service code of the positive Read response = 0b1101 2) Length = 0b0001 3) Compare ExtLength variable with the real size of the ISDU packet 4) Calculate checksum and compare with saved Checksum
Test passed	Response correct according to "Config3", and I-Service, Length, ExtLength and Checksum are correct
Test not passed (examples)	No, negative or wrong response from the EUT
Report	"Config3" read correctly from EUT: <ok | nok >

6.6.3 Read Index with unavailable Subindex

Table 59 defines the test conditions for this test case.

Table 59 Read Index with unavailable Subindex

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0052
Name	WTCD_DLIS_ISDU_READ_NOSUBINDEX
Purpose (short)	Check response when Subindex not available
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test: test to fail
Specification (clause)	REF 2 clause 7.4.3; REF 1 Annex B.2.8, Table C.1
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends ISDU read request for VendorName (Index = 0x10) and a Subindex = 0x02. This results in a negative read response, “Subindex not available” (ErrorCode = 0x80 / AdditionalCode = 0x12)
Precondition	WDTU: W-Device in PREOPERATE or OPERATE state EUT: PREOPERATE or OPERATE
Procedure	a) WDTU sends ISDU Read request with Index = 0x10 and Subindex = "2" b) Receive and save read response in "Sub2"
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check Read response in c)
Test passed	Negative Read response (I-Service: 0b1100, Length: 0b0100) with ErrorCode = 0x80, and AdditionalCode = 0x12 “Subindex not available”
Test not passed (examples)	Positive response from EUT or incorrect ErrorCode or AdditionalCode
Report	Negative Read response upon unavailable Subindex: <ok | nok >

653 ### 6.6.4 Read ISDU

654 Table 60 defines the test conditions for this test case.

655 **Table 60 Read ISDU**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0053
Name	WTCD_DLIS_ISDU_READ
Purpose (short)	Check read response using “Config1”
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to pass
Specification (clause)	REF 2 clause 7.4.3
Configuration / setup	W-Device-Tester-System

656

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends ISDU read request using “Config1”. EUT responds according “Config1”
Precondition	WDTU: W-Device in PREOPERATE or OPERATE state EUT: PREOPERATE or OPERATE
Procedure	a) WDTU sends ISDU Read request to Index defined in "Config1" b) Save I-Service, Length, Data and Checksum in variables
Test parameter	“Config1” according to clause 6.6.1
Post condition	-

657

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) A positive ISDU read response shall be received 2) The length of the received data is correct according to “Config1” 3) The received data, I-Service, Length and Checksum are correct
Test passed	A positive response according to "Config1", and I-Service, Length, ExtLength and Checksum are correct
Test not passed (examples)	Any negative response or no response
Report	"Config1" read correctly from EUT: <ok | nok >

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660 ### 6.6.5 Write ISDU

661 Table 61 defines the test conditions for this test case.

662 **Table 61 Write ISDU**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0054
Name	WTCD_DLIS_ISDU_WRITE
Purpose (short)	Check whether ISDU write request is possible
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to pass
Specification (clause)	REF 1 clause 7.4.3
Configuration / setup	W-Device-Tester-System

663

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends ISDU Write request using “Config1”. Check whether the Write request was successful by reading the value that has just been written
Precondition	WDTU: W-Device in PREOPERATE or OPERATE state EUT: PREOPERATE or OPERATE
Procedure	a) WDTU sends ISDU Write request using "Config1" b) Receive Write response c) WDTU sends ISDU Read request using "Config1" d) Save received data in "temp"
Test parameter	“Config1” according to clause 6.6.1 Manufacturer/vendor is responsible for choosing a variable for the test not changing value after Write
Post condition	-

664

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check ISDU response in b) and d) 2) Check received data in d)
Test passed	Positive write response Positive Read response "temp" = “Config1” from IODD
Test not passed (examples)	Negative write response Negative Read response "temp" ≠ “Config1” from IODD
Report	"Config1" changed after Write request: <ok | nok >

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6.6.6 Read Index reserved

Table 62 defines the test conditions for this test case.

Table 62 Read Index reserved

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0055
Name	WTCD_DLIS_ISDU_READ_RESERVED
Purpose (short)	W-Device response “Index not available” upon Read to reserved Index
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to fail
Specification (clause)	REF 2 clause 7.4.3; REF 1 Table C.1
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends ISDU Read request to Index = 0x7F32 (reserved) and receives a negative response with “Index not available” (ErrorCode = 0x80, Additional Code = 0x11)
Precondition	WDTU: W-Device in PREOPERATE or OPERATE state EUT: PREOPERATE or OPERATE
Procedure	a) WDTU sends ISDU Read request with Index = 0x7F32, Subindex “0” b) Receive Read response
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check Read response in b)
Test passed	Negative Read response (I-Service: 0b1100, Length: 0b0100) with ErrorCode = 0x80, and AdditionalCode = 0x11 “Index not available”
Test not passed (examples)	Positive response from EUT or incorrect ErrorCode or AdditionalCode
Report	Negative read response received upon reserved Index: <ok | nok >

6.6.7 Write ISDU with data length overrun

Table 63 defines the test conditions for this test case.

Table 63 Write ISDU with data length overrun

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0056
Name	WTCD_DLIS_ISDU_WRITE_LENOVERRUN
Purpose (short)	Check response of Write request with more than 12 octets when 12 are permitted
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to fail
Specification (clause)	REF 2 clause 7.4.3; REF 1 Table C.1
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends ISDU Write request with >12 octets for “Config1”. Write Request with ExtLength. Check whether the Write request was denied with "Parameter length overrun"
Precondition	WDTU: W-Device in PREOPERATE or OPERATE state EUT: PREOPERATE or OPERATE
Procedure	a) WDTU sends ISDU Read request with “Config1” b) Receive and save ISDU response in "temp1" c) WDTU send ISDU Write request to Index with “Config1” containing more than 12 octets and different content from "temp1" d) Receive Write response e) WDTU sends ISDU Read request with “Config1” f) Receive and save ISDU response in "temp2"
Test parameter	“Config1” according to clause 6.6.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check ISDU response from d) 2) Check received data from f)
Test passed	ErrorType “Parameter length overrun” (ErrorCode 0x80, AdditionalCode 0x33) received "temp1" = "temp2"
Test not passed (examples)	Positive Write response or different ErrorType from EUT "temp1" ≠ "temp2"
Report	Negative Read response upon length overrun: <ok | nok >

6.6.8 Write ISDU Index with data length underrun

Table 64 defines the test conditions for this test case.

Table 64 Write ISDU Index with data length underrun

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0057
Name	WTCD_DLIS_ISDU_WRITEWRONGLEN
Purpose (short)	Check response of ISDU write request with one octet less than expected
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to fail
Specification (clause)	REF 2 clause 7.4.3; REF 1 Table C.1
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends a Write request with one octet less than the “m” expected octets for “Config1”. Check whether the Write request was denied with “Parameter length underrun”
Precondition	WDTU: W-Device in PREOPERATE or OPERATE state EUT: PREOPERATE or OPERATE
Procedure	a) WDTU sends ISDU Read request with “Config1” b) Receive and save ISDU response in "temp1" c) WDTU sends ISDU Write request to Index with “Config1” containing one octet less length and different content from "temp1" d) Receive Write response e) WDTU sends ISDU Read request with “Config1” f) Receive and save ISDU response in "temp2"
Test parameter	“Config1” according to clause 6.6.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check ISDU response in d) 2) Check received data in f)
Test passed	ErrorType “Parameter length underrun” (ErrorCode = 0x80 and AdditionalCode = 0x34) received "temp1" = "temp2"
Test failed (examples)	Positive Write response or different ErrorType from EUT "temp1" ≠ "temp2"
Report	Negative read response upon length underrun: <ok | nok >

6.6.9 Read ISDU Index with wrong Checksum value

Table 65 defines the test conditions for this test case.

Table 65 Read ISDU Index with wrong Checksum value

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0058
Name	WTCD_DLIS_ISDU_WRITEWRONGCHECKSUM
Purpose (short)	Check W-Device ignore ISDU requests with CRC error
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to fail
Specification (clause)	REF 2 clause 7.4.3; REF 1 Annex B.2.8, Annex A.5
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends a ISDU Read request with a wrong Checksum value. The Read request for the VendorName (0x10) shall be used. The correct Checksum value is 0xA5, the value in use is 0xFF. The EUT should not respond to this ISDU request, so that the WDTU detects an ISDU timeout after 5 seconds
Precondition	WDTU: W-Device in PREOPERATE or OPERATE state EUT: PREOPERATE or OPERATE
Procedure	a) WDTU sends ISDU Read request with wrong Checksum Segment 1: 0xB5 (Service: Read request: 0b1011 / Length:0b0101) Segment 2: 0x00 (Index high) Segment 3: 0x10 (Index low, VendorName) Segment 4: 0x00 (Subindex) Segment 5: 0xFF (Checksum) b) Check EUT ignore ISDU requests with CRC error and returns no response c) WDTU sends ISDU Read request with correct Checksum after more than 5 seconds
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check Read response from Procedure step a) and c)
Test passed	ISDU read request from Procedure step a) returns no read response within more than 5 seconds ISDU read request from Procedure step c) returns a correct read response
Test not passed (examples)	ISDU read request from Procedure step a) returns a positive response or ErrorCode with AdditionalCode upon a wrong Checksum value The EUT no longer handles ISDU requests after an ISDU CRC error
Report	Ignores ISDU requests upon wrong Checksum value: <ok | nok > The EUT handles ISDU requests after an ISDU CRC error: <ok | nok >

6.6.10 Write ISDU Index to a read only Index

Table 66 defines the test conditions for this test case.

Table 66 Write ISDU Index to a read only Index

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0059
Name	WTCD_DLIS_ISDU_WRITEROINDEX
Purpose (short)	Check response of a ISDU write request to a read only Index
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to fail
Specification (clause)	REF 2 clause 7.4; REF 1 Annex B, Table C.1
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WMTU sends an ISDU Write request to a read only index "VendorName". A negative Write response "Access denied" is expected with ErrorCode = 0x80 and Additional Code = 0x23
Precondition	WDTU: W-Device in PREOPERATE or OPERATE state EUT: PREOPERATE or OPERATE
Procedure	a) WDTU sends ISDU Write request to Index 0x0010 “Vendor Name” with 1 octet data length b) Receive negative Write confirmation with ErrorCode and AdditionalCode
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check Write response in b)
Test passed	Negative Write response with ErrorCode = 0x80 and AdditionalCode = 0x23 "Access denied"
Test not passed (examples)	Negative response ≠ "Access denied", or Positive Write response
Report	Negative Write response upon read only Index: <ok | nok >

6.6.11 Read ISDU Index with response abort

Table 67 defines the test conditions for this test case.

Table 67 Read Index with response abort

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0060
Name	WTCD_DLIS_ISDU_ABORTREADRESP
Purpose (short)	Response of aborted Read request
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to pass
Specification (clause)	REF 2 clause 7.4, Figure 59 (T11), Table 78
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends ISDU Read request for “Config3” and receives from the EUT the expected first ISDU segment. WDTU aborts reading the complete ISDU value from “Config3”
Precondition	WDTU: W-Device in PREOPERATE or OPERATE state EUT: PREOPERATE or OPERATE
Procedure	a) WDTU sends ISDU Read request to “Config3” b) WDTU receives the first segment of the ISDU read response c) WDTU sends FlowCtrl = ABORT
Test parameter	“Config3” according to clause 6.6.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) EUT send the first segment of “Config3” value as ISDU read response 2) No read response after WDTU sends ABORT
Test passed	No further ISDU segments received
Test not passed (examples)	Additional ISDU segments received after ABORT
Report	W-Device works properly after the aborted Read request: <ok | nok >

6.6.12 Read ISDU (not segmented) with NACK/Retry during request

Table 68 defines the test conditions for this test case.

Table 68 Read ISDU (not segmented) with NACK/Retry during request

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0061
Name	WTCD_DLIS_ISDU_READNACKRETRYREQUEST
Purpose (short)	The W-Device shall correctly process a not segmented ISDU Read request, which is sent again with a NACK in the next downlink
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to pass
Specification (clause)	REF 2 clause 7.7.2
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends an ISDU Read request to the EUT. In the next Downlink, the identical ISDU Read request is sent to the EUT with a NACK. The EUT shall correctly respond to the request with an ISDU Read confirmation
Precondition	WDTU: W-Device in OPERATE state EUT: OPERATE
Procedure	a) WDTU send ISDU Read request with Index according to “Config1” b) WDTU send same ISDU Read request again with NACK in the Downlink c) WDTU receive and check Read confirmation
Test parameter	“Config1” according to clause 6.6.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether the ISDU Read request results in a correct Read confirmation
Test passed	Correct Read confirmation received
Test not passed (examples)	No Read confirmation received Read confirmation received twice
Report	Correct read response received upon NACK: <ok | nok >

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717 ### 6.6.13 Read ISDU with NACK/Retry during response

718 Table 69 defines the test conditions for this test case.

719 **Table 69 Read ISDU with NACK/Retry during response**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0062
Name	WTCD_DLIS_ISDU_READNACKRETRYRESPONSE
Purpose (short)	The W-Device shall correctly repeat its response to an ISDU Read request, after receiving a NACK
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to pass
Specification (clause)	REF 2 clause 7.7.2, Table 78, Annex A.7.4
Configuration / setup	W-Device-Tester-System

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends an ISDU Read request to the EUT. Right after the first segment of a response from the EUT is received, the WDTU sends a NACK. The EUT shall repeat the last segment. The ChannelCode (ChC) in ULink Control Octet is set to 3 and for the FlowControl (FC) check ULink as specified in REF 2 Table 78
Precondition	WDTU: W-Device in OPERATE state EUT: OPERATE
Procedure	a) WDTU send ISDU Read request with Index according to “Config1” b) WDTU receive the first segment of the EUT’s response to the ISDU read request c) WDTU to check ChC = 3 and FC for ISDU segment d) WDTU send a Downlink with NACK e) WDTU receive the repetition of the last segment sent by the EUT f) WDTU to check ChC = 3 and FC for ISDU segment
Test parameter	“Config1” according to clause 6.6.1
Post condition	-

721

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check whether the EUT repeats the last segment after the NACK 2) Result of procedure step c) and f): ChC for ISDU = 3. Check FC for each segment as specified	
Test passed	The EUT repeats the last segment after the NACK ChC is set to 3 and Received FC is as specified	
Test not passed (examples)	No repetition of the last segment after the NACK ChC is not set to 3 or Received FC is not as specified	
Report	Repetition of the last segment received after NACK: ChC is set to 3: FC for segmentation:	<ok | nok > <ok | nok > <ok | nok >

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725 ### 6.6.14 Write ISDU (segmented) with NACK/Retry during request

726 Table 70 defines the test conditions for this test case.

727 **Table 70 Write ISDU (segmented) with NACK/Retry during request**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0063
Name	WTCD_DLIS_ISDU_WRITENACKRETRYREQUEST
Purpose (short)	The W-Device shall correctly process a segmented ISDU Write request, when the second segment is sent again with a NACK in the next downlink
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to pass
Specification (clause)	REF 2 clause 7.7.2
Configuration / setup	W-Device-Tester-System

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends an ISDU Write request to the EUT. The second segment of the ISDU message is sent again with a NACK. The EUT shall correctly respond to the request with a Write confirmation
Precondition	WDTU: W-Device in OPERATE state EUT: OPERATE
Procedure	a) WDTU send ISDU Write request with Index according to “Config1”. The new data shall not be the same as the data which are already on the EUT b) WDTU repeat the second ISDU segment with a NACK c) WDTU send the remaining ISDU segments d) WDTU receive, check the Write confirmation e) WDTU send a Read request to the EUT with Index according to “Config1” f) Compare the data received in step e) with the data sent in step a)
Test parameter	“Config1” according to clause 6.6.1
Post condition	-

729

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether the ISDU Write request results in a correct Write confirmation 2) Check that the data read back from the EUT is equal to the data that has been written
Test passed	Correct Write confirmation received The new data are written to the EUT
Test not passed (examples)	No Write confirmation received Write confirmation received with status != OK The new data are not written to the EUT
Report	Correct write response received upon NACK: <ok | nok > "Config1" changed after Write request upon NACK: <ok | nok >

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732 ### 6.6.15 Write ISDU (segmented) with NACK/Retry with different length during
733 request

734 Table 71 defines the test conditions for this test case.

735 **Table 71 Write ISDU (segmented) with NACK/Retry with different length during request**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0064
Name	WTCD_DLIS_ISDU_WRITENACKRETRYREQUESTDIFFERENTLENGHT
Purpose (short)	The W-Device shall correctly process a segmented ISDU write request, when the second segment is sent again with a NACK and with different length in the next downlink
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to pass
Specification (clause)	REF 2 clause 7.7.2
Configuration / setup	W-Device-Tester-System

736

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends an ISDU Write request to the EUT. The second segment of the ISDU message is sent again with a NACK and with different length. The EUT shall correctly respond to the request with a Write confirmation
Precondition	WDTU: W-Device in OPERATE state EUT: OPERATE
Procedure	a) WDTU send ISDU Write request with Index according to “Config1”. The new data shall not be the same as the data which are already on the EUT b) WDTU repeat the second ISDU segment with NACK and with different length c) WDTU send the remaining ISDU segments d) Receive and check Write confirmation e) WDTU send a Read request to the EUT with Index according to “Config1” f) Compare the data received in step e) with the data sent in step a)
Test parameter	“Config1” according to clause 6.6.1
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether the Write request results in a correct Write confirmation 2) Check that the data read back from the EUT is equal to the data that has been written.
Test passed	Correct Write confirmation received The new data are written to the EUT
Test not passed (examples)	No Write confirmation received Write confirmation received with status != OK The new data are not written to the EUT
Report	Correct write response received upon NACK and data equal: <ok | nok >

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6.6.16 Write ISDU (segmented) with flow control overflow

Table 72 defines the test conditions for this test case.

Table 72 Write ISDU (segmented) with flow control overflow

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0065
Name	WTCD_DLIS_ISDU_WRITEFCOVERFLOW
Purpose (short)	The W-Device shall correctly process a segmented ISDU write request, when the counter in the DLink Control Octet overflows
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to pass
Specification (clause)	REF 2 clause 7.7, Table 78
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends an ISDU Write request (segmented into >= 9 segments) to the EUT. The EUT shall correctly respond to the request with a Write confirmation
Precondition	WDTU: W-Device in OPERATE state EUT: OPERATE
Procedure	a) WDTU send ISDU Write request with Index according to “Config1”. The request is segmented into >= 9 segments with flow control (FC): 0x08 (START), 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x00, …, 0x09 (EOS). The new data shall not be the same as the data which are already on the EUT b) WDTU receive and check Write confirmation c) WDTU send an ISDU Read request to the EUT with Index according to “Config1” and receive the result d) Compare the data received in step c) with the data sent in step a)
Test parameter	“Config1” according to clause 6.6.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether the Write request results in a correct Write confirmation 2) Check that the data read back from the EUT is equal to the data that has been written
Test passed	Correct Write confirmation received The new data are written to the EUT
Test not passed (examples)	No Write confirmation received Write confirmation received with status != OK The new data are not written to the EUT
Report	Correct write response received and data equal: <ok | nok >

6.6.17 Read ISDU (segmented) with flow control overflow (SSlot)

Table 73 defines the test conditions for this test case.

Table 73 Read ISDU (segmented) with flow control overflow

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0066
Name	WTCD_DLIS_ISDU_READFCOVERFLOW
Purpose (short)	The W-Device shall respond to an ISDU read request with correct flow control in the ULink Control Octet.
Equipment under test (EUT)	Single Slot W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to pass
Specification (clause)	REF 2 clause 7.7, Table 78
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends an ISDU Write request with maximum length data to “Config1”. Then the WDTU sends a Read request to the EUT. The EUT shall correctly respond to the request with a segmented ISDU response with correct values for the flow control in the ULink Control octet
Precondition	WDTU: W-Device in OPERATE state EUT: OPERATE
Procedure	a) WDTU send ISDU Write request with Index according to “Config1” and maximum length data. The new data shall not be the same as the data which are already on the EUT b) WDTU receive and check Write confirmation c) WDTU send an ISDU Read request to the EUT with Index according to “Config1” d) WDTU receive the segmented ISDU response from the EUT e) Compare the data received in step d) with the data sent in step a)
Test parameter	“Config1” according to clause 6.6.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether the ISDU Write request results in a correct Write confirmation 2) Check that the data from the EUT is received with the correct Flow Control (FC) sequence: 0x08 (START), 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x00, 0x01, …, 0x0B, 0x09 (EOS) 3) Check that the data read back from the EUT is equal to the data that has been written
Test passed	Correct Write confirmation received Right FC sequence received The new data are written to the EUT
Test not passed (examples)	No Write confirmation received Write confirmation received with status != OK Wrong FC sequence received The new data are not written to the EUT
Report	Correct flow control sequence received <ok | nok > Expected data received: <ok | nok >

6.6.18 Read ISDU with incorrect flow control

Table 74 defines the test conditions for this test case.

Table 74 Read ISDU with incorrect flow control

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0067
Name	WTCD_DLIS_ISDU_READFCINCORRECT
Purpose (short)	The W-Device shall not respond to ISDU read requests with incorrect flow control sequences
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device ISDU test, test to pass
Specification (clause)	REF 2 clause 7.7, Table 78
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WDTU sends several ISDU Read requests with Index according to “Config1” and with incorrect flow control. The EUT shall not send any ISDU response
Precondition	WDTU: W-Device in OPERATE state EUT: OPERATE
Procedure	a) WDTU send ISDU Read requests with index according to “Config1” and wrong segmentation according to the following list: • FC START (0x08) missing, start directly with 0x01 • Gap in the counter: Send START (0x08), 0x01, 0x03, … • FC abort: Send START (0x08), 0x01, ABORT (0x0A) b) After each ISDU Read request, check if any ISDU response is received from the EUT within 5 seconds
Test parameter	“Config1” according to clause 6.6.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether any ISDU response has been received
Test passed	No ISDU response received
Test not passed (examples)	Any ISDU response received
Report	No ISDU response received: <ok | nok >

6.7 Events

6.7.1 General

Any of the W-Device applications can generate predefined "status" information when communication operations fail, or "technology specific" information (diagnosis) as a result from technology specific diagnostic methods. This information can be communicated via Event to upper level systems of different capability. Thus, the following tests can only verify the conformity to the standard REF 2 in terms of Event handling mechanisms.

Event test cases shall be executed if the W-Device supports one or more Events. The Number of supported events is defined by the number of entries of EventCollection in IODD.

Test cases use Test Events A and B stimulated by ISDU Write to the Index defined in Config7. For each of the Test Events, Config7 defines a value EventA_Appear/EventB_Appear that stimulates "Event Appear" and a value EventA_Disappear/EventB_Disappear that stimulates "Event Disappear" of the corresponding Event.

It is mandatory for a W-Device to implement the required test Events. Event Type shall be error and corresponding device status shall be “4- failure”. EventCodes are Vendor specific.

EventCodes for Event A and Event B shall be different. If the W-Device supports only Notifications, the test Events shall be Notifications and the Event mode is "Event single shot".

Event Test Procedures

In general, a device is allowed to have initial events at the beginning of a test process. It is not allowed to activate additional unexpected application specific events during the test run.

Event related tests focus on testing of the change of diagnosis during the test run. IO-Link Test Master reads out the activated events 1s after the precondition is reached and acknowledges all events. Later on the IO-Link Test Master only checks for changes in the diagnosis channel.

At the end of each test case, the Device-Tester-Unit shall clean-up the test Events. For stimulated Events, the corresponding EventA_Disappear or EventB_Disappear command shall be sent, and all Events shall be acknowledged. A pause of 1 s shall be added at the end of the test to ensure the Event can be stimulated again without delay within the next test case.

6.7.2 Check event segmentation for SSlot W-Device while in OPERATE state

Table 75 defines the test conditions for this test case.

Table 75 Check event segmentation for SSlot W-Device while in OPERATE state

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0068
Name	WTCD_DLIC_EVNT_OPEREVENTSSLOT
Purpose (short)	Test of Event processing while in OPERATE state.
Equipment under test (EUT)	W-Device (if configured as SSlot)
Test case version	1.0
Category / type	W-Device Event test: test to pass
Specification (clause)	REF 2 see 7.6.
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if event is serviced as specified: - Event is triggered once an event occurred - ChannelCode (ChC) in ULink Control Octet is set to 4 respectively - Check FlowControl (FC) in ULink as specified in REF 2 see Table 78 and A.7.4 (segmentation example for SSlot) - Event handler is frozen while event is pending - Event is cleared as specified - Event Type & Code match
Precondition	WDTU: Communication. EUT: OPERATE
Procedure	a) ReleasedWrite EventA_Appear to index in Config7. b) ReleasedWDTU to check ChC = 4 and FC for each Event segment. c) ReleasedWDTU to read EventQualifier and EventCode. d) ReleasedWDTU to confirm event. e) ReleasedWrite EventB_Appear to index in Config7. f) ReleasedWDTU to check ChC = 4 and FC for each Event segment. g) ReleasedWDTU to read EventQualifier and EventCode. h) ReleasedWDTU to confirm event.
Test parameter	Config7 (Event A and B) in 6.6.1
Post condition	Test Events A and B are reset once the test is completed

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Result of procedure step b) and f): ChC for Event = 4. Check FC for each segment as specified 2) Result of procedure step c) and g): 3) Event Type & Code are as specified.
Test passed	Evaluation steps 1) and 2) ok.
Test not passed (examples)	a) ChC is not set to 4 b) Received FC is not as specified c) Event Type & Code are not as specified
Report	ChC is set to 4: <ok/nok> FC for segmentation <ok/nok> Event Type & Code: <ok/nok> Eventcode matches user manual: <ok/nok>

6.7.3 Event while in OPERATE state

Table 76 defines the test conditions for this test case.

Table 76 Event while in OPERATE state

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0069
Name	WTCD_DLIC_EVNT_OPEREVENT
Purpose (short)	Test of Event processing while in OPERATE state.
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device Event test: test to pass
Specification (clause)	REF 2, see 7.6
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if event is serviced as specified: - Event is triggered once an event occurred - ChannelCode (ChC) in ULink Control Octet is set to 4 respectively - Check FlowControl (FC) in ULink as specified REF 2, see Table 78 and A.7.4 (segmentation example for SSlot) - Event handler is frozen while event is pending - Event is cleared as specified - Event Type & Code match
Precondition	WDTU: Communication. EUT: OPERATE
Procedure	a) ReleasedWrite EventA_Appear to index in Config7. b) ReleasedWDTU to check ChC = 4 and FC for each Event segment. c) ReleasedWDTU to read EventQualifier and EventCode. d) ReleasedWDTU to confirm event. e) ReleasedWrite EventB_Appear to index in Config7. f) ReleasedWDTU to check ChC = 4 and FC for each Event segment g) ReleasedWDTU to read EventQualifier and EventCode. h) ReleasedWDTU to confirm event.
Test parameter	Config7 (Event A and B) in 6.6.1
Post condition	Test Events A and B are reset once the test is completed

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Result of procedure step b) and f): ChC for Event = 4. Check FC for each segment as specified 2) Result of procedure step c) and g): 3) Event Type & Code are as specified.
Test passed	Evaluation steps 1) and 2) ok.
Test not passed (examples)	a) ChC is not set to 4 or Received FC is not as specified b) Event Type & Code are not as specified
Report	ChC is set to 4: <ok/nok> FC for segmentation <ok/nok> Event Type & Code: <ok/nok> Eventcode matches user manual: <ok/nok>

6.7.4 Event while in PREOPERATE state

defines the test conditions for this test case.

Table 77 Event while in PREOPERATE state

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0070
Name	WTCD_DLIC_EVNT_PROPEVENT
Purpose (short)	Test of Event processing while in PREOPERATE state.
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device Event test: test to pass
Specification (clause)	REF 2, see 7.6
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if event is serviced as specified: - Event is triggered once an event occurred - ChannelCode (ChC) in ULink Control Octet is set to 4 respectively - Check FlowControl (FC) in ULink as specified REF 2, see Table 78 and A.7.4 (segmentation example for SSlot) - Event handler is frozen while event is pending - Event is cleared as specified - Event Type & Code match
Precondition	WDTU: Communication. EUT: OPERATE
Procedure	a) ReleasedWrite EventA_Appear to index in Config7. b) ReleasedWDTU to check ChC = 4 and FC for each Event segment. c) ReleasedWDTU to read EventQualifier and EventCode. d) ReleasedWDTU to confirm event. e) ReleasedWrite EventB_Appear to index in Config7 f) ReleasedWDTU to check ChC = 4 and FC for each Event segment. g) ReleasedWDTU to read EventQualifier and EventCode. h) WDTU to confirm event.
Test parameter	Config7 (Event A and B) in 6.6.1
Post condition	Test Events A and B are reset once the test is completed

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Result of procedure step b) and f): ChC for Event = 4. Check FC for each segment as specified 2) Result of procedure step c) and g): Event Type & Code are as specified
Test passed	Evaluation steps 1) through 2) ok.
Test not passed (examples)	a) ChC is not set to 4 b) Received FC is not as specified c) Event Type & Code are not as specified
Report	ChC is set to 4: <ok/nok> FC for segmentation <ok/nok> Event Type & Code: <ok/nok>

6.7.5 Event handling while communication interruption

Table 78 defines the test conditions for this test case.

For Events of type Notification, which usually are not acknowledged, it should be noted that the same rules apply as for Warnings and Errors: The Event shall be resent.

Table 78 Event handling while communication interruption

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0071
Name	WTCD_DLIC_EVNT_OPERCOMMINTERRUPT
Purpose (short)	Test of Event handling while communication is interrupted.
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device Event test: test to pass
Specification (clause)	REF 2, see 10.10.2
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if Event is resent once communication is cancelled or interrupted.
Precondition	WDTU: Communication. EUT: OPERATE
Procedure	a) Write EventA_Appear to index in Config7.. b) WDTU to read the indicated EventQualifier ("Event appears"). Save value in tester variable "SCb". c) WDTU to read the indicated EventCode. Save value in tester variable "SCc". d) WDTU to stop communication with W-Device (no event confirmation) e) Pause of 1.5 x the configured IMA-Time of W-Device f) WDTU to restart communication with W-Device to OPERATE state g) Wait for of Event A and confirm
Test parameter	Config7 (Event A) in 6.6.1
Post condition	Test Events A and B are reset once the test is completed

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Result of procedure step f): Event transmitted again because the error cause from step a) was not confirmed before communication was lost. The timeout for the Device-Tester shall be 2 x the configured IMA-Time of W-Device. 2) Result of procedure step g): Value read corresponds to tester variable "SCb", and "SCc".
Test passed	Evaluation steps 1) through 2) ok.
Test not passed (examples)	No correspondence between any of the values read and tester variables "SCb", and "SCc".
Report	Event in procedure step f: <ok/nok> Read value in step g: <ok/nok>

6.7.6 Event handling while power supply interruption

Table 79 defines the test conditions for this test case.

This test case can be skipped in case of Notifications.

Table 79 Event handling while power supply interruption

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0072
Name	WTCD_DLIC_EVNT_OPERPOWERINTERRUPT
Purpose (short)	Test of Event handling while power supply is interrupted.
Equipment under test (EUT)	W-Device (only line powered)
Test case version	1.0
Category / type	W-Device Event test: test to pass
Specification (clause)	REF 2, see 7.6
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if Event is resent when power supply of the W-Device is interrupted.
Precondition	WDTU: Communication. EUT: OPERATE
Procedure	a) Write EventA_Appear to index in Config7 b) WDTU to read the indicated EventQualifier ("Event appears"). Save value in tester variable "SCb". c) WDTU to read the indicated EventCode. Save value in tester variable "SCc". d) Power-down of the W-Device (disconnect from power supply) e) Pause of 15 sec f) Power-on of the W-Device (connect to power supply) g) WDTU to restart communication with W-Device to OPERATE state h) Wait for of Event A and confirm
Test parameter	Config7 (Event A) in 6.6.1
Post condition	Test Events A and B are reset once the test is completed

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Result of procedure step f): W-Device shall notify power-on (via Alert Back Alive (ABA)-Bit in Uplink) at W-Device synchronization to initiate a new startup by W-Master. 2) Result of procedure step g): Event transmitted again because the error cause from step a) was not confirmed before communication was lost. The timeout for the Device-Tester shall be 2 min. 3) Result of procedure step h): Either no value or value read corresponds to tester variable "SCb" and "SCc".
Test passed	After power-up the Device may report an Event with status "Event appears" by its own (if incidents are stored) or nothing.
Test not passed (examples)	If after power-up the Device reports an Event with status "Event disappears" by its own.
Report	New startup initiated in step f: <ok/nok> Event in procedure step g: <ok/nok> Read value in step h: <ok/nok>

6.7.7 Event appears/disappears

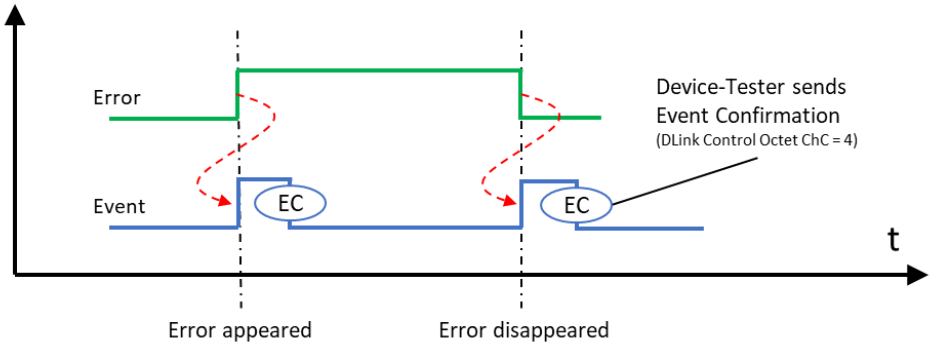
Table 80 defines the test conditions for this test case.

Table 80 Event appears/disappears

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0073
Name	WTCD_DLIC_EVNT_OPERAPPEARDISAPPEAR
Purpose (short)	Test of Event handling with Errors appearing and disappearing.
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device Event test: test to pass
Specification (clause)	REF 2, see 7.6
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if Event modes are handled as specified in Figure 6
Precondition	WDTU: Communication. EUT: OPERATE
Procedure	a) Write EventA_Appear to Index in Config7. b) WDTU to check ChC for Event. c) WDTU to read EventQualifier. Save value in tester variable "SCc" d) WDTU to read EventCode. Save value in tester variable "SCd". e) WDTU to confirm event. f) Write EventA_Disappear to Index in Config7. g) WDTU to check ChC for Event. h) WDTU to read EventQualifier. Save value in tester variable "SCh". i) WDTU to read EventCode. Save value in tester variable "SCi". j) WDTU to confirm event.
Test parameter	Config7 (Event A) in 6.6.1
Post condition	Test Events A and B are reset once the test is completed

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Result of procedure step b): ChC for Event = 4. 2) Result of procedure step c): Value read shows mode = "Event appeared" 3) Result of procedure step g): ChC for Event = 4. 4) Result of procedure step h): Value read shows mode = "Event disappeared" 5) Result of procedure step i): Value of "SCi" = value of "SCd" (EventCodes).
Test passed	Evaluation steps 1) through 5) ok.
Test not passed (examples)	a) ChC is not set to 4 b) Event modes are indicated incorrectly c) EventCodes are different
Report	ChC = 4 in procedure step b: <ok/nok> Value in procedure step c: <ok/nok> ChC = 4 in procedure step g: <ok/nok> Value in procedure step h: <ok/nok> EventCodes in procedure step i: <ok/nok>



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836 **Figure 6 Handling of Events modes**

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6.7.8 Multi Event handling

Table 81 defines the test conditions for this test case.

Table 81 Multi Event handling

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0074
Name	WTCD_DLIC_EVNT_OPERMULTEVENT
Purpose (short)	Test of Event handling while multiple Errors/Events
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device Event test: test to pass
Specification (clause)	REF 2, see 7.6
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if Event modes are handled as specified in Figure 7
Precondition	WDTU: Communication. EUT: OPERATE
Procedure	a) Write EventA_Appear to index in Config7 b) WDTU to check ChC for Event. c) WDTU to read EventQualifier. Save value in tester variable "SCc" d) WDTU to read EventCode. Save value in tester variable "SCd". e) Write EventB_Appear to index in Config7. EventB shall not be sent until EventA is confirmed f) WDTU to confirm EventA. g) WDTU to check ChC for Event. h) WDTU to read EventQualifier. Save value in tester variable "SCi". i) WDTU to read EventCode. Save value in tester variable "SCj". j) Write EventA_Disappear to index in Config7. EventA shall not be sent until EventB is confirmed. k) WDTU to confirm event for EventB. l) WDTU to check ChC for Event. m) WDTU to read EventQualifier. Save value in tester variable "SCm" n) WDTU to read EventCode. Save value in tester variable "SCn". o) Write EventB_Disappear to index in Config7. EventB shall not be sent until EventA is confirmed. p) WDTU to confirm EventA. q) WDTU to check ChC for Event. r) Device-Tester to read EventQualifier. Save value in tester variable "SCq" s) WDTU to read EventCode. Save value in tester variable "SCr". t) WDTU to confirm EventB.
Test parameter	Config7 (Event A and B) in 6.6.1
Post condition	Test Events A and B are reset once the test is completed

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Result of procedure step c): Value read shows mode = "Event A appeared" 2) Result of procedure step h): Value read shows mode = "Event B appeared" 3) Result of procedure step m): Value read shows mode = "Event A disappeared" 4) Result of procedure step r): Value read shows mode = "Event B disappeared"
Test passed	Evaluation steps 1) through 4) ok.
Test not passed (examples)	a) New Event is sent before previous Event was confirmed b) Event modes are indicated incorrectly c) EventCodes are different
Report	Value in procedure step c): <ok/nok> Value in procedure step h): <ok/nok> Value in procedure step m): <ok/nok> Value in procedure step r): <ok/nok>

844 **Figure 7 Multiple events**

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6.7.9 Interconnection active Event/Device Status

Table 82 defines the test conditions for this test case.

Table 82 Interconnection active Event/Device Status/Detailed Device Status

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0075
Name	WTCD_DLIC_DEFP_EVENTDEVSTAT
Purpose (short)	Check correct interconnection between Event and (detailed) Device Status
Equipment under test (EUT)	W-Device supporting Events of type Warning or Error and Parameters Device Status and Detailed Device Status
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.20 and B.2.21 and Table D.1
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test correct behavior regarding the interconnection of an active Event and the resulting content of parameter Device Status and Detailed Device Status.
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read Parameter Device Status and store value in “devStatBase” b) Read Parameter Detailed Device Status, parse result from beginning to end in steps of 3 octets and store values in “detDevStatBase” c) Write EventA_Appear to index in Config7 d) Read Parameter Device Status e) Read Parameter Detailed Device Status, parse result from beginning to end in steps of 3 octets f) Write EventA_Disappear to index in Config7 g) Read Parameter Device Status h) Read Parameter Detailed Device Status, parse result from beginning to end in steps of 3 octets
Test parameter	--
Post condition	--

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check values at step d) 2) Check values at step e) 3) Check values at step g) 4) Check values at step h)
Test passed	a) Device Status = 4 (failure) b) Check Detailed Device Status: One entry must be the Event Code given in Config 7 c) Device Status must be the same as stored in a) (“devStatBase”) d) Detailed Device Status Entry given in config 7 has been deleted, content matches stored values in b) (“detDevStatBase”)
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

6.8 Data Storage (DS)

6.8.1 General

See REF 4 clause 6.7.1.

6.8.2 Upload without DS_UPLOAD_FLAG notification

Table 83 defines the test conditions for this test case.

Table 83 Upload without DS_UPLOAD_FLAG notification

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0076
Name	WTCD_APPS_DSUP_NOFLAG
Purpose (short)	Explicit upload without DS_UPLOAD_FLAG notification
Equipment under test (EUT)	W-Device with Datastorage support
Test case version	1.0
Category / type	W-Device DS test, test to pass
Specification (clause)	REF 1, see 10.4.2, Table B.11, Figure 90
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers upload of data storage contents (parameter set) without DS_UPLOAD_FLAG notification
Precondition	WDTU: W-Device in PREOPERATE or OPERATE mode EUT: DS_UPLOAD_FLAG is not set W-Device parameterized (manufacturer to define parameter set)
Procedure	Perform upload completely as defined in W-Master DS state machine: a) Switch W-Master DS from deactivated to activated state. b) Stimulate upload using DS_Commands "DS_UploadStart" and "DS_UploadEnd"
Test parameter	Parameter set (manufacturer to define parameter set)
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check whether parameter set is read without errors through Data Storage Index. Upon each of the following actions: 1) After call of the DS_UploadStart command 2) After reading/uploading the parameters 3) After call of the DS_UploadEnd command check the following: 4) State of Data Storage is correct 5) DS_UPLOAD_FLAG is not set 6) Parameter_checksum does not change 7) Verify that the value of DS Size matches with the size of the uploaded data + 4 * number of entries in Index List (see REF 1 Annex G)
Test passed	All three checks during the three actions described in evaluation are positive
Test not passed (examples)	Any check in evaluation failed
Report	Result of evaluation action 1) and check 4): <state> <ok | nok> Result of evaluation action 1) and check 5): <flag> <ok | nok> Result of evaluation action 1) and check 6: <checksum> <ok | nok> Result of evaluation action 2) and check 4): <state> <ok | nok> Result of evaluation action 2) and check 5): <flag> <ok | nok> Result of evaluation action 2) and check 6): <checksum> <ok | nok> Result of evaluation action 3) and check 4): <state> <ok | nok> Result of evaluation action 3) and check 5): <flag> <ok | nok> Result of evaluation action 3) and check 6): <checksum> <ok | nok>

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6.8.3 Upload via ParamDownloadStore

Table 84 defines the test conditions for this test case.

Table 84 Upload via ParamDownloadStore

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0077
Name	WTCD_APPS_DSUP_VIADOWNLOADSTORE
Purpose (short)	Explicit upload via SystemCommand "ParamDownloadStore"
Equipment under test (EUT)	W-Device with Datastorage support
Test case version	1.0
Category / type	W-Device DS test, test to pass
Specification (clause)	REF 1, see 10.4.2, Tables B.8, B9, B.11, D.1, Figure 90
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers parameterization (parameter set 2) of a W-Device and upload of this set into the W-Master DS per SystemCommand "ParamDownloadStore". Manufacturer is responsible for the definition of two possible "parameter sets".
Precondition	WDTU: W-Device in PREOPERATE or OPERATE mode Parameter set 1 stored within W-Device (manufacturer to define parameter set 1) EUT: DS_UPLOAD_FLAG is not set Test preparation e.g., using DS_Command "DS_UploadStart", upload of parameter set 1" using the Index List (upload), followed by a "DS_UploadEnd"
Procedure	a) Call SystemCommand "ParamDownloadStart" if W-Device supports Block Parameterization b) Write different parameter set 2 into the W-Device (manufacturer to define parameter set 2) c) Call SystemCommand "ParamDownloadStore" (causes the Event DS_UPLOAD_REQ) d) Wait for event DS_UPLOAD_REQ e) Execute Upload (Data Storage) completely as defined in the W-Master state machine (switch W-Master DS from deactivated to activated)
Test parameter	Parameter set 1 and parameter set 2 (defined by manufacturer)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check whether parameter set 2 is read without errors through Parameter_checksum. Upon each of the following actions: 1) After call of the DS_UploadStart command 2) After reading/uploading the parameters 3) After call of the DS_UploadEnd command Check the following: 4) State of Data Storage is correct 5) DS_UPLOAD_FLAG is correct 6) Parameter_checksum has changed to that of parameter set 2
Test passed	All three checks during the three actions described in evaluation are positive
Test not passed (examples)	Any check in evaluation failed
Report	Result of evaluation action 1) and check 4): <state> <ok | nok> Result of evaluation action 1) and check 5): <flag> <ok | nok> Result of evaluation action 1) and check 6): <checksum> <ok | nok> Result of evaluation action 2) and check 4): <state> <ok | nok> Result of evaluation action 2) and check 5): <flag> <ok | nok> Result of evaluation action 2) and check 6): <checksum> <ok | nok> Result of evaluation action 3) and check 4): <state> <ok | nok> Result of evaluation action 3) and check 5): <flag> <ok | nok> Result of evaluation action 3) and check 6): <checksum> <ok | nok>

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6.8.4 Upload via ParamDownloadStore without write calls

Table 85 defines the test conditions for this test case.

Table 85 Upload via ParamDownloadStore without write calls

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0078
Name	WTCD_APPS_DSUP_VIADOWNLOADSTORENOWRITE
Purpose (short)	Explicit upload via "ParamDownloadStore" without write calls
Equipment under test (EUT)	W-Device with Datastorage support
Test case version	1.0
Category / type	W-Device protocol test, test to pass
Specification (clause)	REF 1, see 10.4.2, Table B8, B.11, Table D.2, Figure 90
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers parameterization (parameter set 2) of a W-Device and upload of this set into the W-Master DS per SystemCommand “ParamDownloadStore”. Manufacturer is responsible for the definition of two possible “parameter sets”.
Precondition	WDTU: W-Device in PREOPERATE or OPERATE mode Parameter set 1 stored within W-Device (manufacturer to define parameter set 1) EUT: DS_UPLOAD_FLAG is not set Test preparation e.g., using DS_Command "DS_UploadStart", upload of parameter set 1" using the Index List (upload), followed by a "DS_UploadEnd"
Procedure	a) Write different parameter set 2 into the W-Device (manufacturer to define parameter set 2) b) Wait 1 s for event DS_UPLOAD_REQ c) Call SystemCommand "ParamDownloadStart" via ISDU (w/o writing parameters), if W-Device supports Block Parameterization d) Initiate upload via SystemCommand "ParamDownloadStore" e) Wait for event DS_UPLOAD_REQ f) Execute upload (Data Storage) completely as defined in the W-Master state machine (switch W-Master DS from deactivated to activated)
Test parameter	Parameter set 1 and 2 (manufacturer to define possible parameter sets)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether parameter set 2 is written without errors. 2) Check whether Event DS_UPLOAD_REQ was not raised after changing parameters (parameter set 2) 3) Check whether Event DS_UPLOAD_REQ was raised by the W-Device after SystemCommand "ParamDownloadStore" 4) Check whether parameter set 2 is read without errors through Parameter_checksum Upon each of the following actions: 5) After call of the DS_UploadStart command 6) After reading/uploading the parameters 7) After call of the DS_UploadEnd command Check via Data Storage Index the following: 8) State of Data Storage is correct. 9) DS_UPLOAD_FLAG is correct 10) Parameter_checksum has changed only after 'Write parameter set 2'
Test passed	All checks in 1) to 4) and all three checks during the three actions described in evaluation are positive
Test not passed (examples)	Any check in evaluation failed

TEST CASE RESULTS	CHECK / REACTION	
Report	Result of evaluation 1): <checksum>	<ok | nok>
	Result of evaluation 2): <flag>	<ok | nok>
	Result of evaluation 3): <flag>	<ok | nok>
	Result of evaluation 4): <checksum>	<ok | nok>
	Result of evaluation action 5) and check 8): <state>	<ok | nok>
	Result of evaluation action 5) and check 9): <flag>	<ok | nok>
	Result of evaluation action 5) and check 10): <checksum>	<ok | nok>
	Result of evaluation action 6) and check 8): <state>	<ok | nok>
	Result of evaluation action 6) and check 9): <flag>	<ok | nok>
	Result of evaluation action 6) and check 10): <checksum>	<ok | nok>
	Result of evaluation action 7) and check 8): <state>	<ok | nok>
	Result of evaluation action 7) and check 9): <flag>	<ok | nok>
	Result of evaluation action 7) and check 10): <checksum>	<ok | nok>

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6.8.5 Upload via local parameter modification

Table 86 defines the test conditions for this test case.

Table 86 Upload via local parameter modification

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0079
Name	WTCD_APPS_DSUP_VIALOCALCHANGE
Purpose (short)	Implicit upload after local parameter modification
Equipment under test (EUT)	W-Device with local parameterization such as teach-in or panel as indicated in IODD and with Datastorage support
Test case version	1.0
Category / type	W-Device DS test, test to pass
Specification (clause)	REF 1, see 10.4.2, Table B8, B.11, Table D.1, Figure 90
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers local parameter changes of a W-Device and implicit upload of the parameter set into the W-Master DS. Manufacturer is responsible for the definition of two possible "parameter sets".
Precondition	WDTU: W-Device in PREOPERATE or OPERATE mode Parameter set 1 stored within W-Device (manufacturer to define parameter set 1) EUT: DS_UPLOAD_FLAG is not set Test preparation e.g., using DS_Command "DS_UploadStart", upload of parameter set 1" using the Index List (upload), followed by a "DS_UploadEnd"
Procedure	a) Change parameter value(s) locally in the W-Device, e.g., via local menu or teach-in b) Wait for event DS_UPLOAD_REQ c) Execute upload (Data Storage) completely as defined in the W-Master state machine (switch W-Master DS from deactivated to activated)
Test parameter	Parameter set 1 (manufacturer to define the possible parameter set)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether Event DS_UPLOAD_REQ was raised automatically by the W-Device after local parameter modification 2) Check whether parameter set 2 is read without errors through Parameter_checksum Upon each of the following actions: 3) After call of the DS_UploadStart command 4) After reading/uploading the parameters 5) After call of the DS_UploadEnd command Check via Data Storage Index the following: 6) State of Data Storage is correct 7) DS_UPLOAD_FLAG is correct 8) Parameter_checksum has changed only after 'local change of parameter values'
Test passed	All checks in 1), 2), and all three checks during the three actions described in evaluation are positive
Test not passed (examples)	Any check in evaluation failed
Report	Result of evaluation 1): <flag> <ok | nok> Result of evaluation 2): <checksum> <ok | nok> Result of evaluation action 3) and check 6): <state> <ok | nok> Result of evaluation action 3) and check 7): <flag> <ok | nok> Result of evaluation action 3) and check 8): <checksum> <ok | nok> Result of evaluation action 4) and check 6): <state> <ok | nok>

	Result of evaluation action 4) and check 7): <flag>	<ok | nok>
	Result of evaluation action 4) and check 8): <checksum>	<ok | nok>
	Result of evaluation action 5) and check 6): <state>	<ok | nok>
	Result of evaluation action 5) and check 7): <flag>	<ok | nok>
	Result of evaluation action 5) and check 8): <checksum>	<ok | nok>

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6.8.6 Call ParamBreak in different states of Upload

Table 87 defines the test conditions for this test case.

Table 87 Call ParamBreak in different states of Upload

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0080
Name	WTCD_APPS_DSUP_PARABREAKABORT
Purpose (short)	Upload abort via SystemCommand "ParamBreak" in different states
Equipment under test (EUT)	W-Device with Datastorage and Block Parameterization support
Test case version	1.0
Category / type	W-Device DS test: test to pass
Specification (clause)	REF 1, see 10.4.2, Table B8, B.11, Table D.1, Figure 90
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers Upload aborts via SystemCommand "ParamBreak" in different states. Manufacturer is responsible for the definition of two possible "parameter sets".
Precondition	WDTU: W-Device in PREOPERATE or OPERATE mode Parameter set 1 stored within W-Device (manufacturer to define parameter set 1) EUT: DS_UPLOAD_FLAG is not set using DS_Command "DS_UploadStart", upload of parameter set 1" using the Index List (upload), followed by a "DS_UploadEnd"
Procedure	a) Call SystemCommand "ParamDownloadStart" b) Write different parameter set 2 into the W-Device (manufacturer to define parameter set 2) c) Call SystemCommand "ParamDownloadStore" (causes event DS_UPLOAD_REQ) d) Wait for event DS_UPLOAD_REQ e) Start Upload via SystemCommand "ParamUploadStart" f) Call SystemCommand "ParamBreak" directly after "ParamUploadStart" g) Start Upload via SystemCommand "ParamUploadStart" h) Transmit first Block Parameter object of Config4 i) Call SystemCommand "ParamBreak" j) Start Upload via SystemCommand "ParamUploadStart" k) Transmit all Block Parameter objects of Config4 l) Call SystemCommand "ParamBreak" m) Execute upload (Data Storage) completely as defined in the W-Master state machine (switch W-Master DS from deactivated to activated)
Test parameter	Parameter set 1 and 2
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether Event DS_UPLOAD_REQ was raised automatically by the W-Device 2) Check whether parameter set 2 is read without errors through Parameter_checksum Upon each of the following actions: 3) After call of each SystemCommand "ParamUploadStart" (3x) 4) After call of each SystemCommand "ParamBreak" (3x) Check via Data Storage Index the following: 5) State of Data Storage is 0b00 (inactive) 6) DS_UPLOAD_FLAG is set 7) Parameter_checksum has changed only after 'write parameter set 2' 8) Check whether the Upload has been completed without errors
Test passed	All checks in 1), 2), 8), and all three checks during the two actions described in evaluation are positive
Test not passed (examples)	Any check in evaluation failed

TEST CASE RESULTS	CHECK / REACTION	
Report	Result of evaluation 1): <flag>	<ok | nok>
	Result of evaluation 2): <checksum>	<ok | nok>
	Result of evaluation action 3) and check 5): <state>	<ok | nok>
	Result of evaluation action 3) and check 6): <flag>	<ok | nok>
	Result of evaluation action 3) and check 7): <checksum>	<ok | nok>
	Result of evaluation action 4) and check 5): <state>	<ok | nok>
	Result of evaluation action 4) and check 6): <flag>	<ok | nok>
	Result of evaluation action 4) and check 7): <checksum>	<ok | nok>
	Result of evaluation 8):	<ok | nok>

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6.8.7 Check structure of Data Storage Index List

Table 88 defines the test conditions for this test case.

Table 88 Check structure of Data Storage Index List

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0081
Name	WTCD_APPS_DSUP_INDEXLIST
Purpose (short)	Check structure of Data Storage Index List
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DS test: test to pass
Specification (clause)	REF 1, B.2.3, Table B.11
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check structure of Index_List and concatenated Index_Lists if available
Precondition	WDTU: Communication EUT: PREOPERATE
Procedure	a) Read Index 3, extract Index_List (Subindex 5) b) Store length of Index_List (number of octets) in <len> c) Calculate and store <EntryCount> = (<len>-2) / 3 d) Store termination marker in <term> e) If <term> is not equal 0x00 0x00 read next Index_List from index referenced by <term> and repeat from step b)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For each loop cycle check: 1) After step c) check: <EntryCount> must be an integer value in range 0 to 70 2) 2) After step d) check if <EntryCount> is less than 70, <term> must equal 0x00 0x00 1) check if each index referenced by the index list is greater than 3
Test passed	All evaluations with positive result
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

6.8.8 Download after modification of parameters

Table 89 defines the test conditions for this test case.

Table 89 Download after modification of parameters

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0082
Name	WTCD_APPS_DSDN_PARAMODIFICATION
Purpose (short)	Download after modification of parameters
Equipment under test (EUT)	W-Device with Datastorage and Block Parameterization support
Test case version	1.0
Category / type	W-Device DS test: test to pass
Specification (clause)	REF 1, see 10.4.2, Table B8, B.11, Table D.1, Figure 90
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	After changing parameters in W-Device without storing them in DS, download a different parameter set into the W-Device.
Precondition	WDTU: W-Device in PREOPERATE or OPERATE mode Parameter set 1 stored within W-Device (manufacturer to define parameter set 1) EUT: DS_UPLOAD_FLAG is not set Test preparation e.g., using DS_Command "DS_UploadStart", upload of parameter set 1" using the Index List (upload), followed by a "DS_UploadEnd"
Procedure	a) Call SystemCommand "ParamDownloadStart" via ISDU b) Write different parameter set 2 into the W-Device (manufacturer to define parameter set 2) c) Call SystemCommand "ParamDownloadEnd" d) Execute Download (restore) of parameter set 1 completely as defined in the W-Master state machine only if the DS_UPLOAD_FLAG is not set (switch W-Master DS from deactivated to activated)
Test parameter	Parameter set 1 and 2
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether Event DS_UPLOAD_REQ was not raised by the W-Device Upon each of the following actions: 2) After call of SystemCommand "ParamDownloadStart" 3) After call of SystemCommand "ParamDownloadEnd" 4) After execution of the complete Download Check via Data Storage Index the following: 5) State of Data Storage is 0b00 (inactive) 6) DS_UPLOAD_FLAG is not set 7) Parameter_checksum has changed only after 'write parameter set 2' 8) Check whether the Download has been completed without errors
Test passed	All checks in 1), 8), and all three checks during the three actions described in evaluation are positive
Test not passed (examples)	Any check in evaluation failed
Report	Result of evaluation 1): <flag> <ok | nok> Result of evaluation action 2) and check 5): <state> <ok | nok> Result of evaluation action 2) and check 6): <flag> <ok | nok> Result of evaluation action 2) and check 7): <checksum> <ok | nok> Result of evaluation action 3) and check 5): <state> <ok | nok> Result of evaluation action 3) and check 6): <flag> <ok | nok> Result of evaluation action 3) and check 7): <checksum> <ok | nok> Result of evaluation action 4) and check 5): <state> <ok | nok> Result of evaluation action 4) and check 6): <flag> <ok | nok> Result of evaluation action 4) and check 7): <checksum> <ok | nok> Result of evaluation 8): <ok | nok>

6.8.9 Download into the W-Device after reset

Table 90 defines the test conditions for this test case.

Table 90 Download into the W-Device after reset

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0083
Name	WTCD_APPS_DSDN_FACTORYRESET
Purpose (short)	Download into the W-Device after reset to factory settings
Equipment under test (EUT)	W-Device with "Reset to factory settings" support and with Datastorage support
Test case version	1.0
Category / type	W-Device DS test: test to pass
Specification (clause)	REF 1, see 10.4.2, 10.6.4, Table B8, B.11, Table D.1, Figure 90
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of Download of the stored parameter set into the W-Device after reset to factory settings. Manufacturer to provide parameter set 1 different to factory settings.
Precondition	WDTU: W-Device in PREOPERATE or OPERATE mode Parameter set 1 stored within W-Device (manufacturer to define parameter set 1) EUT: DS_UPLOAD_FLAG is not set Test preparation e.g., using DS_Command "DS_UploadStart", upload of parameter set 1" using the Index List (upload), followed by a "DS_UploadEnd"
Procedure	a) Call SystemCommand "Restore factory settings" via ISDU b) Execute Download (restore) of parameter set 1 completely as defined in the W-Master state machine only if the DS_UPLOAD_FLAG is not set (switch W-Master DS from deactivated to activated)
Test parameter	Parameter set 1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) After "Restore factory settings" check whether Event DS_UPLOAD_REQ was not raised by the W-Device. Upon each of the following actions: 2) After "Restore factory settings" Check via Data Storage Index the following: 3) State of Data Storage is correct 4) DS_UPLOAD_FLAG is not set 5) Parameter_checksum has changed 6) Check whether the Download has been completed without errors
Test passed	All checks in 1), 6), and all three checks during the action described in evaluation are positive
Test not passed (examples)	Any check in evaluation failed
Report	Result of evaluation 1): <flag> <ok | nok> Result of evaluation action 2) and check 3): <state> <ok | nok> Result of evaluation action 2) and check 4): <flag> <ok | nok> Result of evaluation action 2) and check 5): <checksum> <ok | nok> Result of evaluation 6): <ok | nok>

6.8.10 Call ParamBreak in different states of Download

Table 91 defines the test conditions for this test case.

Table 91 Call ParamBreak in different states of Download

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0084
Name	WTCD_APPS_DSDN_PARABREAKABORT
Purpose (short)	Download abort via SystemCommand "ParamBreak" in different states
Equipment under test (EUT)	W-Device with Datastorage and Block Parameterization support
Test case version	1.0
Category / type	W-Device DS test: test to pass
Specification (clause)	REF 1, see 10.4.2, Table B8, B.11, Table D.1, Figure 90
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers Download aborts via SystemCommand "ParamBreak" in different states. Manufacturer is responsible for the definition of two possible "parameter sets".
Precondition	WDTU: W-Device in PREOPERATE or OPERATE mode Parameter set 1 stored within W-Device (manufacturer to define parameter set 1) EUT: DS_UPLOAD_FLAG is not set Test preparation e.g., using DS_Command "DS_UploadStart", upload of parameter set 1" using the Index List (upload), followed by a "DS_UploadEnd"
Procedure	a) Start Download via SystemCommand "ParamDownloadStart" b) Call SystemCommand "ParamBreak" directly after "ParamDownloadStart" c) Start Download via SystemCommand "ParamDownloadStart" d) Transmit first Block Parameter object of Config4 with data of parameter set 2 e) Call SystemCommand "ParamBreak" f) Start Download via SystemCommand "ParamDownloadStart" g) Transmit all Block Parameter objects of Config4 with data of parameter set 2 h) Call SystemCommand "ParamBreak" i) Execute Download of parameter set 2 completely as defined in the W-Master state machine only if the DS_UPLOAD_FLAG is not set in the W-Device (switch W-Master DS from deactivated to activated)
Test parameter	Parameter set 1 and 2
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	After call of each SystemCommand "ParamBreak" (3x) check via Data Storage Index the following: 1) State of Data Storage is 0b00 (inactive) 2) DS_UPLOAD_FLAG is not set 3) Parameter_checksum has changed After i): 4) Check whether the Download has been completed without errors
Test passed	All checks during the actions described in evaluation are positive
Test not passed (examples)	Any check in evaluation failed
Report	All evaluations: <ok | nok>

6.8.11 Parameter Manager – Single Parameter and DownloadStore

Table 92 defines the test conditions for this test case.

Table 92 Parameter Manager – Single Parameter and DownloadStore

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0085
Name	WTCD_DSBP_APPL_DSSINGLEPARAM
Purpose (short)	Test of single parameter write in Parameter Manager Idle
Equipment under test (EUT)	W-Device with Data Storage as indicated in IODD
Test case version	1.0
Category / type	W-Device protocol test; test to pass
Specification (clause)	REF 1, 10.3.2 and 10.3.4
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	W-Device shall not invoke DataStorage if parametrized via single parameter accesses. W-Device shall invoke DataStorage after receiving a SystemCommand "ParamDownloadStore".
Precondition	WDTU: W-Device in PREOPERATE or OPERATE mode EUT: No Event pending or active DataStorage of the W-Device is inactive and DS_UPLOAD_FLAG is "0"
Procedure	a) Write test parameter with different content than stored in W-Device b) Wait for DS_UPLOAD_REQ Event with a timeout of 1 s c) Read DataStorage state property: Index 3, Subindex 2 d) Write SystemCommand "ParamDownloadStore" e) Wait for DS_UPLOAD_REQ Event with a timeout of 1 s f) Read Data Storage state property: Index 3, Subindex 2 g) Write DS_Command "DS_UploadEnd"
Test parameter	One parameter of the parameter sets defined in 6.7.1.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) After step b), check that timeout occurred and no Event with code "DS_UPLOAD_REQ" has been received 2) After step c), check that State_Property.DS_UPLOAD_FLAG = "0" 3) After step e), check that no timeout occurred and Event with code "DS_UPLOAD_REQ" has been received 4) After step f), check that State_Property.DS_UPLOAD_FLAG = "1"
Test passed	All evaluations with positive result
Test not passed (examples)	Any check in evaluation failed
Report	Single Parameter without DS activity <ok | nok> DS_DownloadStore in ParameterManager state "Idle_0" <ok | nok>

6.8.12 Clear DS_UPLOAD_FLAG after DS_Up/DownloadEnd

Table 93 defines the test conditions for this test case

Table 93 Clear DS_UPLOAD_FLAG after DS_Up/DownloadEnd

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0086
Name	WTCD_DS_APP_IDLEFLAGCLEAR
Purpose (short)	DS_UPLOAD_FLAG is cleared after TransmissionEnd while in DSIdle_2
Equipment under test (EUT)	W-Device with Data Storage indicated in IODD
Test case version	1.0
Category / type	W-Device protocol test; test to pass
Specification (clause)	REF 1, see 10.4.2, Table B.11, Table D.2, Figure 90
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	DS_UPLOAD_FLAG is cleared when DS_UploadEnd or DS_DownloadEnd command is received while Data Storage state machine is in state DSIdle_2 (Transition T11)
Precondition	WDTU: W-Device in OPERATE mode EUT: DS state machine is in state DSIdle_2
Procedure	a) Write SystemCommand “ParamDownloadStore” b) Read DataStorageIndex c) Write DS Command “DS_UploadEnd” d) Read DataStorageIndex e) Write SystemCommand “ParamDownloadStore” f) Read DataStorageIndex g) Write DS Command “DS_DownloadEnd“ h) Read DataStorageIndex
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "DS_UPLOAD_FLAG" in step b), d), f), and h)
Test passed	In b) = "1" In d) = "0" In f) = "1" In h) = "0"
Test not passed (examples)	Any check in evaluation failed
Report	In b): <flag> <ok | nok> In d): <flag> <ok | nok> In f): <flag> <ok | nok> In h): <flag> <ok | nok>

6.8.13 Storage of DS_UPLOAD_FLAG in non-volatile memory

Table 94 defines the test conditions for this test case

Table 94 Storage of DS_UPLOAD_FLAG in non-volatile memory

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0087
Name	WTCD_DS_APP_UPLOAD_FLAG_NON_VOLATILE
Purpose (short)	Storage of DS_UPLOAD_FLAG in non-volatile memory
Equipment under test (EUT)	W-Device with Data Storage support
Test case version	1.0
Category / type	W-Device protocol test; test to pass
Specification (clause)	REF 1, see 10.4.2, Tables B.8, B.9, B.11, and D.1, Figure 90
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers parameterization (parameter set 2) of a W-Device and initiation of the Up-load via SystemCommand "ParamDownloadStore". W-Device shall store the DS_UP-LOAD_FLAG in non-volatile memory
Precondition	- W-Device in PREOPERATE mode - Parameter set 1 stored within W-Device (manufacturer to define parameter set 1) - DS_UPLOAD_FLAG is not set
Procedure	a) Call SystemCommand "ParamDownloadStore" (causes Event DS_UPLOAD_REQ) b) Wait for event DS_UPLOAD_REQ c) Check DS_UPLOAD_FLAG in parameter DataStorageIndex d) Apply power cycle (power off, wait 5 s, power on: Port remains in communication) e) Check if a communication startup sequence has been triggered, and Device is in PREOPERATE f) Check DS_UPLOAD_FLAG in parameter DataStorageIndex g) Reset the DS_UPLOAD_FLAG with the call of the System Command “DS_Upload Start”, followed by the system command “DSUploadEnd” h) Check DS_UPLOAD_FLAG in parameter DataStorageIndex
Test parameter	Parameter set 1 and parameter set 2 (defined by manufacturer)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check whether Event DS_UPLOAD_REQ was raised automatically by the W-Device after b) 2) check via Data Storage Index: the DS_UPLOAD_FLAG is set after c) 3) Startup Sequence has been detected in e), and W-Device is in PREOPERATE state 4) Value of procedure f) (DS_UPLOAD_FLAG) = "1" (active DS_UPLOAD_REQ) 5) Value of procedure h) (DS_UPLOAD_FLAG) = "0" (no active DS_UPLOAD_REQ)
Test passed	All checks are positive
Test not passed (examples)	Any of the checks failed
Report	W-Device has stored the DS_UPLOAD_FLAG non volatile: <ok | nok>

6.9 Direct Parameter page 1

6.9.1 Read whole Parameter Page 1

Table 95 defines the test conditions for this test case.

Table 95 Read whole Parameter Page 1

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0088
Name	WTCD_DLPC_STDP_READWHOLEPPAGE1
Purpose (short)	Test for read of Direct Parameter Page 1 in one go
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause C.2
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check readout of the Direct Parameter Page 1 in one go and verify the received ISDU data length.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) WDTU perform a read of Direct Parameter Page 1 via Index 0 Subindex 0. b) Check the received ISDU data length
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check the received ISDU data length.
Test passed	Received ISDU data length is equal to 16
Test not passed (examples)	Received ISDU data length is not equal to 16
Report	ReadWholeDPP1: <value> <ok | nok>

6.9.2 MasterCycleTime

Table 96 defines the test conditions for this test case.

Table 96 MasterCycleTime

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0089
Name	WTCD_DLPC_STDP_MASTERCYCLETIME
Purpose (short)	Test for correct value of MasterCycleTime
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause C.2
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of the correct value of MasterCycleTime. The value shall be 0x00.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read DPP1.MasterCycleTime ;returns MasterCycleTime(W-Device)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After a) compare value of MasterCycleTime with 0x00
Test passed	Value match
Test not passed (examples)	Mismatch of value
Report	MasterCycleTime(W-Device): <value> <ok | nok>

952 ### 6.9.3 MinCycleTime

953 Table 97 defines the test conditions for this test case.

954 **Table 97 MinCycleTime**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0090
Name	WTCD_DLPC_STDP_MINCYCLETIME
Purpose (short)	Test for correct setting of MinCycleTime
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause C.2
Configuration / setup	W-Device-Tester-System

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of the correct value of MinCycleTime. The value shall be 0x00.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read DPP1.MinCycleTime ;returns MinCycleTime (W-Device)
Test parameter	-
Post condition	-

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TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After a) compare value of MinCycleTime with 0x00
Test passed	Value match
Test not passed (examples)	Mismatch of value
Report	MinCycleTime (W-Device): <value> <ok | nok>

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6.9.4 M-SequenceCapability

Table 98 defines the test conditions for this test case.

Table 98 M-SequenceCapability

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0091
Name	WTCD_DLPC_STDP_FSEQCAPABILITY
Purpose (short)	Test for correct M-sequence entry
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause C.2
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of the correct value of M-SequenceCapability. The value shall be 0x01.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read DPP1.M-SequenceCapability ;returns M-SequenceCapability (W-Device)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After a) compare value of M-SequenceCapability with 0x01
Test passed	Value match
Test not passed (examples)	Mismatch of value
Report	M-SequenceCapability (W-Device): <value> <ok | nok>

966 ### 6.9.5 RevisionID

967 Table 99 defines the test conditions for this test case.

968 **Table 99 RevisionID**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0092
Name	WTCD_DLPC_STDP_REVISIONID
Purpose (short)	Correct default protocol revision as indicated in IODD
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause C.2.3
Configuration / setup	W-Device-Tester-System

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test value of the protocol revision of EUT. Value shall match the revision defined in IODD
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read DPP1.RevisionID ;returns RevisionID (W-Device)
Test parameter	ProtocolRevisionIODD = *node CommNetworkProfile, attribute iolinkRevision*
Post condition	-

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TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After a), check RevisionID(W-Device)
Test passed	RevisionID(W-Device) = ProtocolRevisionIODD
Test not passed (examples)	RevisionID(W-Device) does not match
Report	ProtocolRevisionIDIODD: <value> RevisionID(W-Device): <value> <ok | nok>

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6.9.6 ProcessDataIn

Table 100 defines the test conditions for this test case.

Table 100 ProcessDataIn

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0093
Name	WTCD_DLPC_STDP_PDIN
Purpose (short)	Correct default ProcessDataInput value as indicated in IODD
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause C.2.4
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the values of ProcessDataInput. The value shall match the specified default value according to the IODD.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read DPP1.ProcessDataIn ;returns ProcessDataIn(W-Device)
Test parameter	ProcessDataInIODD = *node ProcessData.ProcessDataIn, attribute bitlength*
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After a), check ProcessDataIn(W-Device)
Test passed	Process Data length match specified values, and Process Data length unit is a valid value, and Bits 5 and 6 are "0", and ProcessDataIn(W-Device) = ProcessDataInIODD
Test not passed (examples)	Any of the evaluations failed
Report	ProcessDataInIODD: <value> ProcessDataIn(W-Device): <value> <ok | nok>

6.9.7 ProcessDataOut

Table 101 defines the test conditions for this test case.

Table 101 ProcessDataOut

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0094
Name	WTCD_DLPC_STDP_PDOUT
Purpose (short)	Correct default ProcessDataOutput value as indicated in IODD
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause C.2.5
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the values of Process Data Output. The value shall match the value as specified in the IODD.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read DPP1.ProcessDataOut ;returns ProcessDataOut(W-Device)
Test parameter	ProcessDataOutIODD = *node ProcessData.ProcessDataOut, attribute bitLength*
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After a), check ProcessDataOut(W-Device)
Test passed	Process Data length match specified values, and Process Data length unit is a valid value, and Bits 5 and 6 are "0", and ProcessDataOut(W-Device) = ProcessDataOutIODD
Test not passed (examples)	Any of the evaluations failed
Report	ProcessDataOutIODD: <value> ProcessDataOut(W-Device): <value> <ok | nok>

6.9.8 VendorID

Table 102 defines the test conditions for this test case.

Table 102 VendorID

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0095
Name	WTCD_DLPC_STDP_VENDORID
Purpose (short)	Correct VendorID as indicated in IODD
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause C.2.6
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the value of the VendorID. The value shall match the unique ID assigned to the vendor and the value specified in the IODD.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read DPP1.VendorID1 ;returns VendorID1 b) Read DPP1.VendorID2 ;returns VendorID2 c) Combine VendorID1 and VendorID2 to VendorID(W-Device)
Test parameter	VendorIDIODD = *node DeviceIdentity, attribute vendorId* VendorIDAssigned = *VendorID @ https://io-link.com/share/Downloads/Vendor_ID_Table.xml*
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After c), check VendorID(W-Device)
Test passed	VendorID(W-Device) = VendorIDIODD, and VendorID(W-Device) = VendorIDAssigned
Test not passed (examples)	Any of the evaluations failed
Report	VendorIDIODD: <value> VendorIDAssigned: <value> VendorID(W-Device): <value> <ok | nok>

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995 Table 103 defines the test conditions for this test case.

996 **Table 103 DeviceID**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0096
Name	WTCD_DLPC_STDP_DEVICEID
Purpose (short)	Correct default DeviceID as indicated in IODD
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause C.2.7
Configuration / setup	W-Device-Tester-System

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the value of the DeviceID. The value shall match the ID assigned by the vendor and the value specified in the IODD.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read DPP1.DeviceID1 *;returns DeviceID1* b) Read DPP1.DeviceID2 *;returns DeviceID2* c) Read DPP1.DeviceID3 *;returns DeviceID3* d) Combine DeviceID1, and DeviceID2, and DeviceID3 to DeviceID(W-Device)
Test parameter	DeviceIDIODD = *node DeviceIdentity, attribute deviceId*
Post condition	-

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TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After d), check DeviceID(W-Device)
Test passed	DeviceID(W-Device) = DeviceIDIODD, and DeviceID(W-Device) > 0
Test not passed (examples)	Any of the evaluations failed
Report	DeviceIDIODD: <value> DeviceID(W-Device): <value> <ok | nok>

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6.9.9 FunctionID

Table 104 defines the test conditions for this test case.

Table 104 FunctionID

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0097
Name	WTCD_DLPC_STDP_FUNCTIONID
Purpose (short)	Correct FunctionID (reserved)
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause C.2.8
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the value of the FunctionID. The FunctionID is not used and shall contain the default value.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read DPP1.FunctionID1 *;returns FunctionID1* b) Read DPP1.FunctionID2 *;returns FunctionID2* c) Combine FunctionID1 and FunctionID2 to FunctionID(W-Device)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After c), check FunctionID(W-Device)
Test passed	FunctionID(W-Device) = "0"
Test not passed (examples)	FunctionID(W-Device) ≠ "0"
Report	FunctionID(W-Device): <value> <ok | nok>

6.9.10 Reserved parameter – Read/Write

Table 105 defines the test conditions for this test case.

Table 105 Reserved parameter – Read/Write

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0098
Name	WTCD_DLPC_STDP_WRITERESPAR
Purpose (short)	Test reserved Direct Parameter write behaviour
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device DPP test: test to pass
Specification (clause)	See REF 2, clause Annex C
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the Device behaviour and read result after write access to a reserved Direct Parameter
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Write values 0x00 to 0xFF via the W-Device-Tester-System to reserved parameter on Direct Parameter page 1 (Index 0 Subindex 15)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check validity of a Write access to reserved Direct Parameter.
Test passed	If no communication errors occurred
Test not passed (examples)	If communication errors or Events occurred
Report	Communication errors: <no/yes> <ok | nok>

6.10 Predefined Device parameters

6.10.1 General rules

Predefined parameters shall be tested in any case. The following rules apply:
They shall be tested as specified within the test cases if they are defined within the IODD.
They shall not be tested as specified within the test cases if they are not defined within the IODD.
All optional test cases for Predefined Parameters shall be handled according to rule b)

6.10.2 System command – reserved commands

Table 106 defines the test conditions for this test case

Table 106 System command – reserved commands

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0099
Name	WTCD_DLIC_DEFP_SYSCMDRES
Purpose (short)	SystemCommand behavior upon reserved commands (via ISDU)
Equipment under test (EUT)	W-Device, W-Bridge
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see B.2.2, and Annex C.2.1, Table C.1
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies the correct response values upon usage of reserved and unused SystemCommands.
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Write subsequently the following values to parameter SystemCommand: - 0x00 - 0x01 to 0x04, if Block Parameter transfer is not supported - 0x05, if neither Data Storage nor Block Parameter transfer is supported - 0x06, if Block Parameter transfer is not supported - 0x07 to 0x3F - 0x40 to 0x7F, if no Profile is supported - 0x80 to 0x83, if not referenced in IODD - 0x84 to 0x9F - 0xA0 to 0xFF, if not referenced in IODD
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check each Write response in a)
Test passed	All Write error responses = FUNC_NOTAVAIL (0x8035) If Write error response ≠ FUNC_NOTAVAIL (0x8035), indicate value and warning
Test not passed (examples)	Positive or no Write response
Report	Write response (reserved SystemCommand): <value> <ok | nok>

6.10.3 Data Storage Index – entire parameter structure

Table 107 defines the test conditions for this test case.

Table 107 Data Storage Index – entire parameter structure

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0100
Name	WTCD_DLIC_DEFP_DSINDEX
Purpose (short)	Behavior of parameter DataStorageIndex
Equipment under test (EUT)	W-Device, W-Bridge
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.3, Table B.9; see B.2.3 (records without gaps)
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies correct implementation of parameter DataStorageIndex. Devices without Data Storage support shall support the entire parameter structure.
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter DataStorageIndex (Index 0x03)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check response of Read access 2) Check parameter length 3) Calculate <index entries> = (parameter length – 12)/3
Test passed	No negative response, and <index entries> has a positive integer value in the range ≥ 0 and ≤ 70
Test not passed (examples)	Negative response, or <index entries> outside the permitted range
Report	Data Storage Index, length: <index entries> <ok | nok>

6.10.4 Data Storage Index – record items

Table 108 defines the test conditions for this test case

Table 108 DataStorageIndex – record items

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0101
Name	WTCD_DLIC_DEFP_ DSRECORD
Purpose (short)	Behavior of parameter DataStorageIndex record items
Equipment under test (EUT)	W-Device, W-Bridge
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.3, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies the correct structure of parameter and record items of the DataStorageIndex.
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read subsequently Subindex 1 to 5 of DataStorageIndex (Index 0x03)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check response of Read access 2) Check record item length 3) Check value of record item
Test passed	No negative response on record item Read access, and Subindex 1 has a length of 1 octet and value is within range ≥ 0 to ≤ 5 Subindex 2 has a length of 1 octet and value of bit 0 and bit 3 - 6 is "0" Subindex 3 has a length of 4 octets and value is within range 0 to 2048 Subindex 4 has a length of 4 octets Subindex 5 has a length of ≥ 2 octets in increments of 3 (2,5,8,11,14, until 212)
Test not passed (examples)	Record items are deviating in length or value range
Report	DataStorageIndex, Subindex 1: <length, value> <ok | nok> DataStorageIndex, Subindex 2: <length, value> <ok | nok> DataStorageIndex, Subindex 3: <length, value> <ok | nok> DataStorageIndex, Subindex 4: <length> <ok | nok> DataStorageIndex, Subindex 5: <length> <ok | nok>

6.10.5 Data Storage Index – termination marker

Table 109 defines the test conditions for this test case

Table 109 DataStorageIndex – termination marker

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0102
Name	WTCD_DLIC_DEFP_DSRECORDMARKER
Purpose (short)	Behavior of parameter DataStorageIndex record items – Termination marker
Equipment under test (EUT)	W-Device, W-Bridge
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.3, Table B.9, and 10.4.5
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies the correct entries in items Data_Storage_Size and DS Index_List of the parameter DataStorageIndex. Both items shall be "0".
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read subsequently Subindex 1 to 5 of DataStorageIndex (Index 0x03)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check response of Read access 2) Check record item length 3) Check value of record item
Test passed	No negative response on record item Read access, and Subindex 1 has a length of 1 octet and value is within range ≥ 0 to ≤ 5 Subindex 2 has a length of 1 octet and value of bit 0 and bit 3 - 6 is "0" Subindex 3 has a length of 4 octets and value = "0" Subindex 4 has a length of 4 octets Subindex 5 has a length of 2 octets and value = "0"
Test not passed (examples)	Record items are deviating in length or value range
Report	DataStorageIndex, Subindex 1: <length, value> <ok | nok> DataStorageIndex, Subindex 2: <length, value> <ok | nok> DataStorageIndex, Subindex 3: <length, value> <ok | nok> DataStorageIndex, Subindex 4: <length> <ok | nok> DataStorageIndex, Subindex 5: <length, value > <ok | nok>

6.10.6 Device Access Locks – valid

Table 110 defines the test conditions for this test case

Table 110 Device Access Locks – valid

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0103
Name	WTCD_DLIC_DEFP_ACCESSLOCKSVAL
Purpose (short)	ACCESSLOCKSVAL
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see 10.6.5, 10.6.6, Annex B.2.4, Table B.12
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies that all implemented values for DeviceAccessLocks are stored and responded correctly.
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Write value to DeviceAccessLocks with "1" at every bit position marked as implemented and "0" at the remaining bits. b) Read value DeviceAccessLocks c) Write value 0x0000 to DeviceAccessLocks d) Read value DeviceAccessLocks
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check for response on Read and Write access 2) Set warning flag, if a positive response is received for a write access with “1” at bit positions "0" or "1" 3) Compare response value from step b) with written value from step a) 4) Compare response value from step d) with written value from step c)
Test passed	No negative response on Read or Write access, and Evaluations 3) and 4) show matching values
Test not passed (examples)	No matching values
Report	DeviceAccessLocks implemented: <written/read values> <ok | nok> DeviceAccessLocks 0x0000: <written/read values> <ok | nok> Warning "Locking implemented" (see NOTE): <exception>
NOTE If warning flag is set, text shall be displayed: "It is highly recommended not to implement the features. "parameter access locking" or "Data Storage locking" since they will be removed in future releases of the specification. Vendor to inform user".	

6.10.7 Device Access Locks – invalid

Table 112 defines the test conditions for this test case

Table 111 Device Access Locks – invalid

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0104
Name	WTCD_DLIC_DEFP_ ACCESSLOCKSINVAL
Purpose (short)	Behavior of DeviceAccessLocks with invalid values
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.4, Table B.11
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies that all reserved or unused values for DeviceAccessLocks are responded correctly.
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Write to DeviceAccessLocks subsequently the value "1" at a single bit position, which is marked as reserved and a value "0" at the remaining bit positions b) Read value DeviceAccessLocks c) Repeat from a) with next bit position
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check responses in step a) 2) Check response values in step b)
Test passed	Each response in 1) = PAR_VALOUTOFRNG (0x8030), and Each value = 0x0000
Test not passed (examples)	No negative response Any value ≠ 0x0000
Report	Device Access Locks reserved: <written/read values> <ok | nok> Device Access Locks 0x0000: <written/read values> <ok | nok>

6.10.8 Profile Characteristic

Table 112 defines the test conditions for this test case

Table 112 Profile Characteristic

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0105
Name	TCD_DLIC_DEFP_ PROFILCHARAC
Purpose (short)	Behavior of parameter ProfileCharacteristic
Equipment under test (EUT)	W-Device, W-Bridge without supported profiles
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.5; REF **3**
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test for implementation of parameter ProfileCharacteristic
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter ProfileCharacteristic (Index 0x000D)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check response
Test passed	Negative response with ErrorType = 0x8011 – *Index not available*
Test not passed (examples)	Different ErrorType or positive response
Report	Response: <negative/positive> <ok | nok> ErrorType: <value> <ok | nok>

6.10.9 PD Input Descriptor

Table 113 defines the test conditions for this test case

Table 113 PD Input Descriptor

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0106
Name	WTCD_DLIC_DEFP_ PDINDESC
Purpose (short)	Behavior of parameter PDInputDescriptor
Equipment under test (EUT)	W-Device, W-Bridge without supported profiles
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.6; REF **3**
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test for implementation of parameter PDInputDescriptor
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter PDInputDescriptor (Index 0x000E)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check response
Test passed	Negative response with ErrorType 0x8011 – *Index not available*
Test not passed (examples)	Different ErrorType or positive response
Report	Response: <negative/positive> <ok | nok> ErrorType: <value> <ok | nok>

6.10.10 PD Output Descriptor

Table 114 defines the test conditions for this test case

Table 114 PD Output Descriptor

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0107
Name	WTCD_DLIC_DEFP_ PDOUTDESC
Purpose (short)	Behavior of parameter PDOutputDescriptor
Equipment under test (EUT)	W-Device, W-Bridge without supported profiles
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.7; REF **3**
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test for implementation of parameter PDOutputDescriptor
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter PDOutputDescriptor (Index 0x000F)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check response
Test passed	Negative response with ErrorType 0x8011 – *Index not available*
Test not passed (examples)	Different ErrorType or positive response
Report	Response: <negative/positive> <ok | nok> ErrorType: <value> <ok | nok>

6.10.11 Vendor Name

Table 115 defines the test conditions for this test case

Table 115 Vendor Name

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0108
Name	WTCD_DLIC_DEFP_ VENDORNAM
Purpose (short)	Behavior of parameter VendorName
Equipment under test (EUT)	W-Device, W-Bridge with ISDU support
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.6
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter VendorName
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter VendorName (Index 0x0010)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check response 2) Check coding of parameter 3) Check parameter length 4) Check contents of parameter
Test passed	No negative response, and Parameter coded in UTF8, and Parameter length ≤ 64 octets, and Contents matches registered vendor for VendorID (VID)
Test not passed (examples)	Any of the evaluations fails
Report	VendorName response: <negative/positive> <ok | nok> VendorName UTF8 coding: <yes/no> <ok | nok> VendorName length: <value> <ok | nok> VendorName registration: <yes/no> <ok | nok>

6.10.12 Vendor Text

Table 116 defines the test conditions for this test case

Table 116 Vendor Text

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0109
Name	WTCD_DLIC_DEFP_ VENDORTEXT
Purpose (short)	Behavior of parameter VendorText
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.7
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter VendorText
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter VendorText (Index 0x0011)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check response on Read access 2) Check coding of parameter 3) Check parameter length 4) Check contents of parameter	
Test passed	No negative response, and Parameter coded in UTF8, and Parameter length ≤ 64 octets, and Contents matches vendor / Device specific information	
Test not passed (examples)	Any of the evaluations fails	
Report	VendorText response: <negative/positive> VendorText UTF8 coding: <yes/no> VendorText length: <value> VendorText adequate: <yes/no>	<ok | nok> <ok | nok> <ok | nok> <ok | nok>

6.10.13 Product Name

Table 117 defines the test conditions for this test case

Table 117 Product Name

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0110
Name	WTCD_DLIC_DEFP_ PRODUCTNAM
Purpose (short)	Behavior of parameter ProductName
Equipment under test (EUT)	W-Device, W-Bridge with ISDU support
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.8
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter ProductName
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter ProductName (Index 0x0012)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check response 2) Check coding of parameter 3) Check parameter length 4) Check contents of parameter	
Test passed	No negative response, and Parameter coded in UTF8, and Parameter length ≤ 64 octets, and Contents matches vendor / Device specific information	
Test not passed (examples)	Any of the evaluations fails	
Report	ProductName response: <negative/positive> ProductName UTF8 coding: <yes/no> ProductName length: <value> ProductName adequate: <yes/no>	<ok | nok> <ok | nok> <ok | nok> <ok | nok>

6.10.14 Product ID

Table 118 defines the test conditions for this test case

Table 118 Product ID

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0111
Name	WTCD_DLIC_DEFP_ PRODUCTID
Purpose (short)	Behavior of parameter ProductID
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter ProductID.
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter Product ID (Index 0x0013)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check response 2) Check coding of parameter 3) Check parameter length 4) Check contents of parameter	
Test passed	No negative response, and Parameter coded in UTF8, and Parameter length ≤ 64 octets, and Contents matches vendor / Device specific information	
Test not passed (examples)	Any of the evaluations fails	
Report	ProductID response: <negative/positive> ProductID UTF8 coding: <yes/no> ProductID length: <value> ProductID adequate: <yes/no>	<ok | nok> <ok | nok> <ok | nok> <ok | nok>

6.10.15 Product Text

Table 119 defines the test conditions for this test case

Table 119 Product Text

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0112
Name	WTCD_DLIC_DEFP_ PRODUCTID
Purpose (short)	Behavior of parameter ProductID
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter ProductText
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter Product Text (Index 0x0014)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check response 2) Check coding of parameter 3) Check parameter length 4) Check contents of parameter	
Test passed	No negative response, and Parameter coded in UTF8, and Parameter length ≤ 64 octets, and Contents matches vendor / Device specific information	
Test not passed (examples)	Any of the evaluations fails	
Report	ProductText response: <negative/positive> ProductText UTF8 coding: <yes/no> ProductText length: <value> ProductText adequate: <yes/no>	<ok | nok> <ok | nok> <ok | nok> <ok | nok>

6.10.16 Serial Number

Table 120 defines the test conditions for this test case

Table 120 Serial Number

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0113
Name	WTCD_DLIC_DEFP_ SERNUM
Purpose (short)	Behavior of parameter SerialNumber
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.11
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter SerialNumber
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter SerialNumber (Index 0x0015)
Test parameter	SerialNumber of the EUT provided by the manufacturer
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check response 2) Check coding of parameter 3) Check parameter length 4) Check contents of parameter	
Test passed	No negative response, and Parameter coded in UTF8, and Parameter length ≤ 16 octets, and Contents matches vendor / Device specific information	
Test not passed (examples)	Any of the evaluation steps fails	
Report	SerialNumber response: <negative/positive> SerialNumber UTF8 coding: <yes/no> SerialNumber length: <value> SerialNumber adequate: <yes/no>	<ok | nok> <ok | nok> <ok | nok> <ok | nok>

6.10.17 Hardware Revision

Table 121 defines the test conditions for this test case

Table 121 Hardware Revision

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0114
Name	WTCD_DLIC_DEFP_ HARDREV
Purpose (short)	Behavior of parameter HardwareRevision
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.12
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter HardwareRevision
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter HardwareRevision (Index 0x0016)
Test parameter	HardwareRevision of the EUT provided by the manufacturer
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check response 2) Check coding of parameter 3) Check parameter length 4) Check contents of parameter	
Test passed	No negative response, and Parameter coded in UTF8, and Parameter length ≤ 64 octets, and Contents matches vendor / Device specific information	
Test not passed (examples)	Any of the evaluations fails	
Report	HardwareRevision response: <negative/positive> HardwareRevision UTF8 coding: <yes/no> HardwareRevision length: <value> HardwareRevision adequate: <yes/no>	<ok | nok> <ok | nok> <ok | nok> <ok | nok>

6.10.18 Firmware Revision

Table 122 defines the test conditions for this test case

Table 122 Firmware Revision

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0115
Name	WTCD_DLIC_DEFP_ FIRMREV
Purpose (short)	Behavior of parameter FirmwareRevision
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.13
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter FirmwareRevision
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter FirmwareRevision (Index 0x0017)
Test parameter	FirmwareRevision of the EUT provided by the manufacturer
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check response 2) Check coding of parameter 3) Check parameter length 4) Check contents of parameter	
Test passed	No negative response, and Parameter coded in UTF8, and Parameter length ≤ 64 octets, and Contents matches vendor / Device specific information	
Test not passed (examples)	Any of the evaluations fails	
Report	FirmwareRevision response: <negative/positive> FirmwareRevision UTF8 coding: <yes/no> FirmwareRevision length: <value> FirmwareRevision adequate: <yes/no>	<ok | nok> <ok | nok> <ok | nok> <ok | nok>

6.10.19 Application Specific Tag – valid

Table 123 defines the test conditions for this test case

Table 123 Application Specific Tag – valid

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0116
Name	WTCD_DLIC_DEFP_ TAGVALID
Purpose (short)	Behavior of parameter ApplicationSpecificTag – valid strings
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.16, 10.3.4, and 10.3.5, Table 98, rule 6
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct behavior for write and read access to parameter ApplicationSpecific-Tag
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Write a random text string with length <specified fixed length> to parameter ApplicationSpecificTag (Index 0x0018) b) Read parameter ApplicationSpecificTag (Index 0x0018) c) Power OFF/ON of the Device d) Read parameter ApplicationSpecificTag (Index 0x0018)
Test parameter	Random text string with <specified fixed length> = manufacturer dependent (minimum 16 octets, maximum 32 octets).
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check response of Read and Write access 2) Compare contents and length of reading in step b) to written string in step a) 3) Compare contents and length of reading in step b) and step d)
Test passed	No negative responses, and String lengths in 2) = string lengths in 3) Contents in 2) = Contents in 3)
Test not passed (examples)	Negative response or comparison fails
Report	ApplicationSpecificTag string length: <ok | nok> ApplicationSpecificTag content: <ok | nok>

6.10.20 Application Specific Tag – invalid

Table 124 defines the test conditions for this test case

Table 124 Application Specific Tag – invalid

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0117
Name	WTCD_DLIC_DEFP_ TAGINVALID
Purpose (short)	Behavior of parameter ApplicationSpecificTag – invalid string length
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.14
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct behavior for Write and Read access with invalid string length to parameter ApplicationSpecificTag.
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter ApplicationSpecificTag (Index 0x0018) b) Write a random string with length <specified fixed length + 1> to parameter Application Specific Tag (Index 0x0018) c) Read parameter ApplicationSpecificTag (Index 0x0018)
Test parameter	Random text string with <specified fixed length> = manufacturer dependent (minimum 16 octets, maximum 32 octets)
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check Read responses 2) Check Write response 3) Compare contents and length of reading in step a) and step c)
Test passed	No negative Read responses, and Negative Write response = VAL_LENOVRRUN (0x8033), and Values in 3) are matching
Test not passed (examples)	No response
Report	ApplicationSpecificTag negative Write response: <yes/no> <ok | nok> ApplicationSpecificTag contents match: <yes/no> <ok | nok>

6.10.21 Error Count

Table 125 defines the test conditions for this test case

Table 125 Error Count

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0118
Name	WTCD_DLIC_DEFP_ ERRCOUNT
Purpose (short)	Behavior of parameter ErrorCount
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD (stimulation of ErrorCount possible)
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.19
Configuration / setup	W-Device-Tester-System, user interaction for stimulation is required

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter ErrorCount
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter ErrorCount (Index 0x0020) b) Stimulate error within Device specific technology (registered for ErrorCount) c) Read parameter ErrorCount (Index 0x0020) d) Power OFF/ON of the Device *;reset of ErrorCount* e) Read parameter ErrorCount (Index 0x0020)
Test parameter	Manufacturer defined stimulation of an error
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check Read responses 2) Check parameter length 3) Compare values from step a) and step c) if stimulation is possible 4) Check value of step e)
Test passed	No negative Read responses, and Parameter length = 2 octets, and ErrorCount in c) = ErrorCount in a) + 1, and ErrorCount in e) = 0x0000
Test not passed (examples)	Any of the evaluations fails
Report	ErrorCount: <length> <ok | nok> ErrorCount: <increment> <ok | nok> ErrorCount: <value> <ok | nok> No stimulation possible: <Exception>

6.10.22 Device Status

Table 126 defines the test conditions for this test case

Table 126 Device Status

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0119
Name	WTCD_DLIC_DEFP_ DEVSTAT
Purpose (short)	Behavior of parameter DeviceStatus
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.20
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter DeviceStatus
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter DeviceStatus (Index 0x0024)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check response 2) Check parameter length 3) Check parameter value	
Test passed	No negative response, and Parameter length = 1 octet, and "0" ≤ value ≤ 4	
Test not passed (examples)	No response	
Report	DeviceStatus response: <positive/negative> DeviceStatus length: <value> DeviceStatus: <value>	<ok | nok> <ok | nok> <ok | nok>

6.10.23 Detailed Device Status – complete object

Table 127 defines the test conditions for this test case

Table 127 Detailed Device Status – complete object

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0120
Name	WTCD_DLIC_DEFP_ DETAILDEVSTAT
Purpose (short)	Behavior of entire parameter DetailedDeviceStatus
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.17 and REF 7
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of the correct length of parameter DetailedDeviceStatus
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter DetailedDeviceStatus (Index 0x0025)
Test parameter	<record item count>
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check response 2) Check parameter length 3) Calculate <record item count> = parameter length / 3	
Test passed	No negative response, and Parameter length ≤ 64 x 3 octets, and 1 ≤ record item count is an integer value ≤ 64	
Test not passed (examples)	No response	
Report	DetailedDeviceStatus response: <positive/negative> DetailedDeviceStatus length: <value> DetailedDeviceStatus: <value>	<ok | nok> <ok | nok> <ok | nok>

6.10.24 Detailed Device Status – Event inactive

Table 128 defines the test conditions for this test case

Table 128 Detailed Device Status – Event inactive

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0121
Name	WTCD_DLIC_DEFP_ DETAILDEVSTATINACTIVE
Purpose (short)	Record contents in parameter DetailedDeviceStatus without active Events
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.17
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test correct contents of the parameter record DetailedDeviceStatus and initialization of the values.
Precondition	WDTU: Communication EUT: OPERATE, no active Event
Procedure	a) Read record of parameter DetailedDeviceStatus b) Parse result from beginning to end in steps of 3 octets and store values
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check values at each step b)
Test passed	Value at each step = "0x000000"
Test not passed (examples)	No response or value ≠ "0x000000"
Report	DetailedDeviceStatus Event inactive: <ok | nok>

6.10.25 Detailed Device Status – Event active

Table 129 defines the test conditions for this test case

Table 129 Detailed Device Status – Event active

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0122
Name	WTCD_DLIC_DEFP_ DETAILDEVSTATACTIVE
Purpose (short)	Record contents in parameter DetailedDeviceStatus with active Event
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.21
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of correct entry of active Events in parameter DetailedDeviceStatus
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Stimulate an incident in Device's specific technology causing an Event , using config7 (error or warning) b) Read record of parameter DetailedDeviceStatus c) Parse result from beginning to end in steps of 3 octets and store value d) Power OFF/ON of the Device e) Read record of parameter DetailedDeviceStatus f) Parse result from beginning to end in steps of 3 octets and store value
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check value at each procedure step c) 2) Check value at each procedure step f)
Test passed	Evaluation 1) One of the parsed Events equals the initiated Event of Step a) Evaluation 2) Check parsed values of Detailed Device Status against the active Events
Test not passed (examples)	- Incorrect values or no response - an initiated event does not appear in the Detailed Device Status
Report	DetailedDeviceStatus Event active: <ok | nok>

6.10.26 Process Data Input

Table 130 defines the test conditions for this test case

Table 130 Process Data Input

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0123
Name	WTCD_DLIC_DEFP_ PDIN
Purpose (short)	Behavior of parameter ProcessDataInput
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.18
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter ProcessDataInput
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter ProcessDataInput (Index 0x0028)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check Read response 2) Check parameter length 3) Check parameter contents
Test passed	No negative response, and Parameter length matches parameter ProcessDataIn (DPP1, address 0x05), and Unused bits = "0"
Test not passed (examples)	No response
Report	ProcessDataInput response: <positive/negative> <ok | nok> ProcessDataInput length: <value> <ok | nok> ProcessDataInput unused bits = "0": <yes/no> <ok | nok>

6.10.27 Process Data Output

Table 131 defines the test conditions for this test case

Table 131 Process Data Output

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0124
Name	WTCD_DLIC_DEFP_ PDOUT
Purpose (short)	Behavior of parameter ProcessDataOutput
Equipment under test (EUT)	W-Device, W-Bridge with adequate reference in IODD
Test case version	1.0
Category / type	W-Device application test: test to pass
Specification (clause)	REF 1, see Annex B.2.19
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of the correct contents and coding of parameter ProcessDataOutput
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read parameter ProcessDataOutput (Index 0x0029)
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check Read response 2) Check parameter length 3) Check parameter contents	
Test passed	No negative response, and Parameter length matches parameter ProcessDataOut (DPP1, address 0x06), and Unused bits = "0"	
Test not passed (examples)	No response	
Report	ProcessDataOutput response: <positive/negative> ProcessDataOutput length: <value> ProcessDataOutput unused bits = "0": <yes/no>	<ok | nok> <ok | nok> <ok | nok>

6.10.28 Profile Parameter – Read access

Table 132 defines the test conditions for this test case

Table 132 Profile Parameter – Read access

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0125
Name	WTCD_DLIC_DEFP_ PROFILEPARREAD
Purpose (short)	Behavior of unexpected profile parameter Read access
Equipment under test (EUT)	W-Device, W-Bridge supporting no profile: IODD attribute "features/ProfileCharacteristic" is not implemented within the IODD or contains no entries
Test case version	1.0
Category / type	W-Device application test: test to fail
Specification (clause)	REF 1, see Annex B.2.21
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of Read access to Profile specific parameters
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Read Profile parameters from Index 0x0031 to 0x003F
Test parameter	–
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check each Read response
Test passed	Negative response = IDX_NOTAVAIL (0x8011) upon each profile parameter
Test not passed (examples)	No negative response on profile parameters, or Negative response ≠ IDX_NOTAVAIL (0x8011)
Report	For all Read responses: Profile parameter response: <negative/positive> <ok | nok>

6.10.29 Profile Parameter – Write access

Table 133 defines the test conditions for this test case

Table 133 Profile Parameter – Write access

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0126
Name	WTCD_DLIC_DEFP_ PROFILEPARWRITE
Purpose (short)	Behavior of unexpected profile parameter Write access
Equipment under test (EUT)	W-Device, W-Bridge supporting no profile: IODD attribute "features/ProfileCharacteristic" is not implemented within the IODD or contains no entries
Test case version	1.0
Category / type	W-Device application test: test to fail
Specification (clause)	REF 1, see Annex B.2.21
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of Write access to Profile specific parameters
Precondition	WDTU: Communication EUT: OPERATE
Procedure	a) Write profile parameters from index 0x0031 to 0x003F with <values>
Test parameter	<values>: 0x0000
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check each Write response
Test passed	Negative response = IDX_NOTAVAIL (0x8011) upon each profile parameter
Test not passed (examples)	No negative response on profile parameters, or Negative response ≠ IDX_NOTAVAIL (0x8011)
Report	For all Write responses: Profile Parameter used response: <negative/positive> <ok | nok>

6.11 Wireless Parameter

6.11.1 WDeviceMode

The test of this parameter is covered by the Testcases in 6.3 Preoperate and 6.5 Operate

6.11.2 WirelessSystemMgmt

Table 134 defines the test conditions for this test case.

Table 134 WirelessSystemMgmt

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0127
Name	WTCD_DLPC_WLSP_WLSYSMGMT
Purpose (short)	Correct values of WirelessSystemMgmt (UniqueID) as indicated in IODD
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device W-Parameter test
Specification (clause)	See REF 2, clause C.4.4
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the value of WirelessSystemMgmt (UniqueID)
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read W-Parameter UniqueID (Index 0x5001 Subindex 1) via the WDTU b) Break down the UniqueID into VendorID, DeviceID, and DeviceDistinguishingID
Test parameter	VendorIDIODD = *node DeviceIdentity, attribute vendorId* VendorIDAssigned = *VendorID @ https://io-link.com/share/Downloads/Vendor_ID_Table.xml* DeviceIDIODD = *node DeviceIdentity, attribute deviceId*
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After b) check VendorID(W-Device) and DeviceID(W-Device) 2) Check DeviceDistinguishingID(W-Device)
Test passed	a) VendorID(W-Device) = VendorIDIODD, and VendorID(W-Device) = VendorIDAssigned, and b) DeviceID(W-Device) = DeviceIDIODD, and DeviceID(W-Device) > 0, and c) DeviceDistinguishingID(W-Device) ≠ "0"
Test not passed (examples)	Any of the evaluations failed
Report	VendorIDIODD: <value> VendorIDAssigned: <value> VendorID(W-Device): <value> DeviceIDIODD: <value> DeviceID(W-Device): <value> DeviceDistinguishingID(W-Device) <ok | nok>

6.11.3 WirelessSystemCfg

Table 135 defines the test conditions for this test case.

Table 135 WirelessSystemMgmt

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0128
Name	WTCD_DLPC_WLSP_WLSYSCFG
Purpose (short)	Correct values of WirelessSystemCfg
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device W-Parameter test: test to pass
Specification (clause)	See REF 2, clause C.4.4
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the values in WirelessSystemCfg. The values IMATime, MaxRetry and TxPower shall match the values provided by the W-Master and shall be valid.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Configure the W-Port of WDTU with test parameter b) WDTU starts communication with W-Device c) Monitor IMATime, MaxRetry and TxPower written to the W-Device at W-Device startup d) Read W-Parameter WirelessSystemCfg (Index 0x5002, Subindex 0) via the WDTU in one go
Test parameter	W-Port configuration with valid values for IMATime, MaxRetry and TxPower according to IODD.
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After d) check IMATime, MaxRetry and TxPower. They shall match the values written to the W-Device at startup and shall be valid.
Test passed	a) Value of IMATime is equal to value written at W-Device startup, and b) Value of MaxRetry is equal to value written at W-Device startup, and c) Value of TxPower is equal to value written at W-Device startup
Test not passed (examples)	Any of the evaluations failed
Report	IMATime: <value> MaxRetry: <value> TxPower: <value> <ok | nok>

6.11.4 WirelessQuality

Table 136 defines the test conditions for this test case.

Table 136 WirelessQuality

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0129
Name	WTCD_DLPC_WLSP_WLQUALITY
Purpose (short)	Valid values of WirelessQuality
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device W-Parameter test: test to pass
Specification (clause)	See REF **2**, clause C.4.8
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of valid values of parameters LQI_D and RSSI_D, if W-Parameter WirelessQuality is provided. The values shall match the datatypes and limits as specified. If EUT is a low energy W-Device, check for error message “Index not available”.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read W-Parameter WirelessQuality (Index 0x5003, Subindex 0) via the WDTU in one go
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After a) If EUT is a low energy W-Device, check for error message “Index not available”. If not, check the values of LQI_D and RSSI_D. The values shall match the datatypes and limits as specified, or parameter is set to INVALID.
Test passed	a) Result is an error message with “Index not available” (error code: 0x80, additional code: 0x11) or b) Value of LQI_D is between 0 and 100, or 255 (INVALID) and c) Value of RSSI_D is between -128 and 20, or 127 (INVALID)
Test not passed (examples)	Any of the evaluations failed
Report	Error “Index not available”: <yes> or LQI_D: <value> RSSI_D: <value> <ok | nok>

6.11.5 WBridgeInfo

Table 137 defines the test conditions for this test case.

Table 137 WBridgeInfo

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0130
Name	WTCD_DLPC_WLSP_WLBRIDGEINFO
Purpose (short)	Correct values of WBridgeInfo
Equipment under test (EUT)	W-Device or W-Bridge
Test case version	1.0
Category / type	W-Device W-Parameter test: test to pass
Specification (clause)	See REF **2**, clause C.4.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	If EUT is a W-Device, check for error message “Index not available”. If EUT is a W-Bridge, check the parameters WBridgeInfo: BDeviceID, BVendorID, BFunctionID, BDevice DistinguishingID and ConnectionStatus.
Precondition	WDTU: W-Device or W-Bridge is in Operate state. EUT: OPERATE
Procedure	a) Read W-Parameter WBridgeInfo (Index 0x5004, Subindex 0) via the WDTU in one go
Test parameter	VendorIDIODD = *node DeviceIdentity, attribute vendorId* VendorIDAssigned = *VendorID @ https://io-link.com/share/Downloads/Vendor_ID_Table.xml* DeviceIDIODD = *node DeviceIdentity, attribute deviceId*
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After a) If EUT is a W-Device: Check for error message “Index not available” (error code: 0x80, Additional code: 0x11) If EUT is a W-Bridge: Check the values BDeviceID, BVendorID, BFunctionID, BDevice DistinguishingID and ConnectionStatus. The values shall match the specified values.
Test passed	If EUT is a W-Device a) Result is an error message with “Index not available” (error code: 0x80, Additional code: 0x11) If EUT is a W-Bridge: b) VendorID(W-Bridge) = VendorIDIODD, and VendorID(W-Bridge) = VendorIDAssigned, and c) DeviceID(W-Bridge) = DeviceIDIODD, and DeviceID(W-Bridge) > 0, and d) DeviceFunctionID(W-Bridge) = "0" e) DeviceDistinguishingID(W-Bridge) ≠ "0" f) ConnectionStatus(W-Bridge) = “0x10” or “0x00”
Test not passed (examples)	Any of the evaluations failed
Report	Error “Index not available”: <yes> or VendorIDIODD: <value> VendorIDAssigned: <value> VendorID(W-Bridge): <value> DeviceIDIODD: <value> DeviceID(W-Bridge): <value> DeviceDistinguishingID(W-Bridge) ConnectionStatus(W-Bridge) <ok | nok>

6.11.6 WRadioInfo

Table 138 defines the test conditions for this test case.

Table 138 WRadioInfo

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0131
Name	WTCD_DLPC_WLSP_ WLRADIOINFO
Purpose (short)	Correct value of WRadioInfo
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device W-Parameter test: test to pass
Specification (clause)	See REF 2, clause C.4.5
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct values of WRadioInfo. The values RadioVendorID, RadioModuleID, RadioHWRevision and RadioSWRevision shall match the values provided by the Radio-Module Vendor.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read W-Parameter WRadioInfo (Index 0x5005, Subindex 0) via the WDTU in one go
Test parameter	RadioVendorIDprovided = *VendorID @ https://io-link.com/share/Downloads/Vendor_ID_Table.xml* RadioModuleIDprovided = *provided by Radio-Module Vendor* RadioHWRevisionprovided = *provided by Radio-Module Vendor* RadioSWRevisionprovided = *provided by Radio-Module Vendor*
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After a) check if RadioVendorID, RadioModuleID, RadioHWRevision and RadioSWRevision
Test passed	a) RadioVendorID(W-Device) = RadioVendorIDprovided, and b) RadioModuleID(W-Device) = RadioModuleIDprovided, and c) RadioHWRevision(W-Device) = RadioHWRevisionprovided, and d) RadioSWRevision(W-Device) = RadioSWRevisionprovided
Test not passed (examples)	Any of the evaluations failed
Report	RadioVendorIDprovided: <Value> RadioVendorID(W-Device): <Value> RadioModuleIDprovided: <Value> RadioModuleID(W-Device): <Value> RadioHWRevisionprovided: <Value> RadioHWRevision(W-Device): <Value> RadioSWRevisionprovided: <value> RadioSWRevision(W-Device): <value> <ok | nok>

6.11.7 AdaptiveHopTable

Table 139 defines the test conditions for this test case.

Table 139 AdaptiveHopTable

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0132
Name	WTCD_DLPC_WLSP_WLADAPTHOP
Purpose (short)	Write and read of AdaptiveHopTable parameters
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device W-Parameter test: test to pass
Specification (clause)	See REF 2, clause C.4.10 and H.4
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of the W-Device behaviour and read result after write access to the W-Parameter AdaptiveHopTable
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Write random valid values via the WDTU to the parameters of W-Parameter AdaptiveHopTable (Index 0x5006 Subindexes 1, 2, 3 and 4) b) Read back values
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check validity of a Write access to W-Parameter AdaptiveHopTable 2) Compare values written to and read from W-Parameter AdaptiveHopTable
Test passed	a) If no errors or events occurred, and b) Read values match written values
Test not passed (examples)	Any of the evaluations failed
Report	Errors / Events: <no/yes> Written value: <value> Read value: <value> <ok | nok>

1262 ### 6.11.8 WCycleTime

1263 Table 140 defines the test conditions for this test case.

1264 **Table 140 WCycleTime**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0133
Name	WTCD_DLPC_WLSP_WCYCLETIME
Purpose (short)	Test for correct values of WCycleTime
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device W-Parameter test: test to pass
Specification (clause)	See REF 2, clause C.4.12
Configuration / setup	W-Device-Tester-System

1265

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the values in WCycleTime. The values of WMinCycleTimeOut and WMinCycleTimeIn shall match the W-Device specific default settings as indicated in IODD and it shall be valid according to specified coding. The values of WMasterCycleTimeOut and WMasterCycleTimeIn shall match the values transmitted by the W-Master (WDTU).
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) Read W-Parameter WCycleTime (Index 0x5007, Subindex 0) via the WDTU in one go
Test parameter	WMinCycleTimeOutIODD = *node PhysicalLayer, attribute WMinCycleTimeOut in IODD* WMinCycleTimeInIODD = *node PhysicalLayer, attribute WMinCycleTimeIn in IODD*
Post condition	-

1266

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) After a) compare WMinCycleTimeOut(Device) with WMinCycleTimeOutIODD and WMinCycleTimeIn(Device) with WMinCycleTimeInIODD 2) After a) compare WMasterCycleTimeOut(Master) with WMasterCycleTimeOut(Device) and WMasterCycleTimeIn(Master) with WMasterCycleTimeIn(Device)
Test passed	Values match and Time Base of WMinCycleTimeOut and WMinCycleTimeIn = 1
Test not passed (examples)	Mismatch of values or Time Base of WMinCycleTimeOut or WMinCycleTimeIn ≠ 1
Report	WMinCycleTimeOut(Device): <value> WMinCycleTimeOutIODD: <value> Time Base Out: <value> WMinCycleTimeIn(Device): <value> WMinCycleTimeInIODD: <value> Time Base In: <value> WMasterCycleTimeOut(Master): <value> WMasterCycleTimeOut(Device): <value> WMasterCycleTimeIn(Master): <value> WMasterCycleTimeIn(Device): <value> <ok | nok>

1267

1268

6.12 Process Data

6.12.1 W-Device propagates "PD invalid" indication in a correct manner

Table 141 defines the test conditions for this test case.

Table 141 W-Device propagates "PD invalid" indication in a correct manner

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0134
Name	WTCD_ DLPD_CYCC_PDIVPROP
Purpose (short)	W-Device propagates "PD invalid" indication in a correct manner
Equipment under test (EUT)	W-Device except W-Devices with zero length process data output
Test case version	1.0
Category / type	W-Device protocol test, test to pass
Specification (clause)	REF 2, clause 7.3.4
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	PDValid – PDInvalid transition is handled correctly.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) WDTU provides PDOut b) Evaluation 1) c) WDTU provides “PDInvalid” d) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check if valid PDOut is set at the W-Device 2) Check if the W-Device performs the "PDInvalid" handling. For example, it marks the PDs as invalid by indicator or disables its outputs
Test passed	Valid PDOut is set, and W-Device “PDInvalid” handling is performed
Test not passed (examples)	Valid PDOut is not set, and/or W-Device “PDInvalid” handling is not performed
Report	"PDInvalid" = 1 handled correctly by the W-Device: <ok | nok>

6.12.2 W-Device propagates "PD valid" indication in a correct manner

Table 142 W-Device propagates "PD valid" indication in a correct manner defines the test conditions for this test case.

Table 142 W-Device propagates "PD valid" indication in a correct manner

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0135
Name	WTCD_ DLPD_CYCC_PDVPROP
Purpose (short)	W-Device propagates "PDValid" indication in a correct manner
Equipment under test (EUT)	W-Device except W-Devices with zero length process data output
Test case version	1.0
Category / type	W-Device protocol test, test to pass
Specification (clause)	REF 2, clause 7.3.4
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	PDInvalid – PDValid transition is handled correctly.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) WDTU provides “PDInvalid” b) Evaluation 1) c) WDTU provides PDOut d) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check if the W-Device performs the "PDInvalid" handling. For example, it marks the PDs as invalid by indicator or disables its outputs 2) Check if valid PDOut is set at the W-Device
Test passed	W-Device “PDInvalid” handling is performed, and valid PDOut is set
Test failed (examples)	W-Device “PDInvalid” handling is not performed, and/or valid PDOut is not set
Report	"PDInvalid" = 0 handled correctly by the W-Device: <ok | nok>

6.12.3 W-Device generates "PD invalid" indication in a correct manner

Table 143 defines the test conditions for this test case.

Table 143 W-Device generates "PD invalid" indication in a correct manner

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0136
Name	WTCD_ DLPD_CYCC_PDIVGEN
Purpose (short)	W-Device generates "PD invalid" indication in a correct manner
Equipment under test (EUT)	W-Device except W-Devices with zero length process data input or not able to invalidate data
Test case version	1.0
Category / type	W-Device protocol test, test to pass
Specification (clause)	REF 2, clause 7.3.5
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test PDValid – PDInvalid transition on process data input
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE (able to provide valid Process Data In)
Procedure	a) WDTU reads PDIn1 ;PDValid b) Evaluation 1) c) EUT is prompted to set the PDIn to “PDInvalid” d) WDTU reads PDIn2 ;PDInvalid e) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check if valid PDIn1 is transmitted 2) Check if PDIn2 is “PDInvalid”
Test passed	Valid PDIn1 is transmitted, and PDIn2 is “PDInvalid”
Test not passed (examples)	Any of the evaluations failed
Report	"PDInvalid" = 1 is generated by W-Device: <ok | nok>

6.12.4 W-Device generates "PD valid" indication in a correct manner

Table 144 defines the test conditions for this test case.

Table 144 W-Device generates "PD valid" indication in a correct manner

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0137
Name	WTCD_ DLPD_CYCC_PDVGEN
Purpose (short)	W-Device generates "PDValid" indication in a correct manner
Equipment under test (EUT)	W-Device except W-Devices with zero length process data input or not able to invalidate data
Test case version	1.0
Category / type	W-Device protocol test, test to pass
Specification (clause)	REF **2**, clause 7.3.5
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test if PDInvalid – PDValid transition on process data input.
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE (able to provide valid Process Data In)
Procedure	a) EUT is prompted to set the PDIn to “PDInvalid” b) WDTU reads PDIn1 ;PDInvalid c) Evaluation 1) d) EUT is prompted to set the PDIn to “PDValid” e) WDTU reads PDIn2 ;PDValid f) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check if PDIn1 is “PDInvalid” 2) Check if valid PDIn2 is transmitted
Test passed	PDIn1 is “PDInvalid”, and Valid PDIn2 is transmitted
Test failed (examples)	Any of the evaluations failed
Report	"PDInvalid" = "0" generated by W-Device: <ok | nok>

6.12.5 Segmentation

Table 145 defines the test conditions for this test case.

Table 145 W-Device segments Input process data into multiple W-Sub-cycles

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0138
Name	WTCD_ DLPD_CYCC_SEGMENT
Purpose (short)	W-Device segments Input process-data into multiple W-Cycles
Equipment under test (EUT)	W-Device with PDIn trigger possibility, except W-Devices which have not enough data for segmentation
Test case version	1.0
Category / type	W-Device protocol test, test to pass
Specification (clause)	REF 2, clauses 7.3.5, 7.7.2
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	If the process data does not fit into one W-Cycle, it needs to be transmitted on multiple W-Sub-cycles
Precondition	WDTU: W-Device is in Operate state. EUT: OPERATE
Procedure	a) EUT updates the process-data PDIn b) WDTU perform Evaluation 1)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) W-Cycle 1 contains first segment of PDIn with FC=START and following W-Cycles contain next segments of PDIn with FC=COUNT or FC=0x0B-0x18 for last segment
Test passed	Evaluation 1) is succeeded
Test not passed (examples)	Any of the evaluations failed
Report	Process-data input segmentation: <ok | nok>

6.12.6 Retry Handling

Table 146 defines the test conditions for this test case.

Table 146 W-Device retransmits process-data on lost

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0139
Name	WTCD_ DLPD_CYCC_RETRY
Purpose (short)	W-Device retransmits process-data on lost and generates Event
Equipment under test (EUT)	W-Device with PDIn trigger possibility
Test case version	1.0
Category / type	W-Device protocol test, test to pass
Specification (clause)	REF 2, clauses 7.3.5, 7.7.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The W-Device tries up to MaxRetry count sending the process data input. If the limit is reached, it sends an IOLW_RETRY_ERROR event.
Precondition	WDTU: W-Device is unpaired, port not configured EUT: UNPAIRED
Procedure	a) SMI_PortConfiguration (ABPS_NOTYPE_CHECK< UniqueID = EUT UniqueID, MaxRetry = 2 >) ;Test parameter b) TM_AWAIT_PORT_STATUS(OPERATE) ;wait for OPERATE c) WDTU is configured to respond to all uplinks of the EUT with ACK = “0” d) EUT updates the process-data PDIn e) Evaluation 1) f) Evaluation 2)
Test parameter	MaxRetry = 2
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) EUT re-transmits PDIn at least “MaxRetry” times 2) After “MaxRetry” re-transmits without ACK, the EUT sends the event D_IOLW_RETRY_ERROR (0xFFB0)
Test passed	PDIn is re-transmitted, and D_IOLW_RETRY_ERROR is raised after “MaxRetry” re-transmits
Test not passed (examples)	PDIn is not re-transmitted, and/or D_IOLW_RETRY_ERROR is not raised or raised too early
Report	D_IOLW_RETRY_ERROR sent to WDTU: <ok | nok>

6.12.7 W-Device PD handling in STARTUP and PREOPERATE

Table 147 defines the test conditions for this test case.

Table 147 W-Device PD handling in STARTUP and PREOPERATE

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0140
Name	WTCD_ DLPD_CYCC_PDVGEN
Purpose (short)	W-Device does not handle any process data exchange in STARTUP and PREOPERATE.
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device protocol test, test to pass
Specification (clause)	REF **2**, clauses 7.3.1, 7.2.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test that process data is not handled in STARTUP or PREOPERATE mode
Precondition	WDTU: W-Device in STARTUP mode
Procedure	a) WDTU sends PDOut to the W-Device b) Evaluation 1) c) WDTU sends MasterCommand 0x9A ;switch to PREOPERATE mode d) WDTU sends PDOut to the W-Device e) Evaluation 1)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check that no process data is handled: W-Device does not set the PDOut at its physical outputs.(Sensor: W-Device does not send PDIn).
Test passed	W-Device does not handle any process data exchange in STARTUP. W-Device does not handle any process data exchange in PREOPERATE.
Test not passed (examples)	W-Device handles any process data exchange in STARTUP, and/or W-Device handles any process data exchange in PREOPERATE.
Report	W-Device does not handle any process STARTUP: <ok | nok> W-Device does not handle any process PREOPERATE: <ok | nok>

6.13 Block parameter

6.13.1 General

The manufacturer/vendor of a W-Device shall provide information about a possible Block Parameter set enabling the performance of the following tests. This Block Parameter set shall comply with the requirements of the test cases 6.13.2 through 6.13.14.

6.13.2 Block parameter – Download

Table 148 defines the test conditions for this test case.

Table 148 Block parameter – Download

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0141
Name	WTCD_DSBP_APPL_BPDOWNLOAD
Purpose (short)	Test of Block Parameter download
Equipment under test (EUT)	W-Device with option "blockParameter" indicated in IODD
Test case version	1.0
Category / type	W-Device protocol test; test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of Block Parameter download
Precondition	WDTU: W-Device is in Operate state. EUT: No Block parameterization is active
Procedure	a) Write SystemCommand (0x0002): 0x03 (ParamDownloadStart) b) Write Block Parameters listed by the manufacturer c) Write SystemCommand (0x0002): 0x04 (ParamDownloadEnd)
Test parameter	Parameter set defined in 6.8.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step a) that no ErrorType has been received 2) Check during step b) that no ErrorType has been received 3) Check after step c) that no ErrorType has been received
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or any evaluation negative
Report	Write "ParamDownloadStart" <ok | nok> Write Block parameter <ok | nok> Write "ParamDownloadEnd" <ok | nok

6.13.3 Block parameter – Break by command

Table 149 defines the test conditions for this test case.

Table 149 Block parameter – Break by command

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0142
Name	WTCD_DSBP_APPL_BPBREAKCMD
Purpose (short)	Test break of Block Parameter transfer per command
Equipment under test (EUT)	W-Device with option "blockParameter" indicated in IODD
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	W-Device shall discard any change of parameters when receiving a SystemCommand "ParamDownloadBreak"
Precondition	WDTU: W-Device is in Operate state. EUT: No Block parameterization is active
Procedure	a) Read one parameter (see field Test parameter) and buffer it as <value1> b) Write SystemCommand "ParamDownloadStart" c) Write parameter from step a) with <value2> ≠ <value1> d) Write SystemCommand "ParamDownloadBreak" e) Read parameter from step a) f) Write SystemCommand "ParamDownloadEnd" g) Read parameter from step a)
Test parameter	Parameter set defined in 6.8.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step b) that no ErrorType has been received 2) Check after step d) that no ErrorType has been received 3) Check after step e) that received value matches <value1> 4) Check after step f) that ErrorType 0x8036 has been received 5) Check after step g) that received value matches <value1>
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or evaluations negative
Report	Write "ParamDownloadBreak" <ok | nok> Rollback to previous value after break <ok | nok> Write "ParamDownloadEnd" <ok | nok> Non-volatile storage after ParamDownloadEnd <ok | nok>

6.13.4 Block parameter – Break by reset

Table 150 defines the test conditions for this test case.

Table 150 Block parameter – Break by reset

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0143
Name	WTCD_DSBP_APPL_BPBREAKRESET
Purpose (short)	Test break of Block Parameter transfer per reset
Equipment under test (EUT)	W-Device with option "blockParameter" indicated in IODD
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, that a W-Device discards any change of parameters if a reset occurs during parametrization
Precondition	WDTU: W-Device is in Operate state. EUT: No Block parametrization is active
Procedure	a) Read one Parameter (see field Test parameter) and buffer it as <value1> b) Write SystemCommand "ParamDownloadStart" c) Write parameter from step a) with <value2> ≠ <value1> d) Reset the W-Device either (descending priority based on availability) - using SystemCommand "DeviceReset" or - using power off/on cycle e) Set W-Device into communication f) Read Parameter from step a) g) Write SystemCommand "ParamDownloadEnd" h) Read Parameter from step a)
Test parameter	Parameter set defined in 6.8.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step b) that no ErrorType has been received 2) Check after step e) that Device communication is active 3) Check after step f) that received value matches <value1> 4) Check after step g) that ErrorType 0x8036 has been received 5) Check after step h) that received value matches <value1>
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or evaluations negative
Report	Write "ParamDownloadBreak" <ok | nok> Communication restart <ok | nok> Rollback to previous value after communication restart <ok | nok> Write "ParamDownloadEnd" <ok | nok> Non-volatile storage after ParamDownloadEnd <ok | nok>

6.13.5 Block parameter – Illegal parameter write

Table 151 defines the test conditions for this test case.

Table 151 Block parameter – Illegal parameter write

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0144
Name	WTCD_DSBP_APPL_BPBREAKILLPARAM
Purpose (short)	Test break of Block parameter transfer by illegal parameter
Equipment under test (EUT)	W-Device with option “blockParameter” indicated in IODD
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	W-Device shall discard any change of parameters if an illegal parameter occurs during parameterization
Precondition	WDTU: W-Device is in Operate state. EUT: No Block parametrization is active
Procedure	a) Read one parameter (see Test parameter) and buffer it as <value1> b) Write SystemCommand "ParamDownloadStart" c) Write parameter from step a) with <value2> ≠ <value1> d) Write another parameter using an illegal structure (incorrect data length) e) Write SystemCommand "ParamDownloadEnd" f) Read parameter from step a)
Test parameter	Parameter set defined in 6.8.1
Post condition	–

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	1) Check after step c) that no ErrorType has been received 2) Check after step d) that ErrorType 0x8033 or 0x8034 has been received 3) Check after step e) that ErrorType 0x8041 has been received 4) Check after step f) that received parameter matches <value1>	
Test passed	All evaluation steps with positive result	
Test not passed (examples)	No response or any evaluation negative	
Report	Write "ParamDownloadStart" Device behavior upon illegal structure Write "ParamDownloadEnd" Rollback to previous value after inconsistent parameter block	<ok | nok> <ok | nok> <ok | nok> <ok | nok>

6.13.6 Block parameter – Break by double download

Table 152 defines the test conditions for this test case.

Table 152 Block parameter – Break by double download

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0145
Name	WTCD_DSBP_APPL_BPBREAK2DOWNLOADS
Purpose (short)	Test break of Block Parameter transfer by double SystemCommand "ParamDownloadStart"
Equipment under test (EUT)	W-Device with option "blockParameter" indicated in IODD
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	W-Device shall discard any change of parameters if Block parameterization is restarted via a new "ParamDownloadStart" during a running Block parameter transfer
Precondition	WDTU: W-Device is in Operate state EUT: No block parametrization is active
Procedure	a) Read one parameter (see field Test parameter) and buffer it as <value1> b) Write SystemCommand "ParamDownloadStart" c) Write parameter from step a) with <value2> ≠ <value1> d) Write SystemCommand "ParamDownloadStart" e) Write all parameters in field Test parameter, except those used in step a) f) Write SystemCommand "ParamDownloadEnd" g) Read parameter from step a)
Test parameter	Parameter set defined in 6.8.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step b) that no ErrorType has been received 2) Check after step d) that no ErrorType has been received 3) Check during step e) that no ErrorType has been received 4) Check after step f) that no ErrorType has been received 5) Check after step g) that received value matches <value1>
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or evaluations negative
Report	Write "ParamDownloadStart" <ok | nok> Write second "ParamDownloadStart" while block is unfinished <ok | nok> Write Block parameter <ok | nok> Write "ParamDownloadEnd" <ok | nok> Rollback to previous values via second “ParamDownloadStart” <ok | nok>

6.13.7 Block parameter – local locking

Table 153 defines the test conditions for this test case.

Table 153 Block parameter – local locking

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0146
Name	WTCD_DSBP_APPL_BPBREAKLOCALLOCK
Purpose (short)	Test locking of local parametrization during Block Parameter transfer
Equipment under test (EUT)	W-Device with option Block Parameter indicated in IODD, and local parameterization capability (on-board)
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Local access and change of parameterization shall be locked during Block parameterization
Precondition	WDTU: W-Device is in Operate state EUT: No block parametrization is active
Procedure	a) Read one parameter from A) and buffer it as <value1> b) Read parameter B) and buffer it as <value2> c) Write SystemCommand "ParamDownloadStart" d) Write parameter from step a) with <value2> ≠ <value1> e) Try to change parameter B) via local parameterization f) Write SystemCommand "ParamDownloadEnd" g) Read parameter from step a) h) Read parameter B)
Test parameter	A) Parameter set defined in REF 4 in 6.7.1.1 B) Parameter in A) that can be changed by local parametrization (on-board) and via IO-Link Wireless communication
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step c) that no ErrorType has been received 2) Check during step e) that the Device denies the trial of local parameterization 3) Check after step f) that no ErrorType has been received 4) Check after step g) that received value does not match <value1> 5) Check after step h) that received value matches <value2>
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or evaluations negative
Report	Write "ParamDownloadStart" <ok | nok> Inhibited local parametrization <ok | nok> Write "ParamDownloadEnd" <ok | nok> Non-volatile storage after "ParamDownloadEnd" <ok | nok> Rejection of local changes <ok | nok>

6.13.8 ParameterManager – Unexpected commands in Idle

Table 154 defines the test conditions for this test case.

Table 154 ParameterManager – Unexpected commands in Idle

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0147
Name	WTCD_DSBP_APPL_UNEXPECTEDINIDLE
Purpose (short)	Test of unexpected commands in state Idle of ParameterManager
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, 10.6.11, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	W-Device shall issue the correct ErrorType after receiving an unexpected block ending command while ParameterManager is in state Idle.
Precondition	WDTU: W-Device is in Operate state EUT: No block parametrization is active
Procedure	a) Write SystemCommand "ParamUploadEnd" b) Write SystemCommand "ParamBreak" c) Write SystemCommand "ParamDownloadEnd"
Test parameter	"blockParameter" <true / false> indicated in IODD
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) After steps a) to c), check received ErrorType
Test passed	ErrorType = 0x8036 if blockParameter <true>, OR ErrorType = 0x8035 if blockParameter <false>
Test not passed (examples)	No response or incorrect ErrorTypes
Report	Unexpected actions in ParameterManager state Idle <ok | nok>

6.13.9 ParameterManager – Write request during Upload

Table 155 defines the test conditions for this test case

Table 155 ParameterManager – Write request during Upload

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0148
Name	WTCD_DSBP_APPL_WRITEINUPLOAD
Purpose (short)	Test of reaction on write accesses during an active Block Upload
Equipment under test (EUT)	W-Device with option "blockParameter" indicated in IODD
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, 10.6.11, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	W-Device shall not accept any write accesses to parameters except via SystemCommands during an active Block Upload. The SystemCommand is already tested in other test cases.
Precondition	WDTU: W-Device is in Operate state. EUT: No block parametrization is active
Procedure	a) Write SystemCommand "ParamUploadStart" b) Write any parameter which is not excluded from DataStorage c) Write SystemCommand "ParamUploadEnd" d) Write any parameter which is not excluded from DataStorage
Test parameter	One parameter of the parameter sets defined in 6.8.1
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step b) that ErrorType 0x8022 has been received 2) Check after step d) that no ErrorType has been received
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or any evaluation negative
Report	Write restriction during Block parameter Upload <ok | nok>

6.13.10 ParameterManager – Read requests during Download

Table 156 defines the test conditions for this test case

Table 156 ParameterManager – Read requests during Download

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0149
Name	WTCD_DSBP_APPL_READINDOWNLOAD
Purpose (short)	Test of reaction on read accesses during active Download
Equipment under test (EUT)	W-Device with option "blockParameter" indicated in IODD
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, 10.6.11, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	W-Device shall not accept any Read accesses to parameters during an active Block Download.
Precondition	WDTU: W-Device is in Operate state. EUT: No block parametrization is active
Procedure	a) Write SystemCommand "ParamDownloadStart" b) Read Test parameter c) Read DataStorageIndex, Index 3, SubIndex 0 d) Write SystemCommand "ParamDownloadEnd" e) Read Test parameter
Test parameter	One parameter of the parameter sets defined in 6.8.1
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step b) that ErrorType 0x8022 has been received 2) Check after step c) that no ErrorType has been received 3) Check after step e) that no ErrorType has been received
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or any evaluation negative
Report	Read restriction during Block parameter Download <ok | nok>

6.13.11 ParameterManager – Unexpected commands during Upload

Table 157 defines the test conditions for this test case.

Table 157 ParameterManager – Unexpected commands during Upload

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0150
Name	WTCD_DSBP_APPL_UNEXPINUPLOAD
Purpose (short)	Test of reaction on unexpected SystemCommands during active Upload
Equipment under test (EUT)	W-Device with option "blockParameter" indicated in IODD
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, 10.6.11, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	During an active Block Upload, a Device shall react on unexpected SystemCommands, abort the ongoing process and switch to the requested state.
Precondition	WDTU: W-Device is in Operate state. EUT: - No Event pending or active - DataStorage of the Device is inactive and DS_UPLOAD_FLAG is "0" - No Block parametrization is active
Procedure	a) Write SystemCommand "ParamUploadStart" b) Write Test parameter A) c) Write SystemCommand "ParamUploadStart" d) Write Test parameter A) e) Write SystemCommand "ParamDownloadEnd" f) Write Test parameter A) If "dataStorage" = <true> g) Write SystemCommand "ParamUploadStart" h) Write SystemCommand "ParamDownloadStore" i) Wait for Event (max 1s) and read DataStorage Index j) Write DS_Command "DS_UploadEnd"
Test parameter	A) One parameter of the parameter sets defined in 6.8.1 B) dataStorage <true / false> indicated in IODD
Post condition	–

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step b) that ErrorType 0x8022 has been received 2) Check after step d) that ErrorType 0x8022 has been received 3) Check after step f) that no ErrorType has been received If "dataStorage" = <true> 4) Check after step i) that Event with code DS_UPLOAD_REQ has been received 5) and DS_UPLOADREQ = "1"
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or any evaluation negative
Report	Reaction on unexpected commands in Upload <ok | nok>

6.13.12 ParameterManager – Unexpected switches Upload/Download

Table 158 defines the test conditions for this test case.

Table 158 ParameterManager – Unexpected switches Upload/Download

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0151
Name	WTCD_DSBP_APPL_SWITCHSTATES
Purpose (short)	Test of reaction on unexpected switches between Upload and Download
Equipment under test (EUT)	W-Device with option "blockParameter" indicated in IODD
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, 10.6.11, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Any Upload or Download shall be interrupted by the start of the opposite action.
Precondition	WDTU: W-Device is in Operate state. EUT: No block parametrization is active
Procedure	a) Write SystemCommand "ParamUploadStart" b) Write Test parameter c) Write SystemCommand "ParamDownloadStart" d) Read Test parameter e) Write SystemCommand "ParamUploadStart" f) Write Test parameter g) Write SystemCommand "ParamUploadEnd"
Test parameter	One parameter of the parameter sets defined in 6.8.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step b) that ErrorType 0x8022 has been received 2) Check after step d) that ErrorType 0x8022 has been received 3) Check after step f) that ErrorType 0x8022 has been received
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or any evaluation negative
Report	Switching between Upload and Download <ok | nok>

6.13.13 ParameterManager – Upload interrupted by reset

Table 159 defines the test conditions for this test case.

Table 159 ParameterManager – Upload interrupted by reset

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0152
Name	WTCD_DSBP_APPL_UPBREAKRESET
Purpose (short)	Test of Block Parameter Upload transfer interrupted per reset
Equipment under test (EUT)	W-Device with option "blockParameter" indicated in IODD
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, 10.6.11, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Any Upload can be interrupted by a communication reset and Block parameterization shall be aborted in this case.
Precondition	WDTU: W-Device is in Operate state. EUT: No block parametrization is active
Procedure	a) Write SystemCommand "ParamUploadStart" b) Write Test parameter c) Reset the W-Device either (descending priority based on availability) using SystemCommand “DeviceReset” or using power off/on cycle reset d) Set W-Device into communication e) Write Test parameter
Test parameter	One parameter of the parameter sets defined in 6.8.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step b) that ErrorType 0x8022 has been received 2) Check after step e) that no ErrorType has been received
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or any evaluation negative
Report	Communication interruption during Upload <ok | nok>

6.13.14 ParameterManager – UploadEnd during Download

Table 160 defines the test conditions for this test case.

Table 160 ParameterManager – UploadEnd during Download

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0153
Name	WTCD_DSBP_APPL_DNENDBYUPLOAD
Purpose (short)	Reaction on Upload commands while in Download, discarding written parameter
Equipment under test (EUT)	W-Device with option "blockParameter" indicated in IODD
Test case version	1.0
Category / type	W-Device Block parameter test: test to pass
Specification (clause)	REF 1, 10.3.2, 10.3.5, 10.6.11, Table 97, Table 98, Table B.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Parameter values of any Download shall be discarded when receiving an Upload-Start or UploadEnd command.
Precondition	WDTU: W-Device is in Operate state. EUT: No block parametrization is active
Procedure	a) Read Test parameter A) b) Write SystemCommand “ParamDownloadStart” c) Write Test parameter value A) or B), whichever is different from step a) d) Write SystemCommand “ParamUploadStart” e) Read parameter from c) f) Write SystemCommand “ParamDownloadStart” g) Write Test parameter value A) or B), whichever is different from step a) h) Write SystemCommand “ParamUploadEnd” i) Read parameter from c)
Test parameter	A) One parameter of the parameter sets defined in 6.8.1 with value of set 1 B) Same as parameter in A) with value of set 2
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check after step e) that read value equals original value of step a) 2) Check after step i) that read value equals original value of step a)
Test passed	All evaluation steps with positive result
Test not passed (examples)	No response or any evaluation negative
Report	Download break by any Upload command <ok | nok>

6.14 Adaptive Hopping Table

6.14.1 Prearrangement configuration

To test the AHT mechanism, two different hopping tables with disjoint frequencies are used. These hopping tables are build based on the W-Master configurations below:

- MasterID = 23
- Track_N = 0
- Blocklist 1 = 0x2, 0x0, 0x0, 0x0, 0x80, 0xff, 0xff, 0xff, 0xff, 0x7f (allowed frequencies 3 – 39)
- Blocklist 2 = 0xfe, 0xff, 0xff, 0xff, 0xff, 0x1, 0x0, 0x0, 0x0, 0x40 (allowed frequencies 42 – 78)

Table 161 Hopping Table 1

Frequency Index	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Frequency Channel	24	31	38	8	15	22	29	36	6	13	20	27	34	4	11	18	25	32	39

Frequency Index	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**
Frequency Channel	9	16	23	30	37	7	14	21	28	35	5	12	19	26	33	3	10	17

Table 162 Hopping Table 2

Frequency Index	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Frequency Channel	63	70	77	47	54	61	68	75	45	52	59	66	73	43	50	57	64	71	78

Frequency Index	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**
Frequency Channel	48	55	62	69	76	46	53	60	67	74	44	51	58	65	72	42	49	56

Table 163 Hopping Table 3

Frequency Index	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Frequency Channel	70	77	47	54	61	68	75	45	52	59	66	73	43	50	57	64	71	78	48

Frequency Index	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**
Frequency Channel	55	62	69	76	46	53	60	67	74	44	51	58	65	72	42	49	56

6.14.2 Update HoppingTable FULL_TABLE

Table 164 defines the test conditions for this test case

Table 164 Update HoppingTable FULL_TABLE

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0154
Name	WTCD_SMAH_HPTB_FULLTABLE
Purpose (short)	Test for change of a complete hopping table
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device AdaptiveHopTable; test to pass
Specification (clause)	See REF 1 clause C.4.14
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the communication functionality after an update of a new full hopping table
Precondition	WDTU: W-Device is in OPERATE state EUT: OPERATE, Hopping Table 1
Procedure	a) WDTU writes new hopping table via index 0x5006: - Subindex 1 = 0 (WakeUpTime) - Subindex 2 = 0 (UpdateType = FULL_TABLE) - Subindex 3 = 0 (Frequency Index) - Subindex 4 = Hopping Table 2 (Table 162) b) Trigger Jump-Command via MCMD (0xFE), see REF 2 Table 177 c) WDTU uses the new frequencies after 14 W-SubCycles d) Evaluation 1)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check connection
Test passed	Connection is stable and not interrupted
Test not passed (examples)	Connection reports a COMLOST
Report	Hopping table updated successfully <ok | nok>

6.14.3 Update HoppingTable DELETE_CELL

Table 165 defines the test conditions for this test case.

Table 165 Update HoppingTable DELETE_CELL

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0155
Name	WTCD_SMAH_HPTB_DELCELL
Purpose (short)	Test for removing one frequency of the hopping table
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device AdaptiveHopTable; test to pass
Specification (clause)	See REF 1 clause C.4.14
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the communication functionality after removing one frequency from the hopping table.
Precondition	WDTU: W-Device is in OPERATE state EUT: OPERATE, Hopping Table 2
Procedure	a) WDTU writes new hopping table via index 0x5006: - Subindex 1 = 0 (WakeUpTime) - Subindex 2 = 1 (UpdateType = DELETE_CELL) - Subindex 3 = 1 (Frequency Index) - Subindex 4 = don't care b) Trigger Jump-Command via MCMD (0xFE), see REF 2 Table 177 c) WDTU uses the new frequencies after 14 W-SubCycles d) Evaluation 1)
Test parameter	Hopping Table 2 (see clause 6.14.1)
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check connection
Test passed	Connection is stable and not interrupted
Test not passed (examples)	Connection reports a COMLOST
Report	Hopping table updated successfully <ok | nok>

6.14.4 Update HoppingTable ADD_CELL

Table 166 defines the test conditions for this test case.

Table 166 Update HoppingTable ADD_CELL

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0156
Name	WTCD_SMAH_HPTB_ADDCELL
Purpose (short)	Test for adding one frequency of the hopping table
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device AdaptiveHopTable; test to pass
Specification (clause)	See REF 1 clause C.4.14
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the communication functionality after adding a frequency to the hopping table.
Precondition	WDTU: W-Device is in OPERATE state EUT: OPERATE, Hopping Table 3
Procedure	a) WDTU writes new hopping table via index 0x5006: - Subindex 1 = 0 (WakeUpTime) - Subindex 2 = 2 (UpdateType = ADD_CELL) - Subindex 3 = 1 (Frequency Index) - Subindex 4 = 63 b) Trigger Jump-Command via MCMD (0xFE), see REF 2 Table 177 c) WDTU uses the new frequencies after 14 W-SubCycles d) Evaluation 1)
Test parameter	Hopping Table 3 (see clause 6.14.1)
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check connection
Test passed	Connection is stable and not interrupted
Test not passed (examples)	Connection reports a COMLOST
Report	Hopping table updated successfully <ok | nok>

6.14.5 Update HoppingTable REPLACE_CELL

Table 167 defines the test conditions for this test case.

Table 167 Update HoppingTable REPLACE_CELL

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0157
Name	WTCD_SMAH_HPTB_REPLCELL
Purpose (short)	Test for replace one frequency of the hopping table by another
Equipment under test (EUT)	W-Device
Test case version	1.0
Category / type	W-Device AdaptiveHopTable; test to pass
Specification (clause)	See REF 1 clause C.4.14
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the communication functionality after replacing a frequency in the hopping table
Precondition	WDTU: W-Device is in OPERATE state EUT: OPERATE, Hopping Table 2
Procedure	a) WDTU writes new hopping table via index 0x5006: - Subindex 1 = 0 (WakeUpTime) - Subindex 2 = 3 (UpdateType = REPLACE_CELL) - Subindex 3 = 1 (Frequency Index) - Subindex 4 = 24 b) Trigger Jump-Command via MCMD (0xFE), see REF 2 Table 177 c) WDTU uses the new frequencies after 14 W-SubCycles d) Evaluation 1)
Test parameter	Hopping Table 2 (see clause 6.14.1)
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check uplink on Frequency Channel 24
Test passed	Uplink received with ACK on Frequency Channel 24
Test not passed (examples)	Uplink not received on Frequency Channel 24
Report	Hopping table updated successfully <ok | nok>

7 IODD related test

7.1 Overview

The IODD test focuses on four major issues. The first issue is the test of a Device's IODD file with the help of a so-called IODD checker tool. IO-Link defines the parsers such an IODD checker tool shall use for IODD schema consistency checks. It also defines a set of business rules for the IODD check (see 7.2.1 in REF **4**).

The second issue focuses on the IODD interpreter tool. This test shall ensure, that the "Port and Device Configuration Tool" (PDCT) of the Master is able to provide all the IODD definitions in the correct manner (see 7.2.2 in REF **4**).

The third issue is the test whether the parameters defined in the IODD are accessible within the Device (parameter verification test). These test cases are specified in7.3.

The fourth issue is the test of complex system functions such as diverse reset possibilities that are indicated within the IODD. These test cases are specified in 7.4.

For all these tests, the Master shall be configured with inspection level "type compatible".

7.2 IODD Checker rules

Any W-Device comes with an IODD. An IODD of a W-Device is identified by the usage of IOLinkWirelessCommNetworkProfileT as type of the CommNetworkProfile element.

7.2.1 Basic requirements and business rules for W-Devices

Basically, the requirements defined in REF **3** apply.

7.2.2 XML snippets for the Common Profile

The XML snippets for the Common Profile are contained in its .zip file downloadable from the website https://io-link.com/de/Download/Download.php?thisID=8. The name of the corresponding draft XML file is IODD-CP_Snippets_V1.1.0.xml.

7.2.3 XML snippets for Wireless System Extensions

The XML snippets for Wireless System Extensions are specified in REF 2 and contained in an extra file named IODD-W-Snippets_V1.1.0.xml. Both can be downloaded in a .zip file from the website https://io-link.com/de/Download/Download.php?thisID=8

7.3 Parameter verification test

7.3.1 IODD identification

Table 168 defines the test conditions for this test case.

Table 168 IODD identification

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0158
Name	WTCD_IODD_PARV_IDENT
Purpose (short)	W-Device matches the associated IODD
Equipment under test (EUT)	W-Device and associated IODD
Test case version	1.0
Category / type	IODD parameter verification test; test to pass
Specification (clause)	REF 3, clauses 7.4, 7.4.1; REF 1, clauses B.1.8, B.1.9 ,B.2.11
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Verify that W-Device matches the associated IODD. WDTU reads W-Device parameters VendorID, DeviceID, and ProductID, and compares with IODD node descriptions. For further tests, read of DeviceID and ProductID are sufficient for an IODD association check
Precondition	WDTU: W-Device is in OPERATE state. EUT: W-Device is communicating, associated IODD available in machine readable form
Procedure	a) Read VendorID, DeviceID, ProductID from DPP1 of the W-Device b) Read corresponding entries from IODD *;see Test parameter* c) Read DeviceVariantCollection from IODD *;see Test parameter*
Test parameter	IODD: DeviceIdentity/@vendorId, DeviceIdentity/@deviceId, DeviceVariant/@productId
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check if IDs match the entries in IODD's Device identity after b) 2) Check if ProductID is listed in the DeviceVariantCollection of the IODD after c)
Test passed	All IDs from W-Device found in IODD
Test not passed (examples)	Any of the ID from W-Device not found in IODD (not matching)
Report	VendorID: <value> <ok | nok> DeviceID: <value> <ok | nok> ProductID: <value> <ok | nok> ProductID listed in DeviceVariantCollection: <yes/no> <ok | nok>

7.3.2 IODD communication parameter verification

Table 169 defines the test conditions for this test case.

Table 169 IODD communication parameter verification

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0159
Name	WTCD_IODD_PARV_COMPROFILE
Purpose (short)	W-Device's communication parameters match corresponding values in IODD
Equipment under test (EUT)	W-Device and associated IODD
Test case version	1.0
Category / type	IODD parameter verification test: test to pass
Specification (clause)	REF 3 clause, 7.6; REF 1, clauses B.1.3, B.1.5, B.1.6
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Verify that W-Device's communication parameters match values within the associated IODD. WDTU reads W-Device parameters WMinCycleTimeOut, WMinCycleTimeIn, RevisionID and compares with IODD node descriptions.
Precondition	WDTU: W-Device is in OPERATE state. EUT: W-Device is communicating; associated IODD available in machine readable form VendorID and ProductID of the W-Device match values in IODD
Procedure	a) Read WMinCycleTimeOut, WMinCycleTimeIn from index 0x5007 and RevisionID from DPP1 of the W-Device b) Read corresponding entries from IODD *;see Test parameter*
Test parameter	IODD: CommNetworkProfile/@iolinkRevision, TransportLayers/PhysicalLayer/@WMinCycleTimeOut, TransportLayers/PhysicalLayer/@WMinCycleTimeIn
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Compare values from index 0x5007 and DPP1 with corresponding entries in IODD after b)
Test passed	Values are matching
Test not passed (examples)	Values are not matching
Report	WMinCycleTimeOut: <value> <ok | nok> WMinCycleTimeIn: <value> <ok | nok> RevisionID: <value> <ok | nok>

7.3.3 IODD parameter read verification

Table 170 defines the test conditions for this test case.

Table 170 IODD parameter read verification

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0160
Name	WTCD_IODD_PARV_READVERIFY
Purpose (short)	Verify access rights, structures, and data contents of Read parameters
Equipment under test (EUT)	W-Device associated IODD
Test case version	1.0
Category / type	IODD parameter verification test: test to pass
Specification (clause)	REF 3 clause 7.5.4; REF 1 Table C.1, C.2.2 to C.2.19, F.2.2 to F.2.9, F.3.2, F.3.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Verify that all parameters in the IODD with Read access can be read from the W-Device, have a correct structure and valid data content. The length of an acquired parameter is used as measure for its structure since the lengths of parameters depend on their data. The validity of the data content is only checked for parameters of type StringT. The Tests shall be done by access with sub index == 0, and by subindex <>0 if the type of the variable is Record_T, regardless if subindexAccessSupported is true or false.
Precondition	WDTU: W-Device is in OPERATE state. EUT: W-Device is communicating; associated IODD available in machine readable form; VendorID and ProductID of the W-Device match values in IODD
Procedure	a) Get first parameter with Read access from IODD b) Read parameter with Read access according to the IODD c) Repeat from b) with next parameter with Read access from IODD until last one
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For each acquired parameter: 1) Check ErrorType after b) 2) Check length after b) 3) Check data content in case of data type StringT after b)
Test passed	In case of no ErrorType: If the data type is not StringT, the Length must match the IODD entry If the data type is StringT, the following checks will be done: - The length must match the IODD entry, or may be less than the max. length (condensed string). - If condensed, the string may not contain trailing zeros - The string may not contain zero values followed by a non-zero value In case of Error Types: only 0x8020, 0x8021, or 0x8022 permitted, or 0x8012 in case of subindex access when subindexAccessSupported=”false”
Test not passed (examples)	Any evaluation failed
Report	For each and every parameter with Read access in the IODD: No Error <ok | nok> Permitted Error: <ErrorType> <ok | nok> StringT without "0x00" <ok | nok> String content check OK (if applicable) <ok | nok>

7.3.4 IODD parameter write verification

Table 171 defines the test conditions for this test case.

Table 171 IODD parameter write verification

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0161
Name	WTCD_IODD_PARV_WRITEVERIFY
Purpose (short)	Test verifies index space and value ranges defined within the W-Device's IODD
Equipment under test (EUT)	W-Device associated IODD
Test case version	1.0
Category / type	IODD parameter verification test: test to pass
Specification (clause)	REF 3, clause 7.5.4; [7], Table C.1, C.2.2 to C.2.19, F.2.2 to F.2.9, F.3.2, F.3.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The W-Device-Tester writes dedicated IODD parameters to the W-Device. Verify that all parameters in the IODD can be accessed. Test for semantics (device specific technology) is not included. The individual rules for applicable values to be written are defined depending on the data types (for example string, integer, enum), see section "Test parameter". The Tests shall be done by access with sub index == 0, and by subindex <>0 if the type of the variable is Record_T, regardless if subindexAccessSupported is true or false.
Precondition	WDTU: W-Device is in OPERATE state. EUT: W-Device is communicating; associated IODD available in machine readable form VendorID and ProductID of the W-Device match values in IODD
Procedure	a) Identify parameter with Write access in the associated IODD. b) Identify a valid <value> for the Write access (see field "Test parameter"). c) Write parameter according to IODD including Subindices.
Test parameter	Write only parameters are excluded. For every <value> to be written, the following rules for the data types shall apply: - String: filled with blanks - INT, UINT, FLOAT: maximum value of the permitted range minus one unit - BOOL: true - Time: 2011-04-18 12:00:00 UTC - Timespan: 1 s - Enum (single value): first single value
Post condition	Original parameter contents shall be stored and rewritten before the end of the test-case

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For each written parameter: 1) Check for ErrorType according to Table C.1 after c) 2) Check W-Device behavior
Test passed	Either no ErrorType or none of 0x8011, 0x8023, 0x8033, and 0x8034, 0x8012 shall be used in case of subindex access when subindexAccessSupported=”false” and Device is communicating
Test not passed (examples)	Any evaluation failed
Report	For every parameter with Write access in the IODD: No Error <ok | nok> Permitted Error: <ErrorType> <ok | nok>

7.3.5 IODD parameter Index/Subindex consistency

Table 172 defines the test conditions for this test case.

Table 172 IODD parameter Index/Subindex consistency

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0162
Name	WTCD_IODD_PARV_INDEXCONSISTENT
Purpose (short)	Test the consistency between Indices and Subindices for IODD parameters
Equipment under test (EUT)	W-Device and associated IODD
Test case version	1.0
Category / type	IODD parameter verification test: test to pass
Specification (clause)	REF 3, clause 7.5.4; REF 1, clauses A.5.4, F.3.2, F.3.3
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The W-Device-Tester tests if reading or writing parameters via Subindex has the same result as reading or writing via Index Test shall be repeated for all parameters which are: - not dynamic - readable and writeable - subindex access is allowed For each parameter, test shall be repeated for all subindices which are read-able and writeable .
Precondition	WDTU: W-Device is in OPERATE state. EUT: W-Device is communicating; associated IODD available in machine readable form VendorID and ProductID of the W-Device match values in IODD This test only for non-dynamic parameters with complex data type and "subindexAccessSupported = true" within the IODD
Procedure	a) Find a valid value <value1> for subindex 0 b) Write <value1> to subindex 0 c) Read subindex 0 and store it to <value2> d) Extract value of subindex n from <value1> and store it to <value3> e) Read subindex n and store it to <value4> f) Find valid value <value5> for subindex n which is different to <value3> g) Write <value5> to subindex n h) Read subindex 0 and store it to <value6> i) Extract value of subindex n from <value6> and store it to <value7> j) Read subindex n and store it to <value8>
Test parameter	For <value1> and <value5> use values from parameter sets defined in 6.8.1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) After step c) compare <value1> with <value2>. Values must be equal 2) After step e) compare <value3> with <value4>. Values must be equal 3) After step i) compare <value5> with <value7>. Values must be equal 4) After step j) compare <value5> with <value8>. Values must be equal
Test passed	All evaluations are positive
Test not passed (examples)	Any evaluation failed
Report	For every parameter with Subindex access in the IODD: Parameter consistency: <value2/value1> <ok | nok> Parameter consistency: <value2/value3> <ok | nok>

7.4 Functional system tests (IODD indication)

7.4.1 General

The availability of some more complex system functions of a W-Device is indicated in its IODD.

The corresponding functional system tests are specified in this clause.

7.4.2 IODD – functional verification of "Parameter (write) access lock"

Table 173 defines the test conditions for this test case.

Table 173 IODD – functional verification of "Parameter (write) access lock"

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0163
Name	WTCD_IODD_PARV_ACCESSLOCK
Purpose (short)	Test functional behavior of parameter access locking (conditional)
Equipment under test (EUT)	W-Device with feature "Parameter (write) access" indicated within IODD
Test case version	1.0
Category / type	IODD parameter verification test: test to pass
Specification (clause)	REF 1, clauses 10.6.5, B.2.4, C.2.1, Table C.1
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Access to parameter write values is locked if feature "Device Access Lock" is implemented. Only parameters with attribute: accessRights = "rw" or accessRights = "wo" in IODD are tested.
Precondition	WDTU: W-Device is in OPERATE state EUT: W-Device is communicating; VendorID and DeviceID match with IODD
Procedure	a) Write value "0x0001" to Index "DeviceAccessLocks" (= parameter access locked) b) Select parameter with Write access within IODD c) Write <value> (see Test parameter to selected parameter in b) d) Write value "0x0000" to Index "DeviceAccessLocks"
Test parameter	<value> to be defined by manufacturer
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Response is negative and ErrorType = 0x8023 (= access denied) 2) Procedure d) results in a positive response
Test passed	Evaluations 1) and 2) are true
Test not passed (examples)	Evaluation 1) or 2) are false
Report	Parameter (from evaluation 1): <index>, <ErrorType> <ok | nok> DeviceAccessLocks (from evaluation 2) <ok | nok> Warning: <yes/no>

7.4.3 IODD – functional verification of "Device reset"

Table 174 defines the test conditions for this test case.

Table 174 IODD – functional verification of "Device reset"

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0164
Name	WTCD_IODD_PARV_DEVICERESET
Purpose (short)	Test functional behavior of SystemCommand "Device reset" (conditional)
Equipment under test (EUT)	W-Device with feature "Device reset" indicated in IODD
Test case version	1.0
Category / type	IODD parameter verification test: test to pass
Specification (clause)	REF 1, clauses 10.7.2, Table 101, B.2.2
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Parameter and reset behavior shall be as specified after a reset triggered by the SystemCommand "Device reset".
Precondition	WDTU: W-Device is in OPERATE state. EUT: W-Device is communicating; VendorID and DeviceID match IODD
Procedure	a) Provide input field or configuration option for variable <time> representing the maximum Device time after System command Device Reset to restart communication (in seconds) b) Select parameter from IODD fulfilling the conditions in "Test parameter" c) Read selected parameter from b) and store values in array <parvalue_a> d) Read DID (Device ID) and store value in <didvalue_a> e) Write SystemCommand "Device reset" (128 / 0x80) f) Wait <time> g) Check if a communication startup sequence has been triggered h) Read RID (RevisionID) i) Read DID (DeviceID) and store value in <didvalue_b> j) Check if an Event has been triggered (mode "Event appears") k) Read parameter DeviceStatus and store value to <status_b> if DeviceStatus is marked as implemented in IODD l) Read selected parameter from b) and store values in array <parvalue_b>
Test parameter	Only parameters in IODD are tested - with attribute "accessRights = "rw", and - which are not marked with "excludedFromDataStorage="true" in the IODD
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Procedure g) shows exactly one communication startup sequence 2) Result of procedure h) matches with IODD (CommNetworkProfile: iolinkRevision = "Vx.x") 3) Values of <didvalue_a> match values of <didvalue_b> 4) Procedure j) shows at least one event of mode "Event appears" or value of <status_b> is equal ‘0 (0x00)’ (Skip this step, if DeviceStatus is not marked as implemented in IODD) For each received parameter (from procedure b): 5) Response is positive 6) Values of <parvalue_a> match values of <parvalue_b>
Test passed	All evaluations 1) to 6) are true
Test not passed (examples)	Any of the evaluations 1) to 6) is false

TEST CASE RESULTS	CHECK / REACTION	
Report	Communication from evaluation 1): <value>	<ok | nok>
	RevisionID from evaluation 2): <value>	<ok | nok>
	DeviceID from evaluation 3): <value>	<ok | nok>
	DeviceStatus: <value> (from procedure k), <event> (from procedure j)	<ok | nok>
	For each received parameter (from evaluation 5) and 6)):	
	Parameter: <Index>, <parvalue_a>, <parvalue_b>	<ok | nok>

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7.4.4 IODD – functional verification of "Application reset"

Table 175 defines the test conditions for this test case.

Table 175 IODD – functional verification of "Application reset"

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0165
Name	WTCD_IODD_PARV_APPLRESET
Purpose (short)	Test functional behavior of SystemCommand "Application reset" (conditional)
Equipment under test (EUT)	W-Device with feature "Application reset" indicated in IODD
Test case version	1.0
Category / type	IODD parameter verification test: test to pass
Specification (clause)	REF 1, clauses 10.7.3, Table 101, B.2.2
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Parameter and reset behavior shall be as specified after a reset triggered by the SystemCommand "Application reset"
Precondition	WDTU: W-Device is in OPERATE state, data storage is disabled EUT: W-Device is communicating; VendorID and DeviceID match IODD
Procedure	a) Select parameter from IODD fulfilling the conditions in "Test parameter" and excluding parameter ApplicationSpecificTag, FunctionTag, LocationTag b) Read parameter ApplicationSpecificTag, FunctionTag and LocationTag and store responses in <tagvalue_a> c) Read parameter DID (DeviceID) and RID (RevisionID) and store values in <idvalue_a> d) Write SystemCommand "Application reset" (129 / 0x81) e) Wait 5 s f) Check if a communication startup sequence has been triggered g) Check DS_UPLOAD_FLAG in parameter DataStorageIndex h) Read parameter DID (Device ID) and RID (Revision ID) and store values in <idvalue_b> i) Read parameter ApplicationSpecificTag, FunctionTag and LocationTag and store responses in <tagvalue_b> j) Read selected parameter from a) and store values in array <parvalue_b>
Test parameter	Only parameters in IODD are tested - with attribute "accessRights = "rw", and - with attribute: defaultValue=""
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Procedure f) shows no communication startup sequence 2) Values of <idvalue_a> and <idvalue_b> are equal 3) Values of <tagvalue_a> and <tagvalue_b> are equal 4) Value of procedure g) (DS_UPLOAD_FLAG) is equal '1' (DS_UPLOAD_REQ pending) if DS is supported, or is equal '0' if DS is not supported For each received parameter (from procedure a)): 5) Response is positive 6) Values of <parvalue_b> match corresponding assigned "Value" if available in IODD Hint evaluation 6) : Results are only logged
Test passed	All evaluations 1) to 6) are true
Test not passed (examples)	At least one of the evaluations 1) to 6) is false
Report	Communication (from evaluation 1)) <ok | nok> RevisionID/DeviceID (from evaluation 2)) <ok | nok> Identification (from evaluation 3)) <ok | nok> DataStorage (from evaluation 4)) <ok | nok>

7.4.5 IODD – functional verification of "Restore factory settings"

Table 176 defines the test conditions for this test case.

Table 176 IODD – functional verification of "Restore factory settings"

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0166
Name	WTCD_IODD_PARV_FACTORYSETTINGS
Purpose (short)	Test functional behavior of SystemCommand "Restore factory settings" (conditional)
Equipment under test (EUT)	W-Device with feature "Restore factory settings" indicated in IODD
Test case version	1.0
Category / type	IODD parameter verification test: test to pass
Specification (clause)	REF 1, clauses 10.7.4, Table 101, B.2.2
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Parameter and reset behavior shall be as specified after a reset triggered by the SystemCommand "Restore factory settings"
Precondition	WDTU: W-Device is in OPERATE state, data storage is disabled¸ Inspection Level is set to “compatible” EUT: W-Device is communicating; VendorID and DeviceID match IODD
Procedure	a) Select parameter from IODD, which fulfill the conditions in "Test parameter" b) Read parameter DeviceStatus and store value in <status_a> c) Write SystemCommand "ParamDownloadStore" (5 / 0x05) d) Write SystemCommand "Restore factory setting" (130 / 0x82) e) Check if an Event has been triggered (mode "Event disappears") f) Wait 5 seconds g) Check if a communication startup sequence has been triggered h) Check DS_UPLOAD_FLAG in parameter DataStorageIndex i) Read parameter DID (DeviceID) and RID (RevisionID) and store to <idvalue_b> j) Check if an Event has been triggered (mode "Event appears") k) Read parameter DeviceStatus and store value in <status_b> l) Read selected parameter from a) and store values in array <parvalue_b>
Test parameter	Only parameters in IODD are tested - with attribute "accessRights = "rw", and - which are not "excludedFromDataStorage" and - with attribute: defaultValue="<value>"
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Procedure g) shows no or exactly one communication startup sequence 2) If <status_a> is ≠ "0 (0x00)", procedure e) shows at least one Event of mode "Event disappears" (if a communication startup occured skip this evaluation) 3) Values of <idvalue_b> match default values of IODD RID: (CommNetworkProfile → iolinkRevision="Vx.x") 4) Value of procedure h) (DS_UPLOAD_FLAG) = "0" (no DS_UPLOAD_REQ) 5) Procedure j) shows at least one Event of mode "Event appears" or value of <status_b> = "0 (0x00)" For each received parameter (from procedure a)): 6) Response is positive 7) Values of <parvalue_b> match corresponding assigned "Value " if available in IODD
Test passed	All evaluations 1) to 7) are true, (if a communication startup occurred skip evaluation 2)
Test not passed (examples)	At least one of the evaluations 1) to 7) is false

TEST CASE RESULTS	CHECK / REACTION	
Report	Communication (from evaluation 1))	<ok | nok>
	Diagnosis clear (from evaluation 2))	<ok | nok>
	RevisionID/DeviceID (from evaluation 3))	<ok | nok>
	DataStorage (from evaluation 4))	<ok | nok>
	DeviceStatus (from evaluation 5)): <value>, <event>	<ok | nok>
	For each received parameter (from evaluation 6) and 7)):	
	Parameter: <Index>, <parvalue_a>, <parvalue_b>	<ok | nok>

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7.4.6 IODD – functional verification of "Back-to-box"

Table 177 defines the test conditions for this test case.

Table 177 IODD – functional verification of "Back-to-box"

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0167
Name	WTCD_IODD_PARV_BACKTOBOX
Purpose (short)	Test functional behavior of SystemCommand "Back-to-box" (conditional)
Equipment under test (EUT)	W-Device with feature "Back-to-box" indicated in IODD
Test case version	1.0
Category / type	IODD parameter verification test: test to pass
Specification (clause)	REF 1, clauses 10.7.5, Table 101, B.2.2
Configuration / setup	W-Device-Tester-System In case of the DeviceId is not equal to the DefaultDeviceId (see REF 1Table 101) , the DefaultIODD must be provided

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Parameter and reset behavior shall be as specified after a reset triggered by the SystemCommand "Back-to-box"
Precondition	WDTU: W-Device is in OPERATE state, data storage is disabled EUT: W-Device is communicating; VendorID and DeviceID match IODD
Procedure	a) Select parameter from <DefaultIODD > fulfilling the conditions in "Test parameter" b) Call SystemCommand "ParamDownloadStart" if Device supports Block Parameterization c) Write parameter set 1 into the Device because it is different to factory reset d) Write SystemCommand " ParamDownloadStore" (5 / 0x05) e) Write SystemCommand "Back-to-box" (131 / 0x83) f) Wait 5 s (or IMATime, if greater) g) SMI_PortStatus ;returning WPortStatusList h) If the W-Device does not restart automatically, apply power cycle (power off, wait 5 s, power on) i) Wait 1s to ensure that the Pairing mechanism has been started again j) WDTU Invokes pairing by UniqueID k) Wait for connection with EUT for PAIRING_UNIQUE_TIMEOUT l) SMI_PortStatus ;returning WPortStatusList m) Check DS_UPLOAD_FLAG in parameter DataStorageIndex n) Read parameter DID (Device ID) and RID (Revision ID) and store to <idvalue_b> o) Check if an Event has been triggered (mode "Event appears") p) Read parameter DeviceStatus and store value to <status_b> q) Read selected parameter from a) and store values in array <parvalue_b>
Test parameter	Only parameters in IODD are tested - with attribute "accessRights = "rw", and - which are not "excludedFromDataStorage" and - with attribute: defaultValue="<value>" In case of the DeviceId is not equal to the DefaultDeviceId, the Test system needs the following information in addition - the DefaultDeviceId to which the device is switched back - the default parameter from the DefaultIODD - the test parameter must be taken from the DefaultIODD for comparison
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check WPortStatusList.PortStatusInfo = NO_DEVICE after f) 2) Check WPortStatusList.PortStatusInfo = OPERATE after k) 3) Values of <idvalue_b> match the default values of the IODD RID: (CommNetworkProfile: iolinkRevision = "Vx.x") 4) Value of procedure l) (DS_UPLOAD_FLAG) = "0" (no DS_UPLOAD_REQ) 5) Procedure n) shows at least one Event of mode "Event appears" or value of <status_b> = "0 (0x00)" For each read parameter (from procedure a)): 6) Response is positive 7) Values of <parvalue_b> match assigned "defaultValue" if available in IODD
Test passed	All evaluations 1) to 7) are true
Test not passed (examples)	At least one of the evaluations 1) to 7) is false
Report	Communication from evaluation 1): <ok | nok> RevisionID/DeviceID from evaluation 2): <ok | nok> DataStorage from evaluation 3): <ok | nok> DeviceStatus from evaluation 4): <value>, <event> <ok | nok> For each received parameter from evaluation 5) and 6): Parameter: <Index>, <parvalue_a>, <parvalue_b> <ok | nok>

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7.4.7 Write alternative valid DeviceID

Table 178 defines the test conditions for this test case.

Table 178 IODD – Write alternative valid DeviceID

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0168
Name	WTCD_DLPC_DID_OVERWRITE_COMP
Purpose (short)	W-Device behavior with overwrite of the DeviceID (compatible)
Equipment under test (EUT)	W-Device with support of an additional compatible DeviceID
Test case version	1.0
Category / type	IODD parameter verification test: test to pass
Specification (clause)	REF 1, clauses 10.6.2, B.1.9
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check W-Device behavior with overwrite of the DeviceID with a compatible DeviceID as listed in the IODD. Master overwrites the DeviceID and the W-Device accepts the requested DeviceID. After a power off/on, Master checks if the previously written DeviceID has been stored in non-volatile memory in the W-Device.
Precondition	WDTU: PORT_INACTIVE EUT: W-Device set to ("DID-0")
Procedure	a) WDTU establishes communication b) WDTU reads DeviceID from W-Device (EUT) c) WDTU overwrites the DeviceID with the DeviceID ("DID-2") by using the complete mechanism written in REF 1, Figure 76, including Restart d) Reset the W-Device either (descending priority based on availability) - using SystemCommand "DeviceReset" or - using power off/on cycle e) WDTU re-establishes communication f) WDTU reads DeviceID from W-Device (EUT) g) WDTU overwrites the DeviceID(“DID-2”) with “DID-0” to return to the previous settings for the next test by using the complete mechanism written in REF 1, Figure 76, including Restart
Test parameter	IODD: DeviceIdentity/@deviceId, memorized as "DID-0" DeviceIdentity/@additionalDeviceIds, one of the DeviceIds memorized as "DID-2"
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check acquired DeviceID after b) 2) Check acquired DeviceID after f)
Test passed	DeviceID = "DID-0" in 1) DeviceID = "DID-2" in 2)
Test not passed (examples)	Any of the checks failed.
Report	Additional DeviceID stored in non-volatile memory <ok | nok>

7.4.8 Write alternative valid DeviceID

Table 179 defines the test conditions for this test case.

Table 179 IODD – Write alternative invalid DeviceID

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0169
Name	WTCD_DLPC_DID_OVERRIDE_INCOMP
Purpose (short)	W-Device behavior with overwrite of the DeviceID (incompatible)
Equipment under test (EUT)	W-Device with or without support of an additional incompatible DeviceID
Test case version	1.0
Category / type	IODD functional system test: test to fail
Specification (clause)	REF 1, clause 10.6.2
Configuration / setup	W-Device-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check W-Device behavior at overwrite of the DeviceID with incompatible value. Master overwrites the DeviceID and the W-Device rejects the requested DeviceID.
Precondition	WDTU: PORT_INACTIVE EUT: W-Device set to "DID-0"
Procedure	a) WDTU establishes communication b) WDTU reads DeviceID from W-Device (EUT) c) WDTU overwrites the DeviceID with any DeviceID (≠ "DID-0" or "DID-x") by using the complete mechanism written in REF 1, Figure 76, including Restart d) WDTU reads DeviceID from W-Device (EUT) e) Reset the W-Device either (descending priority based on availability) - using SystemCommand "DeviceReset" or - using power off/on cycle f) WDTU re-establishes communication g) WDTU reads DeviceID from W-Device (EUT)
Test parameter	IODD: DeviceIdentity/@deviceId, memorized as "DID-0" DeviceIdentity@additionalDeviceIds = "DID-x", the additional DeviceIDs in the IODD
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check acquired DeviceID after b) 2) Compare "DID-0" with acquired DeviceID in b) 3) Check W-Device (EUT) behavior after f)
Test passed	DeviceID = "DID-0" in 1) DeviceID = "DID-0" in 2) DeviceID = "DID-0" in 3)
Test not passed (examples)	Any of the evaluation failed
Report	W-Device doesn't change to invalid DeviceID: <ok | nok>

7.5 Test report summary of the IODD based Device tests

The template is defined by the W-Device-Tester-System. The test report shall present at least the results of the test cases for the IODD based W-Device tests.

8 W-Master Protocol tests

8.1 General procedure to test a W-Master with one or more tracks

The following testcases are described for one track. If a W-Master contains more than one track the tests shall be done for all tracks.

Procedure results not mentioned in the evaluation part are assumed to be successful for passing the tests.

8.2 Process Data

8.2.1 W-Master reads mirrored in/out PD from Device

Table 180 defines the test conditions for this test case.

Table 180 W-Master reads mirrored in/out PD from W-Device

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0170
Name	WTCM_ DLPD_CYCC_MIRROREDPD
Purpose (short)	W-Master reads mirrored input/output Process Data from W-Device
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test: test to pass
Specification (clause)	REF **2**, clauses 7.3.2, 7.3.3; REF **1** clause 8.3.4
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WMTU mirrors its PD such that the W-Master can check the consistency.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) MTU_DPP1_Set(PDIn length) = 0x10 ;"16" Bit b) MTU_DPP1_Set(PDOut length) = 0x10 ;"16" Bit c) SMI_PortConfiguration (ABPS_NOTYPE_CHECK< UniqueID = MTU_UniqueID >) ;switch to OPERATE d) TM_AWAIT_PORT_STATUS(OPERATE) ;wait for OPERATE e) MTU_State_MirrorPD ;perform PD mirroring f) SMI_PDOut(ABPS_PDOUT<OutputDataLength=2, PDO0=0x12, PDO1=0x34>) g) SMI_PDIn ;returns "ArgBlock PDIn1" h) Evaluation 1) i) SMI_PDOut (ABPS_PDOUT<OutputDataLength=2, PDO0=0x56, PDO1=0x78>) j) SMI_PDIn ;returns "ArgBlock PDIn2" k) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "ArgBlock PDIn1" 2) Check "ArgBlock PDIn2"
Test passed	PDIn1: PDI = [0x12, 0x34], and PDIn2: PDI = [0x56, 0x78].
Test not passed (examples)	Inconsistency between transmitted and received process data
Report	Sent and received PD match: <ok | nok>

8.2.2 W-Master propagates "PD invalid" indication in a correct manner

Table 181 defines the test conditions for this test case.

Table 181 W-Master propagates "PD invalid" indication in a correct manner

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0171
Name	WTCM_ DLPD_CYCC_PDIVPROP
Purpose (short)	W-Master propagates "PD invalid" indication in a correct manner
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test, test to pass
Specification (clause)	REF **2**, clause 7.3.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	PDValid – PDInvalid transition reported correctly.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) SMI_PortConfiguration(ABPS_NOTYPE_CHECK< UniqueID = MTU_UniqueID >) ;switch to OPERATE b) TM_AWAIT_PORT_STATUS(OPERATE) ;wait for OPERATE c) MTU_State_SetPDValidity(VALID) ;PD valid d) SMI_PDIn ;returns "ArgBlock PDIn_1" e) Evaluation 1) f) SMI_PortStatus ;returns "ArgBlock WPortStatusList_1" g) Evaluation 2) h) MTU_State_SetPDValidity(INVALID) ;PD invalid i) SMI_PDIn ;returns "ArgBlock PDIn_2" j) Evaluation 3) k) SMI_PortStatus ;returns "ArgBlock WPortStatusList_2" l) Evaluation 4)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "ArgBlock PDIn_1" 2) Check "ArgBlock WPortStatusList_1" 3) Check "ArgBlock PDIn_2" 4) Check "ArgBlock WPortStatusList_2"
Test passed	PDIn_1: PQI = 0xA0, and WPortStatusList_1: PortQualityInfo.Bit0 = VALID, and PDIn_2: PQI = 0x20, and WPortStatusList_2: PortQualityInfo.Bit0 = INVALID
Test not passed (examples)	EUT defines PDIn_1 in upper-level system as invalid and/or EUT defines PDIn_2 in upper-level system as valid
Report	"PDValidity" propagated correctly to upper-level system: <ok | nok>

8.2.3 W-Master propagates "PD valid" indication in a correct manner

Table 182 defines the test conditions for this test case.

Table 182 W-Master propagates "PD valid" indication in a correct manner

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0172
Name	WTCM_ DLPD_CYCC_PDVPROP
Purpose (short)	W-Master propagates "PDValid" indication in a correct manner
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test, test to pass
Specification (clause)	REF 2, clause 7.3.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	PDInvalid – PDValid transition reported correctly.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	m) MTU_State_SetPDValidity(INVALID) ;PD invalid n) SMI_PortConfiguration(ABPS_NOTYPE_CHECK< UniqueID = MTU_UniqueID >) ;switch to OPERATE o) TM_AWAIT_PORT_STATUS(OPERATE) ;wait for OPERATE p) MTU_State_SetPDValidity(VALID) ;PD valid q) SMI_PDIn ;returns "ArgBlock PDIn" r) Evaluation 1) s) SMI_PortStatus ;returns "ArgBlock WPortStatusList" t) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "ArgBlock PDIn" 2) Check "ArgBlock WPortStatusList"
Test passed	PDIn: PQI = 0xA0, and WPortStatusList: PortQualityInfo.Bit0 = VALID
Test not passed (examples)	EUT defines the PD in the upper-level system as invalid
Report	"PDInvalid" = "0" propagated to upper-level system: <ok | nok>

8.2.4 W-Master generates "PD invalid" indication in a correct manner

Table 183 defines the test conditions for this test case.

Table 183 W-Master generates "PD invalid" indication in a correct manner

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0173
Name	WTCM_ DLPD_CYCC_PDIVGEN
Purpose (short)	W-Master generates "PD invalid" indication in a correct manner
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test, test to pass
Specification (clause)	REF **2**, clause 7.3.2; REF **1**, clause 11.7.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	PDValid – PDInvalid transition on process data output
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) SMI_PortConfiguration (ABPS_NOTYPE_CHECK< UniqueID = MTU_UniqueID >) ;switch to OPERATE b) TM_AWAIT_PORT_STATUS(OPERATE) ;wait for OPERATE c) SMI_PDOut(ABPS_PDOUT) ;PDOut1 valid d) Evaluation 1) e) SMI_PDOut(ABPS_PDOUT<OE=0x00>) ;PDOut2 invalid f) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check PDOut1 in WMTU is valid 2) Check PDOut2 in WMTU is invalid
Test passed	PDOut1 is valid, and PDOut2 is invalid
Test not passed (examples)	Any of the evaluations failed
Report	"PDInvalid" = "0" detected in WMTU: <ok | nok>

8.2.5 W-Master generates "PD valid" indication in a correct manner

Table 184 defines the test conditions for this test case.

Table 184 W-Master generates "PD valid" indication in a correct manner

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0174
Name	WTCM_ DLPD_CYCC_PDVGEN
Purpose (short)	W-Master generates "PDValid" indication in a correct manner
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test, test to pass
Specification (clause)	REF **2**, clause 7.3.2; REF **1**, clause 11.7.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test if PDInvalid – PDValid transition on process data output.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) SMI_PortConfiguration (ABPS_NOTYPE_CHECK< UniqueID = MTU_UniqueID >) ;switch to OPERATE b) TM_AWAIT_PORT_STATUS(OPERATE) ;wait for OPERATE c) SMI_PDOut(ABPS_PDOUT<OE=0x00>) ;PDOut1 invalid d) Evaluation 1) e) SMI_PDOut(ABPS_PDOUT) ;PDOut2 valid f) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check PDOut1 in WMTU is invalid 2) Check PDOut2 in WMTU is valid
Test passed	PDOut1 is invalid, and PDOut2 is valid
Test not passed (examples)	Any of the evaluations failed
Report	"PDValid" = "1" detected in WMTU: <ok | nok>

8.2.6 Max PD Segment Length

Table 185 defines the test conditions for this test case.

Table 185 W-Master segments Output process-data into multiple W-Sub-cycles

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0175
Name	WTCM_ DLPD_CYCC_MAXPD
Purpose (short)	W-Master segments Output process-data into multiple W-Sub-cycles with MaxPDSegLength
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test, test to pass
Specification (clause)	REF **2**, clauses 7.3.2, 7.7.2
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The W-Master splits the process-data onto multiple W-Cycles with a maximum length of MaxPDSegLength.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) MTU_DPP1_Set(PDIn length) = 0x9F ;"32" Bytes b) MTU_DPP1_Set(PDOut length) = 0x9F ;"32" Bytes c) SMI_PortConfiguration (ABPS_NOTYPE_CHECK< UniqueID = MTU_UniqueID , MaxPDSegLength = 1>) ;Test parameter d) TM_AWAIT_PORT_STATUS(OPERATE) ;wait for OPERATE e) SMI_PDOut(ABPS_PDOUT<OutputDataLength=32, PDO[0…31] = [0x01…0x20]>) f) Evaluation 1)
Test parameter	MaxPDSegLength = 1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) WMTU checks that PDO[0…31] is transmitted within 32 W-Cycles and in correct order. The first W-Cycle contains the first octet payload (0x01) with FC=START, each following W-Cycle contains 1 next octet payload with FC=COUNT and the last W-Cycle contains the last octet payload (0x20) with FC=EOS.
Test passed	Process data is transmitted in 32 W-Cycles and Process data order is correct and FC is correct for each W-Cycle
Test not passed (examples)	Any of the evaluations failed
Report	Process-data out MaxPDSegLength: <ok | nok>

8.2.7 Retry Handling

Table 186 defines the test conditions for this test case.

Table 186 W-Master retransmits process-data on lost

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0176
Name	WTCM_ DLPD_CYCC_RETRY
Purpose (short)	W-Master retransmits process-data on lost and generates Event
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test, test to pass
Specification (clause)	REF **2**, clauses 7.3.2, 7.7.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The W-Master tries up to MaxRetry count sending the process data output. If the limit is reached, it sends an IOLW_RETRY_ERROR event.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) SMI_PortConfiguration (ABPS_NOTYPE_CHECK< UniqueID = MTU_UniqueID, MaxRetry = 2 >) ;Test parameter b) TM_AWAIT_PORT_STATUS(OPERATE) ;wait for OPERATE c) WMTU_State_RespondNack ;always send NACK d) SMI_PDOut(ABPS_PDOUT) ;try to send PDOut e) Evaluation 1) f) Evaluation 2)
Test parameter	MaxRetry = 2
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) EUT re-transmits PDOut at least “MaxRetry” times 2) After “MaxRetry” re-transmits with NACK, the EUT sends the event M_IOLW_RETRY_ERROR (0x3000)
Test passed	PDOut is re-transmitted, and M_IOLW_RETRY_ERROR is raised after “MaxRetry” re-transmits
Test not passed (examples)	Any of the evaluations failed
Report	M_IOLW_RETRY_ERROR sent to upper level system: <ok | nok>

8.3 STARTUP

8.3.1 W-Master start-up with non-configured VID and DID

Table 187 defines the test conditions for this test case

Table 187 W-Master start-up with non-configured VID and DID

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0177
Name	WTCM_DLST_CHCK_NONCONFVIDDID
Purpose (short)	Check whether W-Master performs start-up with non-configured VID and DID
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test: test to pass
Specification (clause)	REF 2, 9.3.3.2.3, Annex C.2.1 Table 176, Annex C.2.2 Table 177
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check W-Master behavior. W-Master establishes communication with WMTU and turns it into OPERATE.
Precondition	EUT: WMASTER_CYCLIC PORT_INACTIVE WMTU: WMTU_STANDARD_STATE
Procedure	a) SMI_PortConfiguration(ABPS_NOTYPE_CHECK) b) TM_AWAIT_PORT_STATUS(OPERATE) c) MTU_Startup_GetLog ;returning MessageLog d) Evaluation 1) e) SMI_PortStatus ;returning WPortStatusList f) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check MessageLog 2) Check WPortStatusList
Test passed	In 1) MessageLog shall contain the following sequence of messages in this order: - Write WirelessSystemCfg - Read DirectParameter (RID, PDin length, PDout length) - Read DirectParameter (VID, DID, FID) - Read WCycleTime - Write MasterCommand 0x9A ;Device Preoperate - Write WCycleTime - Write MasterCommand 0x99 ;Device Operate In 2) WPortStatusList shall show the following values: WPortStatusList.PortStatusInfo = OPERATE WPortStatusList.DeviceID = 0x002BD2
Test not passed (examples)	W-Master does not write MasterCommand 0x99
Report	W-Master writes WirelessSystemCfg: <ok | nok> W-Master reads DirectParameter (RID, PDin length, PDout length): <ok | nok> W-Master reads DirectParameter (VID, DID, FID): <ok | nok> W-Master reads WCycleTime: <ok | nok> W-Master writes MasterCommand 0x9A: <ok | nok> W-Master writes WCycleTime: <ok | nok> W-Master writes MasterCommand 0x99: <ok | nok> Correct values in WPortStatusList: <ok | nok>

8.3.2 W-Master start-up with configured VID and DID

Table 188 defines the test conditions for this test case

Table 188 W-Master start-up with configured VID and DID

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0178
Name	WTCM_DLST_CHCK_CONFVIDDID
Purpose (short)	Check W-Master start-up behavior with configured VendorID and DeviceID
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test: test to pass
Specification (clause)	REF 2, 9.3.3.2.3, Annex C.2.1 Table 176, Annex C.2.2 Table 177
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check W-Master start-up behavior. W-Master establishes communication with WMTU and turns it into OPERATE.
Precondition	EUT: WMASTER_CYCLIC PORT_INACTIVE WMTU: WMTU_STANDARD_STATE
Procedure	a) SMI_PortConfiguration(ABPS_TYPE_COMP) ;type compatibility b) TM_AWAIT_PORT_STATUS(OPERATE) c) MTU_Startup_GetLog ;returning MessageLog d) Evaluation 1) e) SMI_PortStatus ;returning WPortStatusList f) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check MessageLog 2) Check WPortStatusList
Test passed	In 1) MessageLog shall contain the following sequence of messages in this order: - Write WirelessSystemCfg - Read DirectParameter (RID, PDin length, PDout length) - Read DirectParameter (VID, DID, FID) - Read WCycleTime - Write MasterCommand 0x9A ;Device Preoperate - Write WCycleTime - Write MasterCommand 0x99 ;Device Operate In 2) WPortStatusList shall show the following values: WPortStatusList.PortStatusInfo = OPERATE WPortStatusList.DeviceID = 0x002BD2
Test not passed (examples)	W-Master does not write MasterCommand 0x99
Report	W-Master writes WirelessSystemCfg: <ok | nok> W-Master reads DirectParameter (RID, PDin length, PDout length): <ok | nok> W-Master reads DirectParameter (VID, DID, FID): <ok | nok> W-Master reads WCycleTime: <ok | nok> W-Master writes MasterCommand 0x9A: <ok | nok> W-Master writes WCycleTime: <ok | nok> W-Master writes MasterCommand 0x99: <ok | nok> W-Master is in OPERATE state: <ok | nok>

8.3.3 W-Master start-up with overwrite of the DID (compatible)

Table 189 defines the test conditions for this test case.

Table 189 W-Master start-up with overwrite of the DID (compatible)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0179
Name	WTCM_DLST_CHCK_OVERDIDOK
Purpose (short)	Check W-Master start-up behavior with overwrite of the DeviceID (compatible)
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test: test to pass
Specification (clause)	REF 2, 9.3.3.2.3, Annex C.2.1 Table 176, Annex C.2.2 Table 177
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check W-Master start-up behavior with overwrite of DeviceID (compatible). W-Master establishes communication with the WMTU, detects incorrect "W-Device", overwrites the DeviceID with requested DeviceID, reads communication parameters again, and turns WMTU into OPERATE.
Precondition	EUT: WMASTER_CYCLIC PORT_INACTIVE WMTU: WMTU_STANDARD_STATE MTU_DPP1_Set(DeviceID) = 0x00A439 *;compatible to DID 0x002BD2*
Procedure	a) SMI_PortConfiguration(ABPS_TYPE_COMP) *;type compatibility* b) TM_AWAIT_PORT_STATUS(OPERATE) c) MTU_Startup_GetLog *;returning MessageLog* d) Evaluation 1) e) SMI_PortStatus *;returning WPortStatusList* f) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check MessageLog 2) Check WPortStatusList
Test passed	In 1) MessageLog shall contain the following sequence of messages in this order: - Write WirelessSystemCfg - Read DirectParameter (RID, PDin length, PDout length) - Read DirectParameter (VID, DID, FID) - Read WCycleTime - Write CRID (0x11) - Write CDID (0x002BD2) - Write MasterCommand (0x96) ;DeviceIdent - Write WirelessSystemCfg - Read DirectParameter (RID, PDin length, PDout length) - Read WCycleTime - Read DirectParameter (VID, DID, FID) - Write MasterCommand (0x9A) ;Device Preoperate - Write WCycleTime - Write MasterCommand (0x99) ;Device Operate In 2) WPortStatusList shall show the following values: WPortStatusList.PortStatusInfo = OPERATE WPortStatusList.DeviceID = 0x002BD2
Test not passed (examples)	W-Master does not write MasterCommand 0x99
Report	W-Master writes WirelessSystemCfg: <ok | nok> W-Master reads DirectParameter (RID, PDin length, PDout length): <ok | nok> W-Master reads DirectParameter (VID, DID, FID): <ok | nok> W-Master reads WCycleTime: <ok | nok>

TEST CASE RESULTS	CHECK / REACTION	
	W-Master writes CRID:	<ok | nok>
	W-Master writes CDID:	<ok | nok>
	W-Master writes MasterCommand 0x96:	<ok | nok>
	W-Master writes WirelessSystemCfg:	<ok | nok>
	W-Master reads DirectParameter (RID, PDin length, PDout length):	<ok | nok>
	W-Master reads WCycleTime:	<ok | nok>
	W-Master reads DirectParameter (VID, DID, FID):	<ok | nok>
	W-Master writes MasterCommand 0x9A:	<ok | nok>
	W-Master writes WCycleTime:	<ok | nok>
	W-Master writes MasterCommand 0x99:	<ok | nok>
	Correct values in WPortStatusList:	<ok | nok>

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8.3.4 W-Master start-up with overwrite of the DID (incompatible)

Table 190 defines the test conditions for this test case.

Table 190 W-Master start-up with overwrite of the DID (incompatible)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0180
Name	WTCM_DLST_CHCK_OVERDIDNOK
Purpose (short)	Check W-Master start-up behavior with overwrite of the DeviceID (incompatible)
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test: test to pass
Specification (clause)	REF 2, 9.3.3.2.3, Annex C.2.1 Table 176, Annex C.2.2 Table 177
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check W-Master start-up behavior with overwrite of the DeviceID. This test case supposes an incompatible DeviceID causing WMTU to initiate a corresponding Event. W-Master starts communication with WMTU, detects incorrect "W-Device", overwrites the DeviceID with the requested DeviceID, reads communication parameters again, and turns WMTU into PREOPERATE.
Precondition	EUT: WMASTER_CYCLIC PORT_INACTIVE WMTU:WMTU_STANDARD_STATE MTU_DPP1_Set(DeviceID) = 0x00AAAA ;incompatible to any other DID
Procedure	a) SMI_PortConfiguration(ABPS_TYPE_COMP) *;type compatibility* b) TM_AWAIT_PORT_STATUS(OPERATE) c) MTU_Startup_GetLog *;returning MessageLog* d) Evaluation 1) e) SMI_PortEvent ;returning EventCode f) Evaluation 2) g) SMI_PortStatus ;returning WPortStatusList h) Evaluation 3)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check MessageLog 2) Check EventCode 3) Check WPortStatusList
Test passed	In 1) MessageLog shall contain the following sequence of messages in this order: - Write WirelessSystemCfg - Read DirectParameter (RID, PDin length, PDout length) - Read DirectParameter (VID, DID, FID) - Read WCycleTime - Write CRID (0x11) - Write CDID (0x002BD2) - Write MasterCommand (0x96) ;DeviceIdent - Write WirelessSystemCfg - Read DirectParameter (RID, PDin length, PDout length) - Read WCycleTime - Read DirectParameter (VID, DID, FID) - Write MasterCommand (0x9A) ;Device Preoperate In 2) PortEvent: EventCode = 0x1803 ;Incorrect DeviceID In 3) WPortStatusList shall show the following values: WPortStatusList.PortStatusInfo = PORT_DIAG, DeviceID = 0x00AAAA, DiagEntry[any].EventCode = 0x1803 ;Incorrect DeviceID
Test not passed (examples)	No PORT_DIAG, or MasterCommand 0x9A and thereafter a MasterCommand 0x99

TEST CASE RESULTS	CHECK / REACTION	
Report	W-Master writes WirelessSystemCfg:	<ok | nok>
	W-Master reads DirectParameter (RID, PDin length, PDout length):	<ok | nok>
	W-Master reads DirectParameter (VID, DID, FID):	<ok | nok>
	W-Master reads WCycleTime:	<ok | nok>
	W-Master writes CRID:	<ok | nok>
	W-Master writes CDID:	<ok | nok>
	W-Master writes MasterCommand 0x96:	<ok | nok>
	W-Master writes WirelessSystemCfg:	<ok | nok>
	W-Master reads DirectParameter (RID, PDin length, PDout length):	<ok | nok>
	W-Master reads WCycleTime:	<ok | nok>
	W-Master reads DirectParameter (VID, DID, FID):	<ok | nok>
	W-Master writes MasterCommand 0x9A:	<ok | nok>
	W-Master indicates Event: <EventCode>	<ok | nok>
	Correct values in WPortStatusList:	<ok | nok>

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8.4 ISDU (Indexed Service Data Unit)

The W-Master tester shall support the ISDU indexes from Table 191. For more details, check the individual test cases

Table 191 Used ISDU Indexes in W-Master-Tester-System

ISDU_NUM	ISDU Index	Used in testcase
1	0x3FFF (16383)	ISDU Write rejected with ErrorType
2	0xFE (254)	ISDU Write to unsupported Index rejected with ErrorType
3	0xFD (253)	ISDU Write to unsupported Subindex rejected with ErrorType
4	0xFC (252)	ISDU Write to temporarily unavailable Index rejected with ErrorType
5	0xFB (251)	ISDU Write to temporarily unavailable Index due to local control
6	0xFA (250)	ISDU Write to temporarily unavailable Index due to W-Device control
7	0xF9 (249)	ISDU Write to read-only Index denied
8	0xF8 (248)	ISDU Write with invalid Length
9	0x3FFE (16382)	ISDU Write with parameter value out of range
10	0x3FFD (16381)	ISDU Write with parameter value above limit
11	0x3FFC (16380)	ISDU Write with parameter value below limit
12	0x3FFB (16379)	ISDU Write with invalid parameter set
13	0x3FFA (16378)	ISDU Write while W-Device application fault
14	0xFFFF (65535)	ISDU Write to reserved Indices
15	0x3FF8 (16376)	ISDU Write response with timeout
16	0x3FF6 (16374)	ISDU Write response with illegal service code
17	0x3FF5 (16373)	ISDU Write response with wrong checksum (CHKPDU)
18	0x3FF4 (16372)	ISDU Write response with reserved data length ISDU Read response without data
19	0x3E80 (16000)	ISDU Write with minimum data length (0 octets)
20	0x3E81 (16001)	ISDU Write with maximum service length (238 octets)
21	0x3E83 (16003)	ISDU Read with maximum service length (238 octets)
22	0x3E84 (16004)	ISDU Write to 16 bit Index and 8 bit Subindex
23	0x64(100)	ISDU Write with maximum service Length (15 octets) ISDU Write with minimum service Extended Length (17)
24	0x65(101)	ISDU Write with maximum service Length (15 octets) ISDU Write with minimum service Extended Length (17)
25	0x3E85 (16005)	ISDU Write with maximum service Length (15 octets) ISDU Write with minimum service Extended Length (17)
26	0x1FFF (8191)	Write ISDU with NACK/Retry during request
27	0x1FFE (8190)	Read ISDU with NACK/Retry during response
28	0x1FFD (8189)	Write ISDU (segmented) with NACK/Retry during request
29	0x1FFC (8188)	Read ISDU (segmented) with NACK/Retry during response
30	0x1FFB (8187)	Read ISDU (segmented) with flow control overflow
31	0x1FFA (8186)	Read ISDU (segmented) with flow control START missing
32	0x1FF9 (8185)	Read ISDU with a gap in flow control COUNT

8.4.1 Application ErrorTypes

8.4.1.1 ISDU Write rejected with ErrorType

Table 192 defines the test conditions for this test case.

Table 192 ISDU Write rejected with ErrorType

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0181
Name	WTCM_ALIC_AERR_WRITEREJECT
Purpose (short)	ISDU Write service rejected with defined ErrorType, no details
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write service rejected with ErrorType, no details. Access to a supported Index of the WMTU is rejected with an application error without details. The response reports an ErrorCode "0x8000" (APP_DEV).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate *;returns "OPERATE-reached"* b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, ErrorType_W=0x8000) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 1 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8000
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1687 #### 8.4.1.2 ISDU Write to unsupported Index rejected with ErrorType

1688 Table 193 defines the test conditions for this test case.

1689 **Table 193 ISDU Write to unsupported Index rejected with ErrorType**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0182
Name	WTCM_ALIC_AERR_WRITEINDEXUNSUPPORTED
Purpose (short)	ISDU Write to unsupported Index rejected with ErrorType
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2, clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1690

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write to unsupported Index rejected with ErrorType. Access to a non-supported Index in the W-Master Tester is rejected with an application error. The response reports an ErrorType "0x8011" (IDX_NOTAVAIL).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate *;returns "OPERATE-reached"* b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, ErrorType_W=0x8011) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 2 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1691

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8011
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

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1694 #### 8.4.1.3 ISDU Write to unsupported Subindex rejected with ErrorType

1695 Table 194 defines the test conditions for this test case.

1696 **Table 194 ISDU Write to unsupported Subindex rejected with ErrorType**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0183
Name	WTCM_ALIC_AERR_WRITESUBINDEXNOTSUPPORTED
Purpose (short)	ISDU Write to unsupported Subindex (>0) rejected with ErrorType
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1697

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write to unsupported Subindex (>0) rejected with ErrorType. Access to a non-supported Subindex in the W-Master Tester is rejected with an application error. The response reports an ErrorType "0x8012" (SUBIDX_NOTAVAIL).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate *;returns "OPERATE-reached"* b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex1>, Value=<data>,ErrorType_W=0x8012) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex2>,OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 3 (see Table 191) subindex1 = 0 subindex2 = 1 data = [0x00]
Post condition	-

1698

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8012
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

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1701 #### 8.4.1.4 ISDU Write to temporarily unavailable Index rejected with ErrorType

1702 Table 195 defines the test conditions for this test case.

1703 **Table 195 ISDU Write to temporarily unavailable Index rejected with ErrorType**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0184
Name	WTCM_ALIC_AERR_WRITETEMPUNAV
Purpose (short)	ISDU Write to temporarily unavailable Index rejected with ErrorType
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1704

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write to temporarily unavailable Index rejected with ErrorType. Access to a temporarily unavailable Index in the W-Master Tester is rejected with an application error. The response reports an ErrorType "0x8020" (SERV_NOTAVAIL).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate *;returns "OPERATE-reached"* b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>,ErrorType_W=0x8020) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>,OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 4 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1705

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8020
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1706

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1708 #### 8.4.1.5 ISDU Write to temporarily unavailable Index due to local control

1709 Table 196 defines the test conditions for this test case.

1710 **Table 196 ISDU Write to temporarily unavailable Index due to local control**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0185
Name	WTCM_ALIC_AERR_WRITEINDEXTEMPANAVLC
Purpose (short)	ISDU Write to temporarily unavailable Index due to local control
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1711

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to a temporarily unavailable Index due to local control in the W-Master Tester is rejected with an application error. The response reports an ErrorType "0x8021" (SERV_NOTAVAIL_LOCCRTL).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE ;*OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>,ErrorType_W=0x8021) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 5 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1712

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8021
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

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1715 #### 8.4.1.6 ISDU Write to temporarily unavailable Index due to W-Device control

1716 Table 197 defines the test conditions for this test case.

1717 **Table 197ISDU Write to temporarily unavailable Index due to W-Device control**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0186
Name	WTCM_ALIC_AERR_WRITEINDEXTEMPANAVDC
Purpose (short)	ISDU Write to temporarily unavailable Index due to W-Device control
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1718

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to temporarily unavailable Index due to W-Device control in the W-Master Tester is rejected with an application error. The response reports an ErrorType "0x8022" (SERV_NOTAVAIL_DEVCRTL).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE ;*OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, ErrorType_W=0x8022) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 6 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1719

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8022
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

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1722 #### 8.4.1.7 ISDU Write to read-only Index denied

1723 Table 198 defines the test conditions for this test case.

1724 **Table 198 ISDU Write to read-only Index denied**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0187
Name	WTCM_ALIC_AERR_WRITEINDEXRO
Purpose (short)	ISDU Write to read-only Index denied
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1725

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to read-only Index in the WMTU is denied with an application error. The response reports an ErrorCode "0x8023" (IDX_NOT_ACCESSIBLE).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate *;returns "OPERATE-reached"* b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, ErrorType_W=0x8023) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 7 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1726

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8023
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

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1729 #### 8.4.1.8 ISDU Write with invalid Length

1730 Table 199 defines the test conditions for this test case.

1731 **Table 199 ISDU Write with invalid Length**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0188
Name	WTCM_ALIC_AERR_WRITEINVALIDLEN
Purpose (short)	ISDU write with invalid Length
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1732

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU write access with too short data length to an Index in the WMTU is rejected with an application error. The response reports an ErrorType "0x8034" (VAL_LENUNDRUN).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data1>, ErrorType_W=0x8034) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data2>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 8 (see Table 191) subindex = 0 data1= [0x00,0x00] data2= [0x00]
Post condition	-

1733

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8034
Test not passed (examples)	Error not identified or unspecific error message
Report	All evaluations <ok | nok>

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1736 #### 8.4.1.9 ISDU Write with parameter value out of range

1737 Table 200 defines the test conditions for this test case.

1738 **Table 200 ISDU Write with parameter value out of range**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0189
Name	WTCM_ALIC_AERR_WRITEPARAMOUTOFRNG
Purpose (short)	ISDU write with parameter value out of range
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1739

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU write access with parameter values out of range to an Index in the WMTU is rejected with an application error. The response reports an ErrorType "0x8030" (PAR_VALOUTOFRNG).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, ErrorType_W=0x8030) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 9 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1740

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8030
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

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1742

1743 **8.4.1.10 ISDU Write with parameter value above limit**

1744 Table 201 defines the test conditions for this test case.

1745 **Table 201 ISDU Write with parameter value above limit**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0190
Name	WTCM_ALIC_AERR_WRITEPARAMABOVELIMIT
Purpose (short)	ISDU write with parameter value above limit
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1746

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU write access with parameter values above limit to an Index in the WMTU is rejected with an application error. The response reports an ErrorType "0x8031" (PAR_VALGTLIM).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, ErrorType_W=0x8031) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 10 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1747

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8031
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

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1750 **8.4.1.11 ISDU Write with parameter value below limit**

1751 Table 202 defines the test conditions for this test case.

1752 **Table 202 ISDU Write with parameter value below limit**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0191
Name	WTCM_ALIC_AERR_WRITEPARAMBELOWLIMIT
Purpose (short)	ISDU write with parameter value below limit
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1753

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU write access with parameter values below limit to an Index in the WMTU is rejected with an application error. The response reports an ErrorType "0x8032" (PAR_VALLTLIM).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, ErrorType_W=0x8032) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 11 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1754

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8032
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

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1757 **8.4.1.12 ISDU Write with invalid parameter set**

1758 Table 203 defines the test conditions for this test case.

1759 **Table 203 ISDU Write with invalid parameter set**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0192
Name	WTCM_ALIC_AERR_WRITEPARAMINVALID
Purpose (short)	ISDU write with invalid parameter set
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1760

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU write access with invalid parameter values to an Index in the WMTU is rejected with an application error. For example, lower threshold value is above upper threshold value. The response reports an ErrorType "0x8040" (PAR_SETINVALID).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate *;returns "OPERATE-reached"* b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, ErrorType_W=0x8040) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 12 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1761

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8040
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

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1764 **8.4.1.13 ISDU Write while W-Device application fault**

1765 Table 204 defines the test conditions for this test case.

1766 **Table 204 ISDU Write while W-Device application fault**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0193
Name	WTCM_ALIC_AERR_WRITEDEVICEAPPFAULT
Purpose (short)	ISDU write while W-Device application fault
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1767

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU write access to an Index in the WMTU, whose technology specific application is not performing, is rejected with an application error. The response reports an ErrorType "0x8082" (APP_DEVNOTRDY).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, ErrorType_W=0x8082) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 13 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1768

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8082
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1769

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1772 **8.4.1.14 ISDU Write to reserved Indices**

1773 Table 205 defines the test conditions for this test case.

1774 **Table 205 ISDU Write to reserved Indices**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0194
Name	WTCM_ALIC_AERR_WRITERESERVEDINDEX
Purpose (short)	ISDU write to reserved Indices
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test, test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5, Annex B
Configuration / setup	W-Master-Tester-System

1775

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU write access to a reserved Index in the WMTU is rejected with an application error. The response reports an ErrorType "0x8011" (IDX_NOTAVAIL).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, ErrorType_W=0x8011) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 14 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1776

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x8011
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1777

1778

8.4.2 Derived Error Types

8.4.2.1 ISDU Write response with timeout

Table 206 defines the test conditions for this test case.

Table 206 ISDU Write response with timeout

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0195
Name	WTCM_ALIC_DERR_WRITEAFTERBUSYTIMEOUT
Purpose (short)	ISDU Write response with timeout reports Derived ErrorType
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test, test to pass
Specification (clause)	REF 1 clause 10.8.7, Table 102; Annex B
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the WMTU, which does not generate a response after an adequate time. The response reports a derived ErrorType "0x1100" (I-SERVICE_TIMEOUT).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, Specialty=TIMEOUT) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 15 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x1100
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1787 #### 8.4.2.2 ISDU Write response with illegal service code

1788 Table 207 defines the test conditions for this test case.

1789 **Table 207 ISDU Write response with illegal service code**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0196
Name	WTCM_ALIC_DERR_ILLSERVICECODE
Purpose (short)	ISDU Write response with illegal service code reports Derived ErrorType
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4, Table 73; REF 1 Annex B
Configuration / setup	W-Master-Tester-System

1790

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the WMTU generating a response with incorrect service code (I-Service/Length), is responded with an application error. The response reports a derived ErrorCode "0x5700" (M_ISDU_ILLEGAL).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, Specialty=INCORRECT_SERVICE_CODE) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 16 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1791

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x5700
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1792

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1794 #### 8.4.2.3 ISDU Write response with wrong checksum (CHKPDU)

1795 Table 208 defines the test conditions for this test case.

1796 **Table 208 ISDU Write response with wrong checksum (CHKPDU)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0197
Name	WTCM_ALIC_DERR_WRONGCHECKSUM
Purpose (short)	ISDU Write response with wrong checksum (CHKPDU) reports Derived ErrorType.
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 1 Annex B; A.5.6
Configuration / setup	W-Master-Tester-System

1797

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the WMTU generating a response with wrong CHKPDU, is responded with an application error. The response reports a derived ErrorCode "0x5600" (M_ISDU_CHECKSUM).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE ;*OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, Specialty=INCORRECT_CHKPDU) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 17 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1798

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x5600
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

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1802 #### 8.4.2.4 ISDU Write response with reserved data length

1803 Table 209 defines the test conditions for this test case.

1804 **Table 209 ISDU Write response with reserved data length**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0198
Name	WTCM_ALIC_DERR_WRITERESERVEDDL
Purpose (short)	ISDU write response with reserved data length reports Derived ErrorType
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4, Table 73; REF 1 Annex B
Configuration / setup	W-Master-Tester-System

1805

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the WMTU is responded with "reserved data length" and results in an application error. The response reports a Derived ErrorCode "0x1000" (COM_ERR) or 0x5700 (M_ISDU_ILLEGAL).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, Specialty=RESERVED_DATA_LENGTH) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 18 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1806

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x1000 or 0x5700
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1807

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1809

8.4.3 Limit checks

8.4.3.1 ISDU Read response without data

Table 210 defines the test conditions for this test case.

Table 210 ISDU Read response without data

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0199
Name	WTCM_ALIC_DERR_READNODATA
Purpose (short)	ISDU Read response without data reports no Derived ErrorType
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5; Annex B
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Read access to an Index in the WMTU generating a positive response without data is responded without error.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>) d) SMI_DeviceRead(ABPS_DEVICEREAD(Index=<index>, Subindex=<subindex>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 18 (see Table 191) subindex = 0 data = [ ]
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "On-request_Data" received, and OD = [ ]
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1818 #### 8.4.3.2 ISDU Write with minimum data length (zero octets)

1819 Table 211 defines the test conditions for this test case.

1820 **Table 211 ISDU Write with minimum data length (zero octets)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0200
Name	WTCM_ALIC_LIMT_WRITEMINDATALENGTH
Purpose (short)	ISDU Write with minimum data length (zero octets)
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5; Annex B
Configuration / setup	W-Master-Tester-System

1821

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the WMTU using the minimum data of zero octets. The response shall be positive.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 19 (see Table 191) subindex = 0 data = [ ]
Post condition	-

1822

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "VoidBlock" received
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1823

1824

1825 #### 8.4.3.3 ISDU Write with maximum service length (238 octets)

1826 Table 212 defines the test conditions for this test case.

1827 **Table 212 ISDU Write with maximum service length (238 octets)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0201
Name	WTCM_ALIC_LIMT_WRITEMAXDATALENGTH
Purpose (short)	ISDU Write with maximum service length (238 octets)
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5; Annex B
Configuration / setup	W-Master-Tester-System

1828

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the WMTU using the maximum service length of 238 octets. The response shall be positive.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2) f) MTU_ISDU_Read(Index=<index>, Subindex=<subindex>) ;returns <value> (octet string) g) Evaluation 3)
Test parameter	index = ISDU_NUM 20 (see Table 191) subindex = 0 data = [0x00, 0x01 to 0xE7] (232 octets user data)
Post condition	-

1829

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock 3) Check returned <value>
Test passed	"OPERATE-reached" = TRUE ArgBlock "VoidBlock" received Returned <value> = data
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1830

1831

1832 #### 8.4.3.4 ISDU Read with maximum service length (238 octets)

1833 Table 213 defines the test conditions for this test case.

1834 **Table 213 ISDU Read with maximum service length (238 octets)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0202
Name	WTCM_ALIC_LIMT_READMAXDATALENGTH
Purpose (short)	ISDU read with maximum service length (238 octets)
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5; Annex B
Configuration / setup	W-Master-Tester-System

1835

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Read access to an Index in the WMTU using the maximum service length of 238 octets. The response shall be positive.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>) d) SMI_DeviceRead(ABPS_DEVICEREAD(Index=<index>, Subindex=<subindex>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 21 (see Table 191) subindex = 0 data = [0x01, 0x02 to 0xE8] (232 octets user data)
Post condition	-

1836

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "On-request_Data" received, and OD = data
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1837

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1840 #### 8.4.3.5 ISDU Write to 16 bit Index and 8 bit Subindex

1841 Table 214 defines the test conditions for this test case.

1842 **Table 214 ISDU Write to 16 bit Index and 8 bit Subindex**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0203
Name	WTCM_ALIC_LIMT_WRITEINDEX16SUBINDEX8
Purpose (short)	ISDU write to 16 bit Index and 8 bit Subindex
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5; Annex B
Configuration / setup	W-Master-Tester-System

1843

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to a 16-bit Index and 8-bit Subindex in the WMTU. The response shall be positive.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data1>) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data2>)) e) Evaluation 2) f) MTU_ISDU_Read(Index=<index>, Subindex=<subindex>) ;returns <value> (octet string) g) Evaluation 3)
Test parameter	index = ISDU_NUM 22 (see Table 191) subindex = 1 data1 = [0xAB] data2 = [0x00]
Post condition	-

1844

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock 3) Check returned <value>
Test passed	"OPERATE-reached" = TRUE ArgBlock "VoidBlock" received Returned <value> = data2
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1845

1846

1847

1848 **8.4.3.6 ISDU Write with maximum service Length (15 octets)**

1849 Table 215 defines the test conditions for this test case.

1850 **Table 215 ISDU Write with maximum service Length (15 octets)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0204
Name	WTCM_ALIC_LIMT_WRITEMAXSERVICELEN15
Purpose (short)	ISDU service (with maximum service length 15) is carried out.
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5; Annex B
Configuration / setup	W-Master-Tester-System

1851

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to several Index and Subindex combinations in the WMTU. WMTU with maximum service length 15. The response shall be positive.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) Assign first values to "index", "subindex", "init", "data" d) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<init>) e) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) f) Evaluation 2) g) MTU_ISDU_Read(Index=<index>, Subindex=<subindex>) ;returns <value> (octet string) h) Evaluation 3) i) Repeat from c) with next "index", "subindex", "init", "data"

Test parameter	index = {ISDU_NUM 23, ISDU_NUM 24, ISDU_NUM 25} (see Table 191)
	subindex = {0, 1, 1}
	init = {
	[0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00],
	[0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00],
	[0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00]
	}
	data = {
	[0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x08, 0x09, 0x0A, 0x0B, 0x0C],
	[0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x08, 0x09, 0x0A, 0x0B],
	[0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x08, 0x09, 0x0A]
	}

Post condition	-

1852

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" For all loops: 2) Check returned ArgBlock 3) Check returned <value>
Test passed	"OPERATE-reached" = TRUE For all loops: ArgBlock "VoidBlock" received Returned <value> = data
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1853

1854 #### 8.4.3.7 ISDU Write with minimum service Extended Length (17)

1855 Table 216 defines the test conditions for this test case.

1856 **Table 216 ISDU Write with minimum service Extended Length (17)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0205
Name	WTCM_ALIC_LIMT_WRITEMINSERVICEEXTLEN17
Purpose (short)	ISDU service (with minimum Extended Length 17) is carried out.
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.4; REF 1 Annex A.5; Annex B
Configuration / setup	W-Master-Tester-System

1857

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to several Index and Subindex combinations in the WMTU. WMTU with minimum Extended Length 17. The response shall be positive.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) Assign first values to "index", "subindex", "init", "data" d) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<init>) e) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) f) Evaluation 2) g) MTU_ISDU_Read(Index=<index>, Subindex=<subindex>) ;returns <value> (octet string) h) Evaluation 3) i) Repeat from c) with next "index", "subindex", "init", "data"

Test parameter	index = {ISDU_NUM 23, ISDU_NUM 24, ISDU_NUM 25} (see Table 191)
	subindex = {0, 1, 1}
	init = {
	[0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00],
	[0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00],
	[0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00]
	}
	data = {
	[0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x08, 0x09, 0x0A, 0x0B, 0x0C, 0x0D],
	[0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x08, 0x09, 0x0A, 0x0B, 0c0C],
	[0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x08, 0x09, 0x0A, 0x0B]
	}

Post condition	-

1858

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" For all loops: 2) Check returned ArgBlock 3) Check returned <value>
Test passed	"OPERATE-reached" = TRUE For all loops: ArgBlock "VoidBlock" received Returned <value> = data
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1859

8.4.4 Low level stability

8.4.4.1 Write ISDU with NACK/Retry during request

Table 217 defines the test conditions for this test case.

Table 217 Write ISDU with NACK/Retry during request

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0206
Name	WTCM_DLIS_ISDU_NOTSEGRETRYDOWNLINK
Purpose (short)	Behavior in case of NACK when sending a not segmented ISDU Request.
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.1
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU write access to an Index in the WMTU which shall be not segmented. The WMTU returns a NACK so that the EUT has to repeat the ISDU write access.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>,Specialty= WRITE_NACK) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>,OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 26 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check that the EUT sends the same packet again after a NACK.
Test passed	"OPERATE-reached" = TRUE The EUT sends the same packet again to the WMTU.
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1868 #### 8.4.4.2 Read ISDU with NACK/Retry during response

1869 Table 218 defines the test conditions for this test case.

1870 **Table 218 Read ISDU with NACK/Retry during response**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0207
Name	WTCM_DLIS_ISDU_NOTSEGRETRYUPLINK
Purpose (short)	Behavior in case of repeating a not segmented ISDU response.
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.1
Configuration / setup	W-Master-Tester-System

1871

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU read access to an Index in the WMTU, where the WMTU shall return the read response (all in one segment) two times with different data, to simulate a not received ACK from the EUT.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, Specialty= READ_NACK) d) SMI_DeviceRead(ABPS_DEVICEREAD(Index=<index>, Subindex=<subindex>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 27 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1872

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check that the EUT uses the data from the second response of the WMTU and returns without errors
Test passed	"OPERATE-reached" = TRUE EUT uses the data from the repetition and returns without errors
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1873

1874 #### 8.4.4.3 Write ISDU (segmented) with NACK/Retry during request

1875 Table 219 defines the test conditions for this test case.

1876 **Table 219 Write ISDU (segmented) with NACK/Retry during request**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0208
Name	WTCM_DLIS_ISDU_SEGRETRYDOWNLINK
Purpose (short)	Behavior in case of NACK when sending segmented ISDU Request.
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.1
Configuration / setup	W-Master-Tester-System

1877

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU write access to an Index in the WMTU which shall be segmented. The WMTU returns a NACK after the second request so that the EUT has to repeat the last segment.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, Specialty= WRITE_NACK_SEG) d) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 28 (see Table 191) subindex = 0 data = [0x00, 0x01 to 0x56] (87 octets user data)
Post condition	-

1878

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check that the EUT sends the same packet again after a NACK.
Test passed	"OPERATE-reached" = TRUE The EUT sends the same packet again to the WMTU.
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1879

1880

1881 #### 8.4.4.4 Read ISDU (segmented) with NACK/Retry during response

1882 Table 220 defines the test conditions for this test case.

1883 **Table 220 Read ISDU (segmented) with NACK/Retry during response**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0209
Name	WTCM_DLIS_ISDU_SEGRETRYUPLINK
Purpose (short)	Behavior in case of repeating a segmented ISDU response
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.1
Configuration / setup	W-Master-Tester-System

1884

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU read access to an Index in the WMTU, where the WMTU shall return the read response two times with different data in the second segment, to simulate a not received ACK from the EUT.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate *;returns "OPERATE-reached"* b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, Specialty= READ_NACK_SEG) d) SMI_DeviceRead(ABPS_DEVICEREAD(Index=<index>, Subindex=<subindex>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 29 (see Table 191) subindex = 0 data = [0x00, 0x01 to 0x56] (87 octets user data)
Post condition	-

1885

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check that the EUT uses the data from the second response of the WMTU and returns without errors
Test passed	"OPERATE-reached" = TRUE EUT uses the data from the repetition and returns without errors
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1886

1887

1888 #### 8.4.4.5 Read ISDU (segmented) with flow control overflow

1889 Table 221 defines the test conditions for this test case.

1890 **Table 221 Read ISDU (segmented) with flow control overflow**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0210
Name	WTCM_DLIS_ISDU_OVERFLOWFCCOUNT
Purpose (short)	Correctly process a segmented ISDU read response, when the counter in the ULink Control Octet overflows.
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.1
Configuration / setup	W-Master-Tester-System

1891

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU read access to an Index in the WMTU which returns a response (segmented into >= 9 segments) to the EUT. The EUT shall correctly handle the segmentation with overflow.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>) d) SMI_DeviceRead(ABPS_DEVICEREAD(Index=<index>, Subindex=<subindex>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 30 (see Table 191) subindex = 0 data = [0x00, 0x01 to 0x7D] (126 octets user data, to reach overflow also on a DSlot device with flow control (FC): 0x08 (START), 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x00, …, 0x09 (EOS))
Post condition	-

1892

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "On-request_Data" received, and OD = data
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1893

1894

1895 #### 8.4.4.6 Read ISDU (segmented) with flow control START missing

1896 Table 222 defines the test conditions for this test case.

1897 **Table 222 Read ISDU (segmented) with flow control START missing**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0211
Name	WTCM_DLIS_ISDU_FCSTARTMISSING
Purpose (short)	Correctly process a ISDU read response when the flow control START is missing.
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.1
Configuration / setup	W-Master-Tester-System

1898

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU read access to an Index in the WMTU which returns a ISDU response where flow control START is missing, the response starts directly with the COUNT (0x01).
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, Specialty= FC_NO_START) d) SMI_DeviceRead(ABPS_DEVICEREAD(Index=<index>, Subindex=<subindex>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 31 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1899

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x5700 (M_ISDU_ILLEGAL)
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1900

1901

1902 #### 8.4.4.7 Read ISDU with a gap in flow control COUNT

1903 Table 223 defines the test conditions for this test case.

1904 **Table 223 Read ISDU with a gap in flow control COUNT**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0212
Name	WTCM_DLIS_ISDU_FCCOUNTERROR
Purpose (short)	Correctly process a ISDU read response when the flow control has a gap in the COUNT.
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master ISDU test: test to pass
Specification (clause)	REF 2 clause 7.4.1
Configuration / setup	W-Master-Tester-System

1905

3) TEST CASE	4) CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU read access to an Index in the WMTU Tester which returns a ISDU response with a gap in the flow control COUNT.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "OPERATE-reached" b) Evaluation 1) c) MTU_ISDU_Add(Index=<index>, Subindex=<subindex>, Value=<data>, Specialty= FC_COUNT_GAP) d) SMI_DeviceRead(ABPS_DEVICEREAD(Index=<index>, Subindex=<subindex>)) e) Evaluation 2)
Test parameter	index = ISDU_NUM 32 (see Table 191) subindex = 0 data = [0x00]
Post condition	-

1906

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "OPERATE-reached" 2) Check returned ArgBlock
Test passed	"OPERATE-reached" = TRUE ArgBlock "Job Error" received, and JobError.ErrorCode/AdditionalCode = 0x5700 (M_ISDU_ILLEGAL)
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

1907

1908

8.5 Scan, Pairing, Roaming

8.5.1 Scan unpaired W-Devices

Table 224 defines the test conditions for this test case.

Table 224 Scan unpaired W-Devices

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0213
Name	WTCM_SMTH_SCAN_UNPAIRED
Purpose (short)	Detect all unpaired W-Devices or W-Bridges
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master service test, test to pass
Specification (clause)	See REF 2 clause 9.2.3.2.1
Configuration / setup	Setup W-Master Tester System consisting of: a) WMTU b) Mix of W-Devices type A and B (see Annex B)

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Detect all unpaired W-Devices or W-Bridges within time SCAN_TIMEOUT
Precondition	EUT: WMASTER_CYCLIC PORT_INACTIVE WMTU: WMTU_STANDARD_STATE W-Devices unpaired
Procedure	a) SMI_WScan() ;returns "ArgBlock VoidBlock" b) TM_AWAIT(SCAN_TIMEOUT) c) SMI_WScanStatus() ;returns "ArgBlock WScanStatusList" d) Evaluation 1) e) SMI_WTrackStatus() ;returns "ArgBlock WTrackStatusList" f) Evaluation 2)
Test parameter	W-Devices list (RevisionID, UniqueID, DefaultSlotType)
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check “ArgBlock WScanStatusList" 2) Check “ArgBlock WTrackStatusList"
Test passed	WScanStatusList correspond with W-Devices list input WTrackStatusList: TrackMode = CYCLIC
Test not passed (examples)	Any evaluation failed
Report	WScanStatusList match: <ok | nok> WTrackStatusList TrackMode: <value> <ok | nok>

8.5.2 Pairing by Unique-ID

Table 225 defines the test conditions for this test case

Table 225 Pairing by Unique-ID

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0214
Name	WTCM_SMTH_PAIR_UNIQUE
Purpose (short)	Pairing of W-Device or W-Bridge via UniqueID
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master service test, test to pass
Specification (clause)	See REF 2 clause 9.2.3.2.1 and 9.2.3.2.2
Configuration / setup	Setup consisting of: a) W-Master-Tester-System b) Mix of W-Devices type A and B (see Annex B)

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check for pairing timeout and pair unpaired W-Devices or W-Bridges to a W-Port
Precondition	EUT: WMASTER_CYCLIC PORT_INACTIVE WMTU: WMTU_STANDARD_STATE W-Devices unpaired
Procedure	a) SMI_PortConfiguration(ABPS_NOTYPE_CHECK, UniqueID not from W-Device list) b) TM_AWAIT(PAIRING_TIMEOUT) c) SMI_PortStatus() ;returns WPortStatusList d) Evaluation 1) e) SMI_PortConfiguration(ABPS_NOTYPE_CHECK, UniqueID from W-Device list) f) TM_AWAIT_PORT_STATUS(OPERATE) *;returns " OPERATE Reached"* g) Evaluation 2) h) Repeat from e) for all W-Devices in list with incremented port and slot numbers
Test parameter	W-Devices list (RevisionID, UniqueID, DefaultSlotType)
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check WPortStatusList 2) Check "OPERATE-reached"
Test passed	WPortStatusList: PortStatusInfo = NO_DEVICE, and “OPERATE-reached” = TRUE
Test not passed (examples)	Any evaluation failed
Report	Correct values in WPortStatusList: <yes/no> <ok | nok> Correct values in WPortStatusList: <yes/no> <ok | nok>

8.5.3 Unpairing

Table 226 defines the test conditions for this test case

Table 226 Unpairing

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0215
Name	WTCM_SMTH_UNPAIRING
Purpose (short)	Unpairing of W-Device or W-Bridge
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master service test, test to pass
Specification (clause)	See REF 2 clause 9.2.3.2.1 and 9.2.3.2.2
Configuration / setup	Setup consisting of: a) W-Master-Tester-System b) Mix of W-Devices type A and B (see Annex B)

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Unpair the W-Master Tester via upper level system
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE in OPERATE W-Devices in OPERATE
Procedure	a) SMI_WPortPairing(UNPAIRING) b) TM_AWAIT_PORT_STATUS(NO_DEVICE) *;returns "Reached"* c) Evaluation 1) d) WMTU_State_CheckUnpairing ;returns "W-Master sent Unpairing" e) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check “Reached” 2) Check “W-Master sent Unpairing“
Test passed	“Reached” = TRUE, and “W-Master sent Unpairing“= TRUE
Test not passed (examples)	Any evaluation failed
Report	Correct values in WPortStatusList <ok | nok> Master sends UnPairing MasterCommand: <ok | nok>

8.5.4 Pairing by button

Table 227 defines the test conditions for this test case

Table 227 Pairing by button

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0216
Name	WTCM_SMTH_PAIR_BUTTON
Purpose (short)	Pairing of a W-Device or W-Bridge via button
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master service test, test to pass
Specification (clause)	See REF 2 clause 9.2.3.2.1 and 9.2.3.2.2
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Pair by button an unpaired W-Device to a W-Port. Check the W-Master port configuration UniqueID is updated
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING (UniqueID != MTU_UniqueID) WMTU: WMTU_STANDARD_STATE
Procedure	a) SMI_WPortPairing(PAIRING_BY_BUTTON) b) WMTU_State_PairingByButton c) TM_AWAIT_PORT_STATUS(OPERATE) *;returns "Reached"* d) Evaluation 1) e) SMI_ReadbackPortConfiguration() *;returns WPortConfigList* f) Evaluation 2) g) SMI_PortEvent ;returns EventCode h) Evaluation 3)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check “Reached” 2) Check WPortConfigList 3) Check EventCode
Test passed	“Reached” = TRUE, and WPortConfigList: UniqueID = MTU_UniqueID, and PortEvent: EventCode = 0x3002 *;IOLW UniqueID changed*
Test not passed (examples)	Any evaluation failed
Report	Correct values in WPortConfigList: <ok | nok> Correct values in PortEvent: <ok | nok>

8.5.5 Pair a W-Device to different Track (multitrack W-Master)

Table 228 defines the test conditions for this test case

Table 228 Pair a W-Device to different Track

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0217
Name	WTCM_SMTH_PAIR_DIFFTRACK
Purpose (short)	W-Master pairs a W-Device from Service Track to a different Track
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master service test, test to pass
Specification (clause)	See REF 2 clause 9.2.3.2.1, 9.2.3.2.2 and 13.2
Configuration / setup	Setup consisting of: a) W-Master-Tester-System b) W-Device type A (see Annex B)

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if W-Device will be paired from a Service Track to a different Track specified in port configuration
Precondition	EUT: WMASTER_CYCLIC (ServiceTrack = 2) PORT_INACTIVE WMTU: WMTU_STANDARD_STATE W-Device unpaired
Procedure	a) SMI_PortConfiguration(ABPS_NOTYPE_CHECK) b) TM_AWAIT_PORT_STATUS(OPERATE) *;returns "Reached"* c) Evaluation 1) d) WMTU_State_CheckCyclic *;reset "CheckCyclic"* e) SMI_PortConfiguration(ABPS_NOTYPE_CHECK, UniqueID of W-Device) f) TM_AWAIT(PAIRING_TIMEOUT) g) WMTU_State_CheckCyclic *;returns "CheckCyclic"* h) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check "Reached" 2) "CheckCyclic" = TRUE (normal downlink operation, not missing every 5th W-Sub-Cycle)
Test passed	"Reached" = TRUE, and Downlinks not missing every 5th W-Sub-Cycle
Test not passed (examples)	Any evaluation failed
Report	W-Device is paired to a Track in CylicMode <ok | nok> Track does not miss W-Sub-Cycles <ok | nok>

8.5.6 Roaming ServiceMode

Table 229 defines the test conditions for this test case

Table 229 Roaming ServiceMode

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0218
Name	WTCM_SMTH_PAIR_ROAMING
Purpose (short)	W-Master detect and pair a W-Device to Track in RoamingMode
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master service test, test to pass
Specification (clause)	REF 2, clause 9.2.3.2.1; 9.2.3.2.2 and 13.3.2
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if W-Device will be detected and paired to Track in RoamingMode specified in port configuration
Precondition	EUT: WMASTER_CYCLIC (ServiceMode = ROAMING) PORT_INACTIVE WMTU: WMTU_STANDARD_STATE (deactivated)
Procedure	a) SMI_WScanStatus() *;returns "ArgBlock WScanStatusList"* b) Evaluation 1) c) MTU_State_Activate d) TM_AWAIT(1 second) e) SMI_WScanStatus() *;returns "ArgBlock WScanStatusList"* f) Evaluation 2) g) SMI_PortConfiguration(ABPS_NOTYPE_CHECK, Roaming=YES) h) TM_AWAIT_PORT_STATUS(OPERATE) i) Evaluation 3) j) SMI_PortConfiguration(ABPS_PORTINACTIVE) k) SMI_PortConfiguration(ABPS_NOTYPE_CHECK) l) TM_AWAIT_PORT_STATUS(OPERATE) m) Evaluation 4)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check “ArgBlock WScanStatusList" 2) Check “ArgBlock WScanStatusList" 3) Check Roaming flag in pairing request 4) Check Roaming flag in pairing request
Test passed	WScanStatusList does not contain WMTU UniqueID, and WScanStatusList contains WMTU UniqueID, and Roaming Flag = 1, and Roaming Flag = 0
Test not passed (examples)	Any evaluation failed
Report	Roaming track scan W-Devices and forward to upper level system <ok | nok> Roaming Flag is set in pairing request according to port configuration <ok | nok>

8.6 Events

The Event propagation to the upper level system, for example a fieldbus, is not subject matter of this document. This behavior shall be defined in the corresponding "upper level systems integration" specification. Thus, there is no immediate Event acknowledgement of the W-Master. Therefore, the timeout for waiting on the acknowledgement shall be adjustable in the MTU.

8.6.1 W-Master receives Event

Table 230 defines the test conditions for this test case.

Table 230 W-Master receives Event

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0219
Name	WTCM_ALIC_EVNT_EVENT
Purpose (short)	W-Master receives event with details (single event)
Equipment under test (EUT)	W-Master + W-Port
Test case version	1.0
Category / type	W-Master Event test: test to pass
Specification (clause)	REF 2, see 8.3.3.1, 11.6, A.11, Annex D
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	W-Master receives Event. W-Master transfers the EventCode and EventQualifier to the upper level system. W-Master confirm the Event;
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "MTU in OPERATE" b) Evaluation 1) c) MTU_Event_SetStatusCode(0x81) *;enters StatusCode in memory* d) MTU_Event_SetSlot(1, 0xF4, 0x1000) *;enters in slot 1 Event Q and Code* e) MTU_Event_TriggerAndWaitForAck *;returns "EventAck"* f) Evaluation 2) g) DLL_GetDeviceEvents(1) ;minED = 1, returns "EventList "Evaluation 3)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "MTU in OPERATE" 2) Check "EventAck" 3) Check "EventList"
Test passed	"MTU in OPERATE" = TRUE, and EventAck.StatusCodeRead = TRUE, EventAck.AllSlotsRead = TRUE, EventAck.Acknowledge = TRUE, and EventList.Entry1 (EventQualifier = 0xF4, EventCode = 0x1000)
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.6.2 W-Master receives Event from SSlot W-Device with wrong FlowControl

Table 231 defines the test conditions for this test case.

Table 231 W-Master receives Event from SSlot W-Device with wrong FlowControl (FC)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0220
Name	WTCM_DLIC_EVNT_SSLOTEVENTWRONGFC
Purpose (short)	W-Master behavior in case of wrong FlowControl from SSlot W-Device
Equipment under test (EUT)	W-Master + W-Port
Test case version	1.0
Category / type	W-Master Event test: test to pass
Specification (clause)	REF 2, see Table 78 and A.7.4 (segmentation example for SSlot)
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WMTU sends Event with wrong Flow Control (FC) W-Master does not transfer Event to upper level system and not confirm the Event. WMTU resends Event after confirmation timeout. W-Master transfers Event to upper level system and confirms the Event.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING (ABPS_NOTYPE_CHECK <SlotType = SSLOT>) WMTU: WMTU_STANDARD_STATE ;*OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "MTU in OPERATE" b) Evaluation 1) c) MTU_Event_SetStatusCode(0x81) ;enters StatusCode in memory d) MTU_Event_SetSlot(1, 0xF4, 0x1000) ;enters in slot 1 Event Q and Code e) WMTU sends the Event with wrong Flow Control (FC): START, FC=0x01, FC=0x03, EOS. f) Evaluation 2) g) WMTU resends the Event with correct Flow Control (FC): START, FC=0x01, FC=0x0B, EOS after confirmation timeout. h) Evaluation 3 i) Evaluation 4
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "MTU in OPERATE" 2) Check W-Master ignores Event (W-Master shall not perform Event handling and shall not confirm the Event). 3) Check W-Master handles Event (W-Master performs Event to upper level system). 4) Check WMTU receives Event confirmation (W-Master confirms the Event).
Test passed	"MTU in OPERATE" = TRUE, and Evaluations steps 2) to 4) ok.
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.6.3 W-Master receives Event from DSlot W-Device with wrong FlowControl (FC)

Table 232 defines the test conditions for this test case.

Table 232 W-Master receives Event from DSlot W-Device with wrong FlowControl (FC)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0221
Name	WTCM_DLIC_EVNT_DSLOTEVENTWRONGFC
Purpose (short)	W-Master behavior in case of wrong FlowControl from DSlot W-Device
Equipment under test (EUT)	W-Master + W-Port
Test case version	1.0
Category / type	W-Master Event test: test to pass
Specification (clause)	REF 2 see Table 78.
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WMTU sends Event in segments with wrong Flow Control (FC) W-Master does not transfer Event to upper level system and not confirm the Event. WMTU resends Event after 1 second with correct flow control (FC). W-Master transfers Event to upper level system and confirms the Event.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE ;OPERATE WMTU shall send 12 octets of Process Data In in each ULink to ensure segmentation for Event
Procedure	a) MTU_State_CheckOperate ;returns "MTU in OPERATE" b) Evaluation 1) c) MTU_Event_SetStatusCode(0x81) *;enters StatusCode in memory* d) MTU_Event_SetSlot(1, 0xF4, 0x1000) *;enters in slot 1 Event Q and Code* e) WMTU sends the Event segmented with wrong Flow Control (FC) in the following way: ULink 1 START+ 1 octet Data ULink 2 FC=1 + 1 octet Data ULink 3 FC=3 + 1 octet Data ULink 4 EOS f) Evaluation 2) g) WMTU resends the Event segmented with correct Flow Control (FC) in the following way: ULink 1 START+ 1 octet Data ULink 2 FC=1 + 1 octet Data ULink 3 FC=2 + 1 octet Data ULink 4 EOS h) Evaluation 3) i) Evaluation 4)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "MTU in OPERATE" 2) Check W-Master ignores Event (W-Master shall not perform Event handling and shall not confirm the Event). 3) Check W-Master handles Event (W-Master performs Event to upper level system). 4) Check WMTU receives Event confirmation (W-Master confirms the Event).
Test passed	"MTU in OPERATE" = TRUE, and Evaluations steps 2) to 4) ok.
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.6.4 W-Master receives Event from W-Device without End Of Segment (EOS)

Table 233 defines the test conditions for this test case.

Table 233 W-Master receives Event from W-Device without End Of Segment (EOS)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0222
Name	WTCM_DLIC_EVNT_EVENTWITHOUTEOS
Purpose (short)	W-Master behavior in case of incomplete Event data from W-Device
Equipment under test (EUT)	W-Master + W-Port
Test case version	1.0
Category / type	W-Master Event test: test to pass
Specification (clause)	REF 2 see Table 78.
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WMTU sends Event without End Of Segment (EOS) as example for an incomplete Event. W-Master shall not transfer Event to upper level system and not confirm the Event.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "MTU in OPERATE" b) Evaluation 1) c) MTU_Event_SetStatusCode(0x81) ;enters StatusCode in memory d) MTU_Event_SetSlot(1, 0xF4, 0xFFB9) ;enters in slot 1 Event Q and Code e) WMTU sends the Event without End Of Segment (EOS) f) Evaluation 2) g) Wait 1 second h) MTU_Event_SetStatusCode(0x81) ;enters StatusCode in memory i) MTU_Event_SetSlot(1, 0xF4, 0x1000) ;enters in slot 1 Event Q and Code j) WMTU sends the Event with End Of Segment (EOS) k) Evaluation 3) l) Evaluation 4)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "MTU in OPERATE" 2) Check W-Master ignores Event (W-Master shall not perform Event handling and shall not confirm the Event). 3) Check W-Master handles Event (W-Master performs Event to the upper level system in an appropriate form (matching semantics or syntax = EventCode = 0x1000 and EventQualifier = 0xF4)). 4) Check WMTU receives Event confirmation (W-Master confirms the Event).
Test passed	"MTU in OPERATE" = TRUE, and Evaluations steps 2) to 4) ok.
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.6.5 W-Master receives Event without confirmation of previous Event

Table 234 defines the test conditions for this test case.

Table 234 W-Master receives Event without confirmation of previous Event

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0223
Name	WTCM_DLIC_EVNT_EVENTWITHOUTCONF
Purpose (short)	W-Master behavior in case of Event bursts from W-Device
Equipment under test (EUT)	W-Master + W-Port
Test case version	1.0
Category / type	W-Master Event test: test to pass
Specification (clause)	REF 2 see clause 7.6.2
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WMTU sends Event without confirmation of previous Event. EUT shall forward first Event to upper level system and ignore second Event.
Precondition	EUT: WMASTER_CYCLIC PORT_CYCLIC_AUTOPAIRING WMTU: WMTU_STANDARD_STATE *;OPERATE*
Procedure	a) MTU_State_CheckOperate ;returns "MTU in OPERATE" b) Evaluation 1) c) MTU_Event_SetStatusCode(0x81) ;enters StatusCode in memory d) MTU_Event_SetSlot(1, 0xF4, 0x1000) ;enters in slot 1 Event Q and Code e) WMTU sends the Event f) MTU_Event_SetStatusCode(0x81) ;enters StatusCode in memory g) MTU_Event_SetSlot(1, 0xF4, 0xFFB9) ;enters in slot 1 Event Q and Code h) WMTU sends the Event immediately without waiting for confirmation of step e). i) Evaluation 2) j) Evaluation 3)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "MTU in OPERATE" 2) Check W-Master handles only first Event (W-Master performs Event to the upper-level system in an appropriate form (matching semantics or syntax = EventCode = 0x1000 and EventQualifier = 0xF4)). 3) Check WMTU receives Event confirmation of first Event (W-Master confirms the first Event).
Test passed	"MTU in OPERATE" = TRUE, and Evaluations steps 2) and 3) ok.
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7 Data Storage (DS)

8.7.1 General

Some test cases need cleared Data Storage as a precondition to perform the test. One possibility is the re-configuration of the W-Master port.

8.7.2 Delete stored DS object after reconfiguration

Table 235 defines the test conditions for this test case.

Table 235 Delete stored DS object after reconfiguration

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0224
Name	WTCM_ALIC_STOR_DELETEDSAFTERRECONF
Purpose (short)	Delete DS data object after W-Port reconfiguration
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.3, Figure 101, Table E.3, Annex G, Table G.2
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Any change of W-Port configuration ("WPortConfigList") via SMI service causes the stored DataStorageObject to be cleared. Two W-Port reconfigurations to different PortModes are tested during 2 test procedure loops (TPL): TPL1: Change to PortMode = IOLW_CYCLIC_AUTO and DeviceID = 0x002BD4, Validation&Backup = "4" TPL2: Change to PortMode = DEACTIVATED
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) Assign first value to "ConfigList" b) TM_MASTER_UPLOAD(PARSET1) ;*prepare EUT and WMTU for identical DS data* c) SMI_DSToParServ ;*returns "DS_Data" (uploaded)* d) Evaluation 1) e) SMI_PortConfiguration(<ConfigList>) *;change W-Port configuration* f) SMI_DSToParServ ;*returns "DS_Data" (cleared)* g) Evaluation 2) h) Repeat from b) with next "ConfigList"
Test parameter	ConfigList = {APBS_NOTYPE_CHECK, ABPS_TYPE_COMP(<DeviceID = 0x002BD4>, < Validation&Backup = "4">), ABPS_PORTINACTIVE, ABPS_TYPE_COMP(<Validation&Backup = "4">)}
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For all TPL: 1) Check ArgBlock "DS_Data" 2) Check ArgBlock "DS_Data"
Test passed	For all TPL: DataStorageObject = PARSET1 in 1), and DataStorageObject = no data/invalid (Header = "0") and length = 12 octets in 2)
Test not passed (examples)	Any evaluation failed or communication error
Report	All evaluations <ok | nok>

8.7.3 Data Storage size limits (quantities)

Table 236 defines the test conditions for this test case.

Table 236 Data Storage size limits (quantities)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0225
Name	WTCM_ALIC_STOR_MAXSIZELIMITS
Purpose (short)	Check the maximum size limits of DS upload/download
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Checks the maximum conditions of DS behavior with respect to Index_List and DS memory size. Using the two data sets in "Test parameter", DS works correctly during the 2 test procedure loops (TPL): TPL1: Maximum permitted size of the DS data object and maximum length of Index_List (MAXINDEXLIST) TPL2: Maximum length of data objects (MAXDATA)
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) Assign first value to "config" b) MTU_DS_SetMaxDataStorage(<config>) *;provide WMTU with max DS data* c) SMI_PortConfiguration(ABPS_TYPE_COMP <Validation&Backup = "3">) d) TM_AWAIT_PORT_STATUS(OPERATE) e) MTU_DS_CheckUpload *;returns "upload sequence performed"* f) Evaluation 1 g) SMI_DSToParServ *;returns "DS_Data" (uploaded)* h) Evaluation 2 i) Repeat from b) with next "config"
Test parameter	config = {MAXINDEXLIST, MAXDATA} See A.4.8
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For all TPL: 1) Check "upload sequence performed" 2) Check ArgBlock "DS_Data"
Test passed	TPL1: "upload sequence performed" = TRUE, and DataStorageObject = MAXINDEXLIST TPL2: "upload sequence performed" = TRUE, andDataStorageObject = MAXDATA
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.4 Write consistent DS data object from parameter server

Table 237 defines the test conditions for this test case.

Table 237 Write consistent DS data object from parameter server

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0226
Name	WTCM_ALIC_STOR_DSFROMPARAMSERV
Purpose (short)	Write consistent DS data object from upper level system
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4, Annex G
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Upper level system writes DS data object with header information via service SMI_ParServToDS. There is no difference between current stored DS data object and written DS data object (match of checksum). W-Master does not perform any up-load or download activities at identical DS data.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) TM_MASTER_UPLOAD(PARSET1) ;*prepare EUT and WMTU for identical DS data* b) SMI_ParServToDS(PARSET1) ;*write identical DS data (checksum match)* c) MTU_DS_CheckDownload ;*returns "download sequence performed"* d) Evaluation 1)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "download sequence performed"
Test passed	"download sequence performed" = FALSE
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.5 Write inconsistent DS data object from parameter server

Table 238 defines the test conditions for this test case.

Table 238 Write inconsistent DS data object from parameter server

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0227
Name	WTCM_ALIC_STOR_INCONSDSFROMPARSERV
Purpose (short)	Write inconsistent DS data object from upper-level system (checksum mismatch)
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Upper-level system writes DS data object with header information via service SMI_ParServToDS. There is a difference between current stored DS data object and written DS data object (mismatch of checksum). This causes the W-Master to restart the W-Port and to download DS data.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) TM_MASTER_UPLOAD(PARSET1) *;prepare EUT and WMTU for identical DS data* b) SMI_ParServToDS(PARSET2) *;write different DS data (checksum mismatch)* c) TM_AWAIT_PORT_STATUS(OPERATE) *;wait until OPERATE* d) MTU_State_CheckPreoperate *;returns "PREOPERATE"* e) Evaluation 1) f) MTU_DS_CheckDownload *;returns "download sequence performed"* g) Evaluation 2) h) MTU_DS_CheckParameter(PARSET2 *;returns "PARSET2 active"* i) Evaluation 3)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "PREOPERATE" 2) Check "download sequence performed" 3) Check "PARSET2 active"
Test passed	"PREOPERATE" = PASSED, and "download sequence performed" = TRUE, and "PARSET2 active" = TRUE
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.6 Write DS data object to improper W-Port configuration

Table 239 defines the test conditions for this test case.

Table 239 Write DS data object to improper W-Port configuration

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0228
Name	WTCM_ALIC_STOR_DSTOIMPROPPORTCONF
Purpose (short)	Write DS data object from upper-level system to improper W-Port configuration
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4, Table E.3, Annex G
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Write DS data from upper-level system via SMI_ParServToDS. In case of improper W-Port configuration (PortMode = IOLW_ROAMING_AUTO. IOLW_ROAMING or VendorID and/or DeviceID ≠ values in DS data header), the service returns a negative response, and no download activity occurs.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) SMI_PortConfiguration(ABPS_NOTYPE_CHECK) *;improper configuration for DS* b) TM_AWAIT_PORT_STATUS(OPERATE) *;wait until OPERATE* c) SMI_ParServToDS(PARSET2) *;PortMode prevents from performance* d) Evaluation 1) e) MTU_DS_CheckDownload *;returns "download sequence performed"* f) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check returned ArgBlock 2) Check "download sequence performed"
Test passed	ArgBlock "Job Error" received, JobError.ErrorCode/AdditionalCode = 0x4039 (INCONSISTENT_DS_DATA), and "download sequence performed" = FALSE
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.7 Upload request Event in OPERATE (Backup + Restore)

Table 240 defines the test conditions for this test case.

Table 240 Upload request Event in OPERATE (Backup + Restore)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0229
Name	WTCM_ALIC_STOR_UPLOADREQEVENTOPERBACKREST
Purpose (short)	Detection of upload request Event in OPERATE and Backup + Restore
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4, Table E.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WMTU generates a hidden "DS_UPLOAD_REQ" Event while in OPERATE. W-Master W-Port configuration is proper for DS (PortMode and Validation&Backup = "3"). W-Master up- loads parameter values from W-Device.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) TM_MASTER_UPLOAD(PARSET1) *;prepare EUT and WMTU for identical DS data* b) MTU_DS_SetParameter(PARSET2) ;*WMTU activates PARSET2* c) MTU_DS_SetUpload(Event) *;WMTU generates DS_UPLOAD_REQ Event* d) TM_AWAIT(2000) *;wait 2 sec* e) MTU_DS_CheckUpload *;returns "upload sequence performed"* f) Evaluation 1) g) SMI_DSToParServ *;returns "DS_Data" (uploaded)* h) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "upload sequence performed" 2) Check ArgBlock "DS_Data"
Test passed	"upload sequence performed" = TRUE, and DataStorageObject = PARSET2
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.8 Upload request Event in OPERATE (Restore)

Table 241 defines the test conditions for this test case.

Table 241 Upload request Event in OPERATE (Restore)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0230
Name	WTCM_ALIC_STOR_UPLOADREQEVENTOPERREST
Purpose (short)	Detection of upload request Event in OPERATE and Restore
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4, Table E.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WMTU generates a hidden "DS_UPLOAD_REQ" Event while in OPERATE. W-Master W-Port configuration is proper for DS (PortMode and Validation&Backup = "4"). W-Master downloads parameter values to W-Device.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) TM_MASTER_UPLOAD(PARSET1) *;prepare EUT and WMTU for identical DS data* b) SMI_PortConfiguration(ABPS_TYPE_COMP,< Validation&Backup = "4">) c) TM_AWAIT_PORT_STATUS(OPERATE) d) MTU_DS_SetParameter(PARSET2) *;WMTU activates PARSET2* e) MTU_DS_SetUpload(Event) *;WMTU generates DS_UPLOAD_REQ Event* f) TM_AWAIT(2000) *;wait 2 sec* g) MTU_DS_CheckDownload *;returns "download sequence performed"* h) Evaluation 1) i) MTU_DS_CheckParameter(PARSET1) *;returns "PARSET1 active"* j) Evaluation 2) k) SMI_DSToParServ *;returns "DS_Data" (uploaded)* l) Evaluation 3)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check procedure steps a) to d)
Test passed	1) Check "download sequence performed" 2) Check "PARSET1 active" 3) Check ArgBlock "DS_Data"
Test passed	"download sequence performed" = TRUE, and "PARSET1 active" = TRUE, and DataStorageObject = PARSET1
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.9 Upload request Event in OPERATE (Backup + Restore inactive)

Table 242 defines the test conditions for this test case.

Table 242 Upload request Event in OPERATE (Backup + Restore inactive)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0231
Name	WTCM_ALIC_STOR_UPLOADREQEVENTOPERBACKRESTINACT
Purpose (short)	Detection of upload request Event in OPERATE and Backup + Restore inactive
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4, Table E.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	WMTU generates a hidden "DS_UPLOAD_REQ" Event while in OPERATE. W-Master W-Port configuration is improper for DS (PortMode = IOLW_CYCLIC_AUTO) and Validation&Backup = "0" or "2"). W-Master does not show upload or download activities.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) TM_MASTER_UPLOAD(PARSET1) ;*prepare EUT and WMTU for identical DS data* b) SMI_PortConfiguration(ConfigList) *;improper configuration for DS* c) TM_AWAIT_PORT_STATUS(OPERATE) d) MTU_DS_SetParameter(PARSET2) *;WMTU activates PARSET2* e) MTU_DS_SetUpload(Event) ;*WMTU generates DS_UPLOAD_REQ Event* f) TM_AWAIT(2000) *;wait 2 sec* g) MTU_DS_CheckUpload *;returns "upload sequence performed"* h) Evaluation 1) i) MTU_DS_CheckDownload *;returns "download sequence performed"* j) Evaluation 2) k) SMI_DSToParServ *;returns "DS_Data" (uploaded)* l) Evaluation 3)
Test parameter	ConfigList = {APBS_NOTYPE_CHECK, ABPS_TYPE_COMP(<Validation&Backup = "0">), ABPS_TYPE_COMP(<VendorID = 0xFDE8>, <DeviceID = 0x002BD2>, <Validation&Backup = "2">)}
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "upload sequence performed" 2) Check "download sequence performed" 3) Check ArgBlock "DS_Data"
Test passed	"upload sequence performed" = FALSE, and "download sequence performed" = FALSE, and DataStorageObject = no data/invalid (Header = "0") and length = 12 octets
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.10 Start-up with empty DS (DS deactivated)

Table 243 defines the test conditions for this test case.

Table 243 Start-up with empty DS (DS deactivated)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0232
Name	WTCM_ALIC_STOR_STARTUPEMPTDSDEACTIV
Purpose (short)	Start-up with empty/invalid DS data object and deactivated Data Storage
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4, Table E.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	For W-Port start-up an empty or invalid DS data object in W-Master is assumed as well astwo different improper W-Port configurations. No upload takes place in both Test Procedure Loops: TPL1: PortMode = IOLW_CYCLIC_AUTO (no type compatibility check) TPL2: PortMode = IOLW_CYCLIC_AUTO (no Backup, no Restore)
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) Assign first value to "config" b) MTU_DS_SetParameter(PARSET2) *;WMTU activates PARSET2* c) MTU_DS_SetUpload(Flag_ON) *;set DS_UPLOAD_FLAG* d) SMI_PortConfiguration(<config>) e) TM_AWAIT_PORT_STATUS(OPERATE) f) MTU_DS_CheckDSCommands *;returns "DS_Commands performed"* g) Evaluation 1) h) SMI_DSToParServ *;returns "DS_Data"* i) Evaluation 2) j) Repeat from b) with next "config"
Test parameter	config = {APBS_NOTYPE_CHECK, ABPS_TYPE_COMP(< Backup&Restore = "2">)}
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For all TPL: 1) Check "DS_Commands performed" 2) Check ArgBlock "DS_Data"
Test passed	For all TPL: "DS_Commands performed" = FALSE, and DataStorageObject = no data/invalid (Header = "0") and length = 12 octets
Test not passed (examples)	a) Any evaluation failed
Report	All evaluations <ok | nok>

8.7.11 Start-up with empty DS (DS activated – DS Upload)

Table 244 defines the test conditions for this test case.

Table 244 Start-up with empty DS (DS activated – DS Upload)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0233
Name	WTCM_ALIC_STOR_STRTUPEMPTYDSDSACTIV
Purpose (short)	Start-up with empty/invalid DS data object and activated Data Storage
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4, Table E.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	For W-Port start-up an empty or invalid DS data object in W-Master is assumed as well as four different proper W-Port configurations. Upload takes place in all four Test Procedure Loops, where PortMode = IOLW_CYCLIC_AUTO TPL1: Validation&Backup = "3", DS_UPLOAD_FLAG = "0" *;Backup+Restore* TPL2: Validation&Backup = "3", DS_UPLOAD_FLAG = "1" *;Backup+Restore* TPL3: Validation&Backup = "4", DS_UPLOAD_FLAG = "0" *;Restore* TPL4: Validation&Backup = "4", DS_UPLOAD_FLAG = "1" *;Restore*
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) Assign first value to "config", "flag" b) MTU_DS_SetParameter(PARSET2) *;WMTU activates PARSET2* c) MTU_DS_SetUpload(<flag>) *;Test parameter* d) SMI_PortConfiguration(ABPS_TYPE_COMP, e) <Validation&Backup = "config">) *;Test parameter* f) TM_AWAIT_PORT_STATUS(OPERATE) g) MTU_DS_CheckUpload *;returns "upload sequence performed"* h) Evaluation 1) i) SMI_DSToParServ *;returns "DS_Data"* j) Evaluation 2) k) Repeat from b) with next "config", "flag"
Test parameter	config = {3, 3, 4, 4} *;Type compatible W-Device V1.1 (Backup+Restore or Restore)* flag = {Flag_off, Flag_on, Flag_off, Flag_on} *;DS_UPLOAD_FLAG*
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For all TPL: 1) Check "upload sequence performed" 2) Check ArgBlock "DS_Data"
Test passed	For all TPL: "upload sequence performed" = TRUE, and DataStorageObject = PARSET2
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.12 Start-up with stored DS (W-Device replacement – DS Download)

Table 245 defines the test conditions for this test case.

Table 245 Start-up with stored DS (W-Device replacement – DS Download)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0234
Name	WTCM_ALIC_STOR_STRTUPDEVREPLACEDSDOWN
Purpose (short)	Start-up after W-Device replacement with DS Download (checksum mismatch)
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1 , 11.2, 11.3, B.2.3, B.2.4, Table E.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	For W-Port start-up a stored or valid DS data object in W-Master is assumed as well as three different proper W-Port configurations. Download takes place in all three Test Procedure Loops, where PortMode = IOLW_CYCLIC_AUTO DS = activated, and DS checksum = mismatch: TPL1: Validation&Backup = "3", DS_UPLOAD_FLAG = "0" *;Backup+Restore* TPL2: Validation&Backup = "4", DS_UPLOAD_FLAG = "0" *;Restore* TPL3: Validation&Backup = "4", DS_UPLOAD_FLAG = "1" *;Restore*
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) Assign first value to "config", "flag" b) MTU_DS_SetParameter(PARSET1) ;*WMTU activates PARSET1* c) SMI_PortConfiguration(ABPS_TYPE_COMP, d) <Validation&Backup = "config">) ;Test parameter e) TM_AWAIT_PORT_STATUS(OPERATE) f) SMI_DSToParServ *;returns DataStorageObject* g) MTU_State_Deactivate *;disable response to W-Master request* h) MTU_DS_SetParameter(PARSET2) *;WMTU activates PARSET2* i) MTU_DS_SetUpload(<flag>) *;Test parameter* j) MTU_State_Activate *;enable response to W-Master request* k) TM_AWAIT_PORT_STATUS(OPERATE) l) MTU_DS_CheckDownload *;returns "download sequence performed"* m) Evaluation 1 n) MTU_DS_CheckParameter(PARSET1) *;returns "PARSET1 active"* o) Evaluation 2 p) Repeat from b) with next "config", " flag"
Test parameter	config = {3, 4, 4} *;Type compatible W-Device V1.1 (Backup+Restore or Restore)* flag = {Flag_off, Flag_off, Flag_on} *;DS_UPLOAD_FLAG*
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For all TPL 1) Check "download sequence performed" 2) Check "PARSET1 active"
Test passed	For all TPL "download sequence performed" = TRUE, and "PARSET1 active" = TRUE
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.13 Start-up with stored DS (W-Device replacement – no DS Download)

Table 246 defines the test conditions for this test case.

Table 246 Start-up with stored DS (W-Device replacement – no DS Download)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0235
Name	WTCM_ALIC_STOR_STRTUPDEVREPLACENODSDOWN
Purpose (short)	Start-up after W-Device replacement without DS Download (checksum match)
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4, Table E.3
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	For W-Port start-up a stored or valid DS data object in W-Master is assumed and the Device is replaced by a type compatible one. No Download takes place in all Test Procedure Loops: TPL1: PortMode = IOW_CYCLIC_AUTO, Validation&Backup = "3" *;Backup+Restore* TPL2: PortMode = IOW_CYCLIC_AUTO, Validation&Backup = "4" *;Restore* TPL3: PortMode = IOW_CYCLIC_AUTO, Validation&Backup = "2" *;no Backup, no Restore*
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) Assign first value to "config" b) MTU_DS_SetParameter(PARSET1) *;WMTU activates PARSET1* c) SMI_PortConfiguration(<config>) *;Test parameter* d) TM_AWAIT_PORT_STATUS(OPERATE) e) MTU_State_Deactivate *;disable response to W-Master request* f) MTU_State_Activate *;enable response to W-Master request* g) TM_AWAIT_PORT_STATUS(OPERATE) h) MTU_DS_CheckDSCommands *;returns "DS_Commands performed"* i) Evaluation 1 j) MTU_DS_CheckParameter(PARSET1) *;returns "PARSET1 active"* k) Evaluation 2 l) Repeat from b) with next "config"
Test parameter	config= {ABPS_TYPE_COMP, <Validation&Backup = "3">, ABPS_TYPE_COMP, <Validation&Backup = "4">, ABPS_NOTYPE_CHECK, ABPS_TYPE_COMP, <Validation&Backup = "2">}
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For all TPL: 1) Check "DS_Commands performed" 2) Check "PARSET1 active"
Test passed	"DS_Commands performed" = FALSE, and "PARSET1 active" = TRUE
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.14 Start-up with stored DS (W-Device replacement – DS Upload)

Table 247 defines the test conditions for this test case.

Table 247 Start-up with stored DS (W-Device replacement – DS Upload)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0236
Name	WTCM_ALIC_STOR_STRTUPDEVREPLACEDSUPFLAG
Purpose (short)	Start-up after W-Device replacement with raised DS upload flag
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	For W-Port start-up a stored or valid DS data object in W-Master is assumed and the Device is replaced by a type compatible one setting DS_UPLOAD_FLAG. Upload takes place at proper PortConfiguration (PortMode = IOLW_CYCLIC_AUTO, Validation&Backup = "3")
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) MTU_DS_SetParameter(PARSET1) *;WMTU activates PARSET1* b) SMI_PortConfiguration(ABPS_TYPE_COMP, Validation&Backup = "3") c) TM_AWAIT_PORT_STATUS(OPERATE) d) MTU_State_Deactivate *;disable response to W-Master request* e) MTU_DS_SetParameter(PARSET2) *;WMTU activates PARSET2* f) MTU_DS_SetUpload(<Flag_on>) *;set DS_UPLOAD_FLAG* g) MTU_State_Activate *;enable response to W-Master request* h) TM_AWAIT_PORT_STATUS(OPERATE) i) MTU_DS_CheckUpload *;returns "upload sequence performed"* j) Evaluation 1) k) SMI_DSToParServ *;returns "DS_Data"* l) Evaluation 2)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "upload sequence performed" 2) Check ArgBlock "DS_Data"
Test passed	"upload sequence performed" = TRUE, and DataStorageObject = PARSET2
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.15 Start-up with stored DS (W-Device replacement – no DS Upload)

Table 248 defines the test conditions for this test case.

Table 248 Start-up with stored DS (W-Device replacement – no DS Upload)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0237
Name	WTCM_ALIC_STOR_STRTUPDEVREPLACEDSFLAGNOUPLOAD
Purpose (short)	Start-up after W-Device replacement with raised DS upload flag – DS upload blocked
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	For W-Port start-up a stored or valid DS data object in W-Master is assumed and the Device is replaced by a type compatible one setting DS_UPLOAD_FLAG. No Upload takes place in all three Test Procedure Loops: TPL1: PortMode = IOLW-CYCLIC_AUTO, Validation&Backup = "4" *;Restore* TPL2: PortMode = IOLW_CYCLIC_AUTO, Validation&Backup = "2" *;no Backup, no Restore*
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) Assign first value to "config" b) MTU_DS_SetParameter(PARSET1) *;WMTU activates PARSET1* c) SMI_PortConfiguration(<config>) *;Test parameter* d) TM_AWAIT_PORT_STATUS(OPERATE) e) MTU_State_Deactivate *;disable response to W-Master request* f) MTU_DS_SetParameter(PARSET2) *;WMTU activates PARSET2* g) MTU_DS_SetUpload(<Flag_on>) *;set DS_UPLOAD_FLAG* h) MTU_State_Activate *;enable response to W-Master request* i) TM_AWAIT_PORT_STATUS(OPERATE) j) MTU_DS_CheckUpload *;returns "upload sequence performed"* k) Evaluation 1) l) SMI_DSToParServ *;returns "DS_Data"* m) Evaluation 2) n) Repeat from b) with next "config"
Test parameter	config = {ABPS_TYPE_COMP, <Validation&Backup = "4">, ABPS_TYPE_COMP, <Validation&Backup = "2">, APBS_NO_TYPE_CHECK}
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	For all TPL: 1) Check "upload sequence performed" 2) Check ArgBlock "DS_Data"
Test passed	For all TPL: "upload sequence performed" = FALSE, and DataStorageObject ≠ PARSET2
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.16 Corrupted DS Index_List

Table 249 defines the test conditions for this test case.

Table 249 Corrupted DS Index_List

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0238
Name	WTCM_ALIC_STOR_DSINDLISTCORRUPT
Purpose (short)	DS error in case of read Index_List fault during W-Port start-up
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4, Annex E.16
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	An error occurs while reading an Index_List during W-Port start-up. This leads to the following consequences: - No Upload/Download occurs (user view) - WMTU is on hold in PREOPERATE - PortEvent is generated
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) TM_MASTER_UPLOAD(PARSET1) ;PARSET1 uploaded to W-Master DS b) DLL_GetPortEvents ;clear Event entries c) MTU_State_Deactivate ;disable response to W-Master request d) MTU_DS_SetParameter(PARSET2) ;MTU activates PARSET2 e) MTU_DS_SetUpload(<Flag_on>) ;set DS_UPLOAD_FLAG f) MTU_DS_SetError(IndexList_err) ;MTU falsifies Index_List g) MTU_State_Activate ;enable response to W-Master request h) DLL_GetPortEvent(3) ;minED=3, returns “PortEventList” i) Evaluation 1) j) MTU_DS_CheckUpload ;returns "upload sequence performed" k) Evaluation 2) l) MTU_State_CheckPreoperate ;returns "PREOPERATE" m) Evaluation 3) n) SMI_PortStatus ;returns "WPortStatusList" o) Evaluation 4) p) SMI_PortConfiguration(ABPS_PORTINACTIVE);switch W-Port to INACTIVE q) DLL_GetPortEvent(1) ;minED=1, returns “PortEventList” r) q) Evaluation 5) s) SMI_PortStatus ;returns "WPortStatusList" t) Evaluation 6)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check ArgBlock " PortEventList" 2) Check "upload sequence performed" 3) Check "PREOPERATE" 4) Check ArgBlock "WPortStatusList" 5) Check ArgBlock " PortEventList" 6) Check ArgBlock "WPortStatusList"
Test passed	PortEventList.Entry1 (EventQualifier: Master/Port, Error, Event appears, EventCode =0x180C), and "upload sequence performed" = FALSE, and "PREOERATE" = REACHED, and WPortStatusList: PortStatusInfo = PORT_DIAG, DiagEntryx = result of 1), and PortEventList.Entry1 (EventQualifier:Master/Port, Error, Event disappears, EventCode = 0x180B, and WPortStatusList: PortStatusInfo = DEACTIVATED, DiagEntryx = empty
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.17 DS Download fault

Table 250 defines the test conditions for this test case.

Table 250 DS Download fault

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0239
Name	WTCM_ALIC_STOR_DSDOWNLOADFAULT
Purpose (short)	DS error during DS download at W-Port start-up
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4, Annex E.16
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	An error occurs while downloading DS data object during W-Port start-up, for example a read Index returns negative response. This leads to Download aborted, WMTU on hold in PREOPERATE, PortEvent generated, rollback of DS data object.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) TM_MASTER_UPLOAD(PARSET1);PARSET1 *;uploaded to W-Master DS* b) DLL_GetPortEvents ;clear Event entries c) MTU_State_Deactivate ;disable response to W-Master request d) MTU_DS_SetParameter(PARSET2) *;MTU activates PARSET2* e) MTU_DS_SetError(W_Index19_err) :MTU to return negative response f) MTU_State_Activate ;enable response to W-Master request g) MTU_DS_WAIT(DS_BREAK) ;wait until Download aborted h) Evaluation 1) i) DLL_GetPortEvent(3) ;minED=3, returns “PortEventList” j) Evaluation 2) k) MTU_DS_CheckParameter(PARSET1) *;returns "PARSET1 active"* l) Evaluation 3) m) MTU_State_CheckPreoperate *;returns "PREOPERATE"* n) Evaluation 4) o) SMI_PortStatus ;returns "WPortStatusList" p) Evaluation 5) q) SMI_PortConfiguration(ABPS_PORTINACTIVE);*switch W-Port to INACTIVE* r) DLL_GetPortEvent(1) ;minED=1, returns “PortEventList” s) Evaluation 6) t) SMI_PortStatus ;returns "WPortStatusList" u) Evaluation 7)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check DS_BREAK 2) Check ArgBlock "PortEventList" 3) Check "PARSET1 active" 4) Check "PREOPERATE" 5) Check ArgBlock "WPortStatusList" 6) Check ArgBlock "PortEventList" 7) Check ArgBlock "WPortStatusList"
Test passed	DS_BREAK detected, and"PARSET1 active" = TRUE, and PortEventList.Entry1 (EventQualifier: Master/Port, Error, Event appears, EventCode = 0x180D), and "PREOPERATE" = REACHED, and WPortStatusList: PortStatusInfo = PORT_DIAG, DiagEntryx = result of 1), and PortEventList.Entry1 (EventQualifier: Master/Port, Error, Event disappears, EventCode = 0x180D), and WPortStatusList: PortStatusInfo = DEACTIVATED, DiagEntryx = empty
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.18 DS Upload fault

Table 251 defines the test conditions for this test case.

Table 251 DS Upload fault

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0240
Name	WTCM_ALIC_STOR_DSUPLOADFAULT
Purpose (short)	DS error during DS Upload at W-Port start-up
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	An error occurs while uploading DS data object during W-Port start-up, for example a read Index returns negative response. This leads to Upload aborted, WMTU on hold in PREOPERATE, PortEvent generated, rollback of DS data object.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) TM_MASTER_UPLOAD(PARSET1) *;PARSET1 uploaded to W-Master DS* b) DLL_GetPortEvents *;clear Event entries* c) MTU_State_Deactivate *;disable response to W-Master request* d) MTU_DS_SetParameter(PARSET2) *;MTU activates PARSET2* e) MTU_DS_SetUpload(<Flag_on>) *;set DS_UPLOAD_FLAG* f) MTU_DS_SetError(R_Index19_err) *;MTU to return negative response* g) MTU_State_Activate *;enable response to W-Master request* h) MTU_DS_WAIT(DS_BREAK) *;wait until Download aborted* i) Evaluation 1) j) DLL_GetPortEvent(3) *;minED=3, returns "PortEventList"* k) Evaluation 2) l) SMI_DSToParServ *;returns "DS_Data"* m) Evaluation 3) n) MTU_State_CheckPreoperate *;returns "PREOPERATE"* o) Evaluation 4) p) SMI_PortStatus *;returns "WPortStatusList"* q) Evaluation 5) r) SMI_PortConfiguration(ABPS_PORTINACTIVE*);switch W-Port to INACTIVE* s) DLL_GetPortEvent(1) *;minED=1, returns "PortEventList"* t) Evaluation 6) u) SMI_PortStatus *;returns "WPortStatusList"* v) Evaluation 7)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check DS_BREAK 2) Check ArgBlock "PortEventList" 3) Check ArgBlock "DS_Data" 4) Check "PREOPERATE" 5) Check ArgBlock "WPortStatusList" 6) Check ArgBlock "PortEventList" 7) Check ArgBlock "WPortStatusList"
Test passed	DS_BREAK detected, and PortEventList.Entry1 (EventQualifier: Master/Port, Error, Event appears, EventCode = 0x180C), and DataStorageObject = PARSET1, and "PREOPERATE" = REACHED, and WPortStatusList: PortStatusInfo = PORT_DIAG, DiagEntryx = result of 1), and PortEventList.Entry1 (EventQualifier: Master/Port, Error, Event disappears, EventCode = 0x180C), and WPortStatusList: PortStatusInfo = DEACTIVATED, DiagEntryx = empty
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.19 Incompatible W-Device and DS

Table 252 defines the test conditions for this test case.

Table 252 Incompatible W-Device and DS

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0241
Name	WTCM_ALIC_STOR_INCOMPDEVICE&DS
Purpose (short)	DS in case of identification fault (incompatible W-Device)
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	At start-up, the W-Master detects a W-Device, not type compatible with configured data. This leads to PortEvent generated, no DS Upload/Download, WMTU is on hold in PREOPERATE and shows diagnosis information.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) TM_MASTER_UPLOAD(PARSET1) *;PARSET1 uploaded to W-Master DS* b) DLL_GetPortEvents *;clear Event entries* c) MTU_State_Deactivate *;disable response to W-Master request* d) MTU_DPP1_Set(DeviceID = 0x102BD2) *;MTU gets different DeviceID* e) MTU_DS_SetParameter(PARSET2) *;MTU activates PARSET2* f) MTU_DS_SetUpload(<Flag_on>) *;set DS_UPLOAD_FLAG* g) MTU_State_Activate *;enable response to W-Master request* h) DLL_GetPortEvent(3) *;minED=3, returns "PortEventList"* i) Evaluation 1) j) MTU_DS_CheckDSCommands *;returns "DS_Command performed"* k) Evaluation 2) l) SMI_PortStatus *;returns "WPortStatusList"* m) Evaluation 3) n) SMI_DSToParServ *;returns "DS_Data"* o) Evaluation 4) p) SMI_PortConfiguration(ABPS_PORTINACTIVE) *;switch W-Port to INACTIVE* q) DLL_GetPortEvent(1) *;minED=1, returns "PortEventList"* r) Evaluation 5) s) TM_AWAIT_PORT_STATUS(DEACTIVATED) *;returns "WPortStatusList"* t) Evaluation 6)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check ArgBlock "PortEventList" 2) Check "DS_Command" 3) Check ArgBlock "WPortStatusList" 4) Check ArgBlock "DS_Data" 5) Check ArgBlock "PortEventList" 6) Check ArgBlock "WPortStatusList"
Test passed	PortEventList.Entry1 (EventQualifier: Master/Port, Error, Event appears, EventCode = 0x1803), and "DS_Commands performed" = FALSE, and WPortStatusList: PortStatusInfo = PORT_DIAG, DiagEntryx = result of 1), and DataStorageObject = PARSET1, and PortEventList.Entry1 (EventQualifier: Master/Port, Error, Event disappears, EventCode = 0x1803), and WPortStatusList: PortStatusInfo = DEACTIVATED, DiagEntryx = empty
Test not passed (examples)	Evaluation 1,2,3,4,5,6 failed
Report	All evaluations <ok | nok>

8.7.20 W-Master power OFF/ON (non-volatile DS data)

Table 253 defines the test conditions for this test case.

Table 253 W-Master power OFF/ON (non-volatile DS data)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0242
Name	WTCM_ALIC_STOR_POWEROFFONNONVOLATILEDS
Purpose (short)	Non-volatile storage of W-Port configuration and DS data
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	After power off/on, the W-Master starts with the same configuration data and DS data as before the power cycle. These data are saved in non-volatile memory.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) TM_MASTER_UPLOAD(PARSET1) *;PARSET1 uploaded to W-Master DS* b) Switch off EUT power supply *;Depending on Tester implementation* c) Switch on EUT power supply d) TM_AWAIT_PORT_STATUS(OPERATE) e) SMI_DSToParServ ;*returns "DS_Data"* f) Evaluation 1)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check ArgBlock "DS_Data"
Test passed	DataStorageObject = PARSET1
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.7.21 DS Upload trial with locked W-Device Data Storage

Table 254 defines the test conditions for this test case.

Table 254 DS Upload trial with locked W-Device Data Storage

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0243
Name	WTCM_ALIC_STOR_DSLOCKED
Purpose (short)	DS Upload trial with locked W-Device Data Storage
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master DS test, test to pass
Specification (clause)	REF 1, 11.2, 11.4, B.2.3, B.2.4
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	W-Master shall detect the locked Data Storage of a W-Device. In this case the W-Master shall deny access for all data storage actions from its own data storage handler. NOTE: Even it is highly recommended for Devices not to implement locking for DS, Devices in the field can show this feature and W-Master shall be able to handle it.
Precondition	EUT: EUT_PORT_ DEACTIVATED WMTU: WMTU_STANDARD_STATE
Procedure	a) MTU_DS_Locked *;Parameter DeviceAccessLocks.Data Storage = "1"* b) DLL_GetPortEvents *;clear Event entries* c) SMI_PortConfiguration(ABPS_TYPE_COMP <Validation&Backup = "3">) d) TM_AWAIT_PORT_STATUS(PORT_DIAG) e) MTU_DS_CheckDSCommands *;returns "DS_Command performed"* f) Evaluation 1) g) DLL_GetPortEvent(1) *;minED=1, returns "PortEventList"* h) TM_AWAIT_PORT_EVENT i) Evaluation 2) j) SMI_DSToParServ *;returns "DS_Data"* k) Evaluation 3)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check "DS_Command performed" 2) Check ArgBlock "PortEvent" 3) Check "DS_Data"
Test passed	"DS_Command performed" = FALSE, and PortEventList.Entry1 (EventQualifier: INSTANCE = SYS, SOURCE = Master/Port, TYPE = Error, Mode = Event appears, EventCode = 0x180B, and "DS_Data" = no data/invalid (Header = "0") and length = 12 octets
Test not passed (examples)	Any evaluation failed
Report	All evaluations <ok | nok>

8.8 Priority in Downlink

8.8.1 W-Message priority in Downlink

Table 255 defines the test conditions for this test case.

Table 255 W-Message priority in Downlink

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0244
Name	WTCM_DLIC_DLMH_PRIORITY
Purpose (short)	W-Message priority in downlink
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master protocol test, test to pass
Specification (clause)	REF 2, clause 6.5.2
Configuration / setup	a) W-Master-Tester-System b) W-Devices type A (see 10)

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test downlinks are filled with W-Messages according to Message Handler priority: I. Master command followed by process-data from slot 0 to slot 7 II. Event confirmation from slot 0 to slot 7 III. ISDU from slot 0 to slot 7
Precondition	WMTU: WMTU_STANDARD_STATE W-Devices paired EUT: WMASTER_CYCLIC PORT_INACTIVE
Procedure	a) Fill Downlink continuously, apply for all W-Devices: b) SMI_PDOut(x) – increment x every 5 ms or as fast as possible c) SMI_DeviceWrite(ABPS_DEVICEWRITE(Index=<index>, Subindex=<subindex>, OD=<data>)) d) WMTU_State_MonitorDownlinks *;resets counter* e) SMI_PortConfiguration(ABPS_NOTYPE_CHECK) f) TM_AWAIT_PORT_STATUS(OPERATE) *;returns "Reached"* g) Repeat step a) for WMTU h) TM_AWAIT(10 Seconds) i) WMTU_State_MonitorDownlinks *;returns priority_errors* j) Evaluation 1)
Test parameter	Config7 (Event A) in 6.6.1, alternates appear/disappear
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	1) Check priority_errors
Test passed	priority_errors = 0
Test not passed (examples)	priority_errors > 0
Report	W-Message downlink priority: <ok/nok>

8.9 Adaptive Hopping Table

8.9.1 Update HoppingTable

Table 256 defines the test conditions for this test case.

Table 256 Update HoppingTable

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0245
Name	WTCM_SMAH_HPTB_UPDATE
Purpose (short)	Test for updating the hopping table
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master AdaptiveHopTable; test to pass
Specification (clause)	REF 1, clause C.4.14
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the update mechanism of the hopping table
Precondition	WMTU: WMTU_STANDARD_STATE *;OPERATE* EUT: WMASTER_CYCLIC (AHT Enabled) PORT_CYCLIC_AUTOPAIRING
Procedure	a) WMTU is prompted to prepare an Event with EventCode = 0xFFB7 and EventQualifier = 0x54. b) WMTU sends the Event. c) W-Master writes the new hopping table via Index 0x5006 d) Evaluation 1) e) W-Master triggers a Jump-Command via MCMD (0xFE), see REF 2 Table 177 Jump f) Evaluation 2) g) WMTU sends acknowledgement to the W-Master h) Evaluation 3) i) W-Master switches hopping table after 14 W-SubCycles j) Evaluation 4)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check if write of Index 0x5006 is according to REF 2 Table 192 2) Check master command = 0xFE 3) Check if W-Master sends no further Jump-Commands 4) Check if new hopping table is set
Test passed	All evaluation steps with positive result
Test not passed (examples)	Any evaluation failed
Report	Hopping table updated successfully <ok/nok>

8.9.2 Jump sequence

Table 257 defines the test conditions for this test case.

Table 257 Jump sequence

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	IOLW_TC_0246
Name	WTCM_SMAH_HPTB_JUMPSEQ
Purpose (short)	Test of Jump sequence mechanism
Equipment under test (EUT)	W-Master
Test case version	1.0
Category / type	W-Master AdaptiveHopTable; test to pass
Specification (clause)	REF 1, clause C.4.14
Configuration / setup	W-Master-Tester-System

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the update mechanism of the hopping table with Jump sequence countdown retry
Precondition	WMTU: WMTU_STANDARD_STATE *;OPERATE* EUT: WMASTER_CYCLIC (AHT Enabled) PORT_CYCLIC_AUTOPAIRING
Procedure	a) WMTU is prompted to prepare an Event with EventCode = 0xFFB7 and EventQualifier = 0x54. b) WMTU sends the Event. c) W-Master writes the new hopping table via Index 0x5006 d) Evaluation 1) e) W-Master triggers a Jump-Command via MCMD (0xFE), see REF 2 Table 177 Jump f) Evaluation 2) g) WMTU sends a NACK to the W-Master h) W-Master decreases Jump-Command by 1 and retries the Jump-Command via MCMD i) Evaluation 3) j) Repeat steps g) to i) until Jump-Command = 0xF0 k) WMTU sends acknowledgement to the W-Master l) W-Master switches hopping table next W-SubCycle m) Evaluation 4)
Test parameter	-
Post condition	-

TEST CASE RESULTS	CHECK/REACTION
Evaluation	1) Check if write of Index 0x5006 is according to REF 2 Table 192 2) Check master command = 0xFE 3) Check master command = 0xFD to 0xF0 4) Check if new hopping table is set
Test passed	All evaluation steps with positive result
Test not passed (examples)	Any evaluation failed
Report	Hopping table updated successfully <ok/nok>

Annex A

9 Test configurations and test tools

9.1 W-Device-Tester-System

9.1.1 Test of W-Devices and W-Bridges

The test of W-Devices and W-Bridges consists of four steps:

- Physical layer test,
- IODD test,
- protocol test
- environmental test.

The tests of W-Devices and W-Bridges can be performed by a W-Device-Tester-System that shall be approved by the organization. See Annex A for details of equipment for testing.

Figure 8 shows the W-Device-Tester-System.

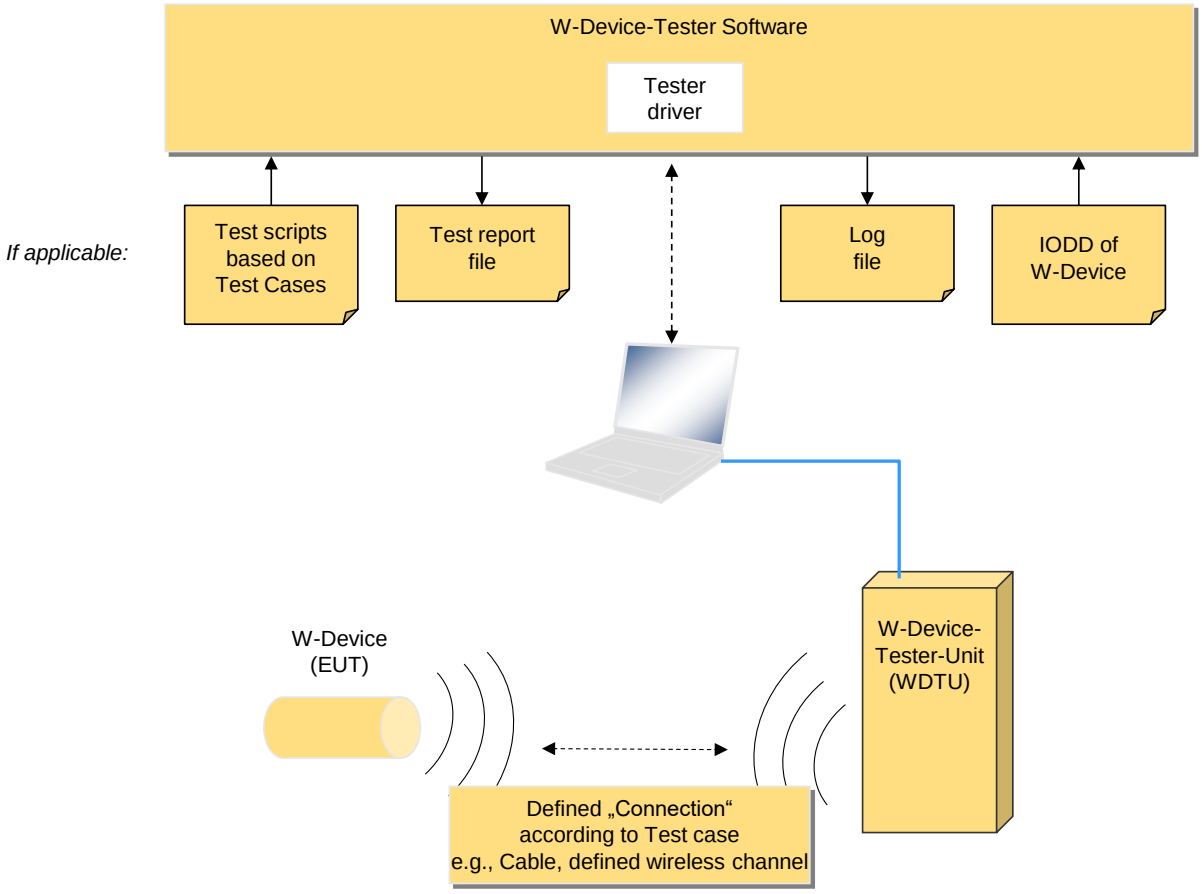

Figure 8 W-Device-Tester-System

Figure 9 shows the W-Bridge-Tester-System

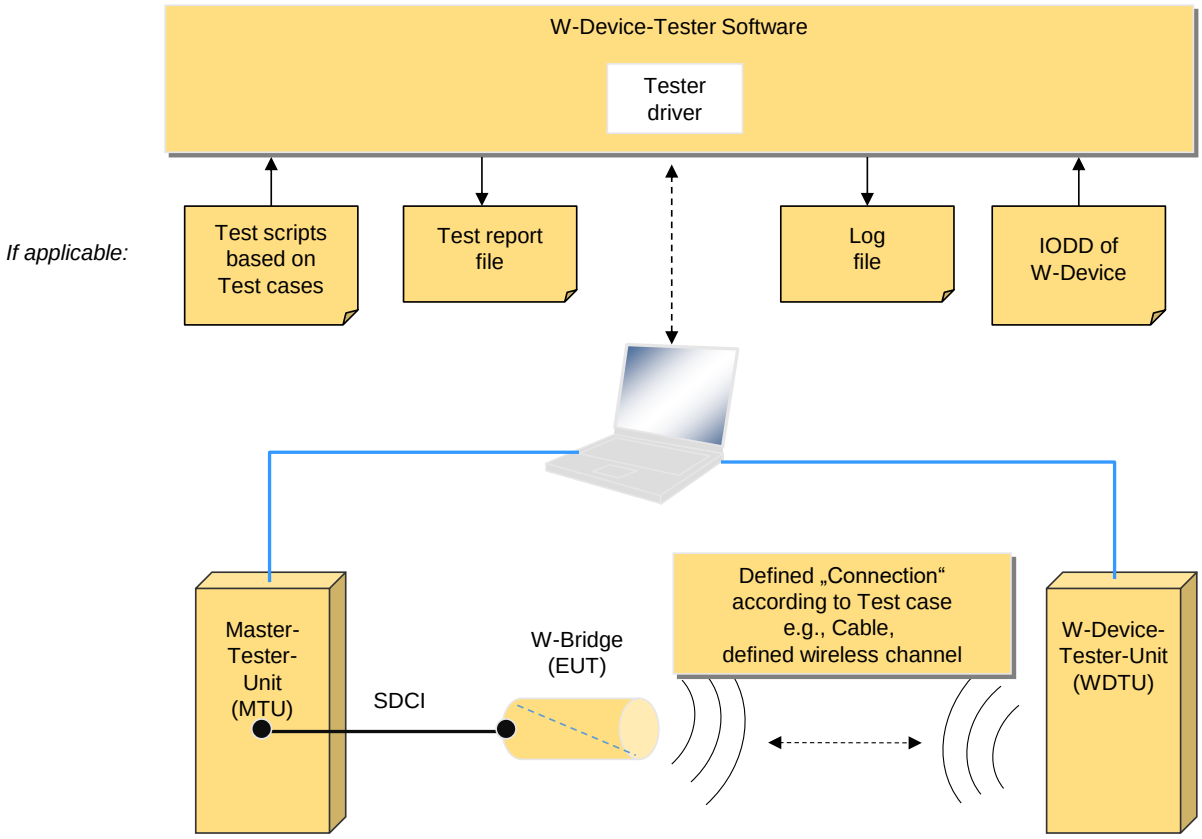

Figure 9 W-Bridge-Tester-System

If a W-Device or W-Bridge shows specific capabilities, connectors, cables, or color coding, these deviations shall be documented within the user manual in respect to the original definitions in the standard REF 9

If a W-Device or W-Bridge did not pass a certain test case due to measurement values close to the tolerance limits or similar situations it is possible to send an informal request to the organization listed in Annex D REF 4. This request shall be comprehensive enough for the experts to allow for an exception under certain conditions or clarification of the specifications. If an exception applies, it shall be documented in the user manual mentioning the possible implications.

Instead of pursuing such a time-consuming and uncertain way, it is highly recommended for the applicant to rather strive for a robust implementation and conformity of the W-Device.

9.2 W-Master-Tester-System

9.2.1 Test of W-Masters

The test of W-Masters consists of four steps:

- Physical layer test,
- IODD interpreter test,
- protocol test,
- environmental test.

The tests of W-Master can be performed by a Master-Tester that shall be approved by the organization.

Figure 10 shows the W-Master-Tester-System.

It contains of a visual check and manually performed measurements.

Figure 10shows the W-Master-Tester-System

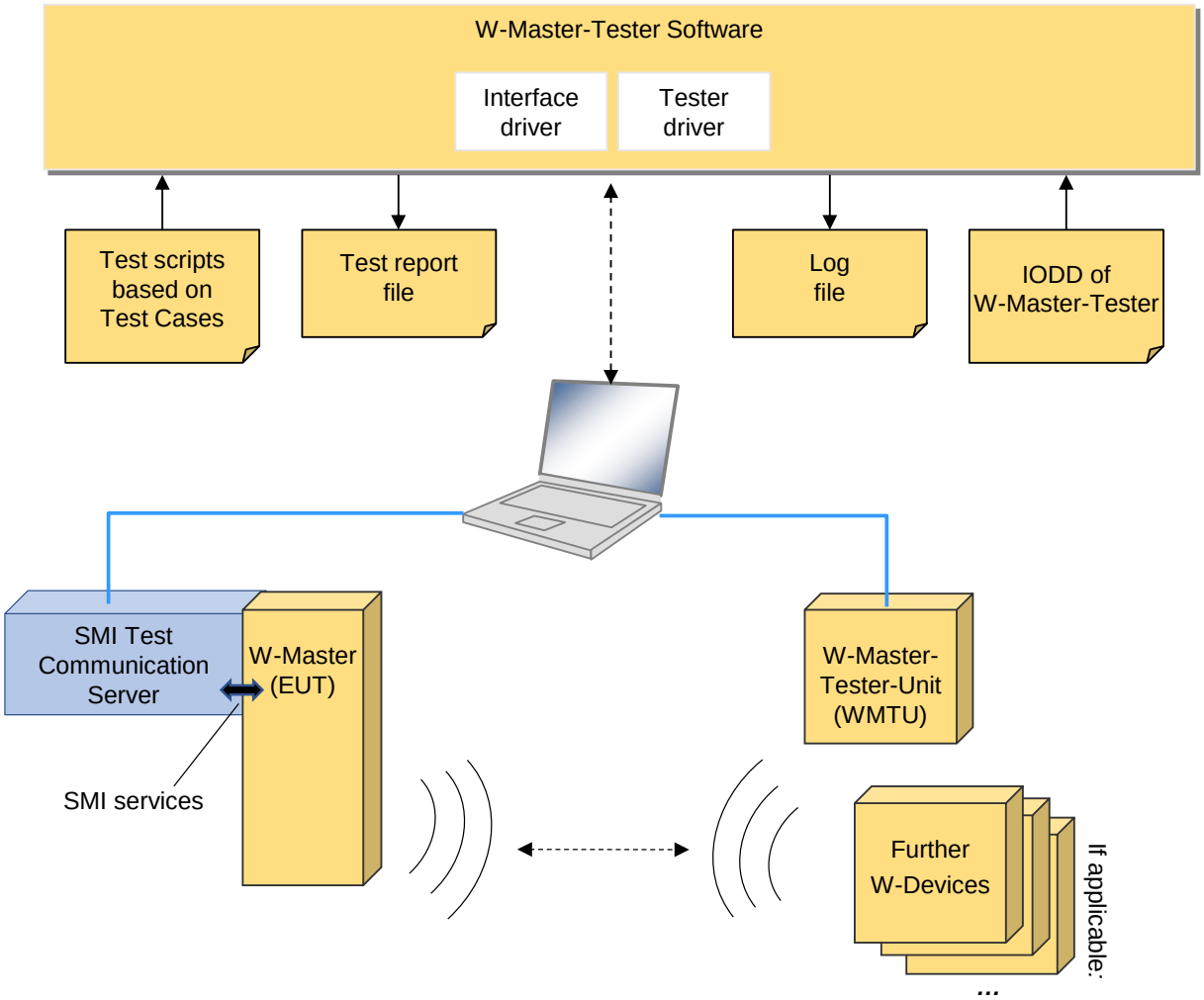

Figure 10 W-Master-Tester-System

If the W-Master shows specific capabilities, connectors, cables, or color coding, these deviations shall be documented within the user manual in respect to the original definitions in the standard REF 9.

If a W-Master did not pass a certain test case due to measurement values close to the tolerance limits or similar situations it is possible to send an informal request to the organization listed in Annex D REF 4. This request shall be comprehensive enough for the experts to allow for an exception under certain conditions or clarification of the specifications. If an exception applies, it shall be documented in the user manual mentioning the possible implications.

Instead of pursuing such a time-consuming and uncertain way, it is highly recommend-ed for an applicant to rather strive for a robust implementation and conformity of the Device.

9.3 W-Bridge-Tester-System

9.3.1 Test strategy of W-Device-Part of W-Bridge

This specification describes the test cases and specifies the necessary test equipment for testing W-Device-Part of the W-Bridge as EUT. In this section the wireless connection is tested and monitored while the Master-Tester Unit (MTU) fulfills the role of a standard IO-Link Device connected to the W-Bridge.

Figure 11shows the Test of W-Device-Part of W-Bridge

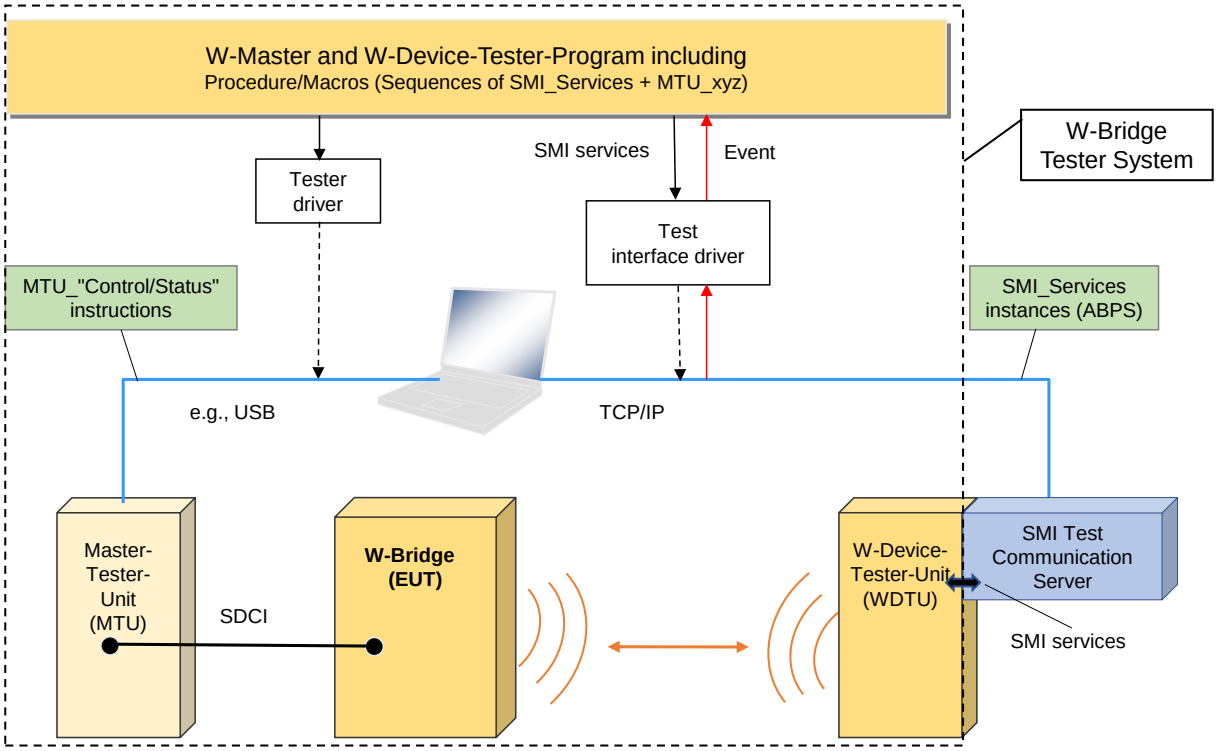

Figure 11 Test of W-Device-Part of W-Bridge

9.3.2 Test strategy of IOL-Master-Part of W-Bridge

This specification describes the test cases and specifies the necessary test equipment for testing IOL-Master-Part of the W-Bridge as EUT. In this section the IO-Link connection is tested and monitored while the W-Device-Tester Unit (WDTU) provides the SMI interface to run the tests.

Figure 12 shows the Test of IOL-Master-Part of W-Bridge

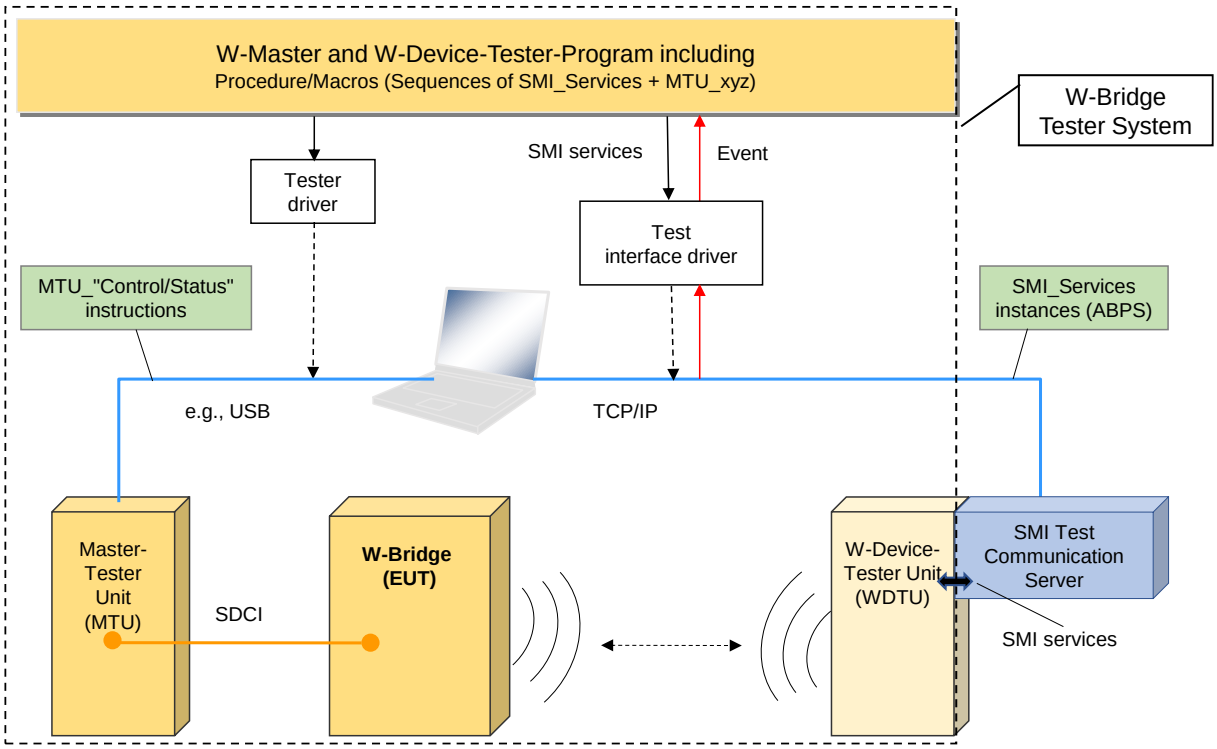

Figure 12 Test of IOL-Master-Part of W-Bridge

Table 258 Overview test cases to test the IOL-Master-Part

Testcase	Description	Reference Remark
Physical Layer		
SDCI_TC_0001	DC supply voltage and current capability of Master Port	See REF 4 & Note4
SDCI_TC_0310	Electrical isolation of Master Port class B power lines	See REF 4 & Note4
SDCI_TC_0021	Driver capability of the wake-up pulse – high-side driver	See REF 4
SDCI_TC_0022	Wake-Up pulse duration (high pulse)	See REF 4
SDCI_TC_0023	Drive capability of the wake-up pulse – low-side driver	See REF 4
SDCI_TC_0024	Wake-Up pulse duration (low pulse)	See REF 4
SDCI_TC_0030	Eye-diagram of ‘low’ and ‘high’ bits	See REF 4
SDCI_TC_0031	Eye-diagram of ‘low’ and ‘high’ bits	See REF 4
SDCI_TC_0032	Eye-diagram of the UART frame	See REF 4
SDCI_TC_0033	Eye-diagram of UART frame	See REF 4
SDCI_TC_0303	UART frame transmission delay is within permitted range	See REF 4

Testcase	Description	Reference Remark
Timings		See REF 4
SDCI_TC_0158	Check delay times after WURQ and Master messages	See REF 4
SDCI_TC_0159	Check whether delay time between wake-up retries is within tolerance	See REF 4
SDCI_TC_0160	Check number of Wake-up retries	See REF 4
SDCI_TC_0161	Check time between two WURQs is between 0,5 s and 1 s.	See REF 4
SDCI_TC_0162	STARTUP: The time between two message beginnings shall be ≥ 100 TBIT.	See REF 4
SDCI_TC_0331	PREOPERATE: TINITCYC of messages with 2 octets OD shall be ≥ 100 TBIT	See REF 4
SDCI_TC_0332	PREOPERATE: TINITCYC of messages with 8 octets OD shall be ≥ 210 TBIT	See REF 4
SDCI_TC_0333	PREOPERATE: TINITCYC of messages with 32 octets OD shall be ≥ 550 TBIT	See REF 4
SDCI_TC_0163	The Master shall adapt correctly to a too short MinCycleTime of the Device	See REF 4
SDCI_TC_0164	Written MasterCycleTime matches real cycle time	See REF 4
SDCI_TC_0165	Master tolerates different Device response times	See REF 4
SDCI_TC_0166	Master tolerates different UART frame delay times (T2) of the Device.	See REF 4
SDCI_TC_0167	Master sends UART frames within tolerated times (T1)	See REF 4
Process Data		See REF 4
SDCI_TC_0168	Master uses M-sequence TYPE_2_1 for 8 bit Process Data input	See REF 4
SDCI_TC_0169	Master uses M-sequence TYPE_2_2 for 16 bit Process Data input	See REF 4
SDCI_TC_0170	Master uses M-sequence TYPE_2_3 for 8 bit Process Data output	See REF 4
SDCI_TC_0171	Master uses M-sequence TYPE_2_4 for 16 bit Process Data output	See REF 4
SDCI_TC_0172	Master uses M-sequence TYPE_2_5 for 8/8 bit Process Data in/output	See REF 4
SDCI_TC_0298	Master uses M-sequence TYPE_2_V for 16/16 bit Process Data in/output	See REF 4
SDCI_TC_0173	Master uses M-sequence TYPE_1_1 for 32/0 octets PD input and 2 octets OD	See REF 4
SDCI_TC_0334	Master uses M-sequence TYPE_2_V for 0/32 octets PD in/out and variable ODs	See REF 4
SDCI_TC_0335	Master uses M-sequence TYPE_2_V for 32/0 octets PD in/out and variable ODs	See REF 4
SDCI_TC_0176	Master reads mirrored Process Data in/out from Device	See REF 4 & Note5
SDCI_TC_0177	Master propagates "PD invalid" indication in a correct manner	See REF 4
SDCI_TC_0178	Master propagates "PD Valid" indication in a correct manner	See REF 4
On Request Data		See REF 4
SDCI_TC_0179	Master uses TYPE_2_V for different PD in/out and 1 octet OD	See REF 4

Testcase	Description	Reference Remark
SDCI_TC_0180	Master uses TYPE_2_V for different PD in/out and 2 octets OD	See REF 4
SDCI_TC_0181	Master uses TYPE_2_V for different PD in/out and 8 octets OD	See REF 4
SDCI_TC_0182	Master uses TYPE_2_V for different PD in/out and 32 octets OD	See REF 4
SDCI_TC_0288	Master sends ISDU request "IDLE 1" after an accomplished ISDU service	See REF 4
Startup		
SDCI_TC_0183	Check that Master starts communication and reads communication parameters	See REF 4
SDCI_TC_0184	Check whether Master adjusts to protocol V1.1 and reads VendorID and DeviceID	See REF 4
SDCI_TC_0185	Check whether Master adjusts to protocol V1.0 and reads VendorID and DeviceID	See REF 4
SDCI_TC_0186	Check whether Master performs start-up with non-configured VID and DID	See REF 4
SDCI_TC_0187	Check Master start-up behavior with configured VendorID and DeviceID	See REF 4
SDCI_TC_0188	Check Master start-up behavior with overwrite of DeviceID (compatible)	See REF 4
SDCI_TC_0189	Check Master start-up behavior with overwrite of the DeviceID (incompatible)	See REF 4
SDCI_TC_0190	Check Master start-up behavior with overwrite of the RevisionID (incompatible)	See REF 4
SDCI_TC_0192	Check Master start-up behavior with non-configured VID and DID (V1.0)	See REF 4
Preoperate	**-**	
SDCI_TC_0202	Master uses TYPE_0 to read Index 24 in PREOPERATE (1 octet OD)	See REF 4 & Note1
SDCI_TC_0203	Master uses TYPE_1_2 to read Index 24 in PREOPERATE (2 octets OD)	See REF 4 & Note1
SDCI_TC_0204	Master uses TYPE_1_V to read Index 24 in PREOPERATE (8 octets OD)	See REF 4 & Note1
SDCI_TC_0205	Master uses TYPE_1_V to read Index 24 in PREOPERATE (32 octets OD)	See REF 4 & Note1
SDCI_TC_0206	Master uses TYPE_0 to write to Index 24 in PREOPERATE (1 octet OD)	See REF 4 & Note1
SDCI_TC_0207	Master uses TYPE_1_2 to write to Index 24 in PREOPERATE (2 octets OD)	See REF 4 & Note1
SDCI_TC_0208	Master uses TYPE_1_V to write to Index 24 in PREOPERATE (8 octets OD)	See REF 4 & Note1
SDCI_TC_0209	Master uses TYPE_1_V to write to Index 24 in PREOPERATE (32 octets OD)	See REF 4 & Note1
Operate		
SDCI_TC_0336	Master uses M-sequence TYPE_1_V for zero bit PD in/out (8	See REF 4

Testcase	Description	Reference Remark
	octets OD)	
SDCI_TC_0337	Master uses M-sequence TYPE_1_V for zero bit PD in/out (32 octets OD)	See REF 4
SDCI_TC_0210	Master uses TYPE_0 to read Index 24 in OPERATE (1 octet OD)	See REF 4
SDCI_TC_0211	Master uses TYPE_0 to write to Index 24 in OPERATE (1 octet OD)	See REF 4
SDCI_TC_0212	Master uses TYPE_1_2 to write to Index 24 in OPERATE (2 octets OD)	See REF 4
Retry		
SDCI_TC_0338	Retry behavior after 2 reply messages with incorrect checksum in STARTUP	See REF 4
SDCI_TC_0339	Retry behavior after 2 reply messages with incorrect checksum in PREOPERATE	See REF 4 & Note1
SDCI_TC_0340	Retry behavior after 2 reply messages with incorrect checksum in OPERATE	See REF 4
SDCI_TC_0341	Retry behavior after 3 reply messages with incorrect CKS at STARTUP (restart/stop)	See REF 4
SDCI_TC_0342	Retry behavior after 3 reply messages with incorrect CKS at PREOP (restart/stop)	See REF 4 & Note1
SDCI_TC_0343	Retry behavior after 3 reply messages with incorrect CKS at OPERATE (restart/stop)	See REF 4 & Note2
SDCI_TC_0344	Retry behavior after 2 missing replies and finally correct Checksum in STARTUP	See REF 4
SDCI_TC_0345	Retry behavior after 2 missing replies and finally correct Checksum in PREOP	See REF 4 & Note1
SDCI_TC_0346	Retry behavior after 2 missing replies and finally correct Checksum in OPERATE	See REF 4
SDCI_TC_0347	Retry behavior after 3 missing reply messages at STARTUP (restart/stop)	See REF 4
SDCI_TC_0348	Retry behavior after 3 missing reply messages at PREOP (restart/stop)	See REF 4 & Note1
SDCI_TC_0349	Retry behavior after 3 missing reply messages at OPERATE (restart/stop)	See REF 4 & Note2
SDCI_TC_0221	Behavior at maximum WURQ sequences and final success	See REF 4 & Note2
SDCI_TC_0222	Behavior at maximum WURQ sequences and no final success	See REF 4 & Note2
ISDU Application Error		
SDCI_TC_0223	ISDU Write service rejected with defined ErrorType, no details	See REF 4
SDCI_TC_0224	ISDU Write to unsupported Index rejected with ErrorType	See REF 4
SDCI_TC_0225	ISDU Write to unsupported Subindex (>0) rejected with ErrorType	See REF 4
SDCI_TC_0226	ISDU Write to temporarily unavailable Index rejected with ErrorType	See REF 4
SDCI_TC_0227	ISDU Write to temporarily unavailable Index due to local control	See REF 4

Testcase	Description	Reference Remark
SDCI_TC_0228	ISDU Write to temporarily unavailable Index due to Device control	See REF 4
SDCI_TC_0229	ISDU Write to read-only Index denied	See REF 4
SDCI_TC_0230	ISDU Write with invalid Length	See REF 4
SDCI_TC_0231	ISDU Write with parameter value out of range	See REF 4
SDCI_TC_0232	ISDU Write with parameter value above limit	See REF 4
SDCI_TC_0233	ISDU Write with parameter value below limit	See REF 4
SDCI_TC_0234	ISDU Write with invalid parameter set	See REF 4
SDCI_TC_0235	ISDU Write while Device application fault	See REF 4
SDCI_TC_0237	ISDU Write to reserved Indices	See REF 4
SDCI_TC_0238	ISDU Write to reserved Indices and unavailable ISDU is rejected with ErrorType.	See REF 4
ISDU Derived Errors		
SDCI_TC_0239	ISDU Write response “No service” (without busy) reports Derived ErrorType.	See REF 4
SDCI_TC_0240	ISDU Write response with timeout after busy indication reports Derived ErrorType	See REF 4
SDCI_TC_0241	ISDU Write response with illegal service code reports Derived ErrorType	See REF 4
SDCI_TC_0242	ISDU Write response with incorrect checksum (CHKPDU) reports Derived ErrorType.	See REF 4
SDCI_TC_0244	ISDU Write response with reserved data length reports Derived ErrorType	See REF 4
ISDU Limits		
SDCI_TC_0243	ISDU Read response without data reports no Derived ErrorType	See REF 4
SDCI_TC_0245	ISDU Write with minimum data length (zero octets)	See REF 4
SDCI_TC_0246	ISDU Write with maximum service length (238 octets)	See REF 4
SDCI_TC_0248	ISDU Read with maximum service length (238 octets)	See REF 4
SDCI_TC_0249	ISDU Write to 8-bit Index and no Subindex	See REF 4
SDCI_TC_0250	ISDU Write to 8-bit Index and 8-bit Subindex	See REF 4
SDCI_TC_0251	ISDU Write to 16-bit Index and 8-bit Subindex	See REF 4
SDCI_TC_0252	ISDU Write immediate response (without busy)	See REF 4
SDCI_TC_0253	ISDU Write response with at least one busy response	See REF 4
SDCI_TC_0254	ISDU service (with maximum service length 15) is carried out.	See REF 4
SDCI_TC_0255	ISDU service (with minimum Extended Length 17) is carried out.	See REF 4
Events		
SDCI_TC_0256	Master receives Event (notification) without details (notification)	See REF 4
SDCI_TC_0261	Master receives Event with details (single Event)	See REF 4
SDCI_TC_0262	Master receives Event with details (double Event)	See REF 4

Testcase	Description	Reference Remark
SDCI_TC_0308	Master receives Event with details (single Event, notification)	See REF 4
SDCI_TC_0263	Master receives event with details (six Events)	See REF 4
SDCI_TC_0264	Master receives one Event while in ISDU transfer (stopover; with details)	See REF 4
SDCI_TC_0265	Master receives Event while in ISDU Read transfer (stopover; with details)	See REF 4
SDCI_TC_0266	Master receives Event while in ISDU Write transfer (stopover; with details)	See REF 4
SDCI_TC_0267	Master receives event while in ISDU Read transfer (stopover; with details)	See REF 4
SDCI_TC_0350	Master sends Port Event "No Device" at COMLOST	Not possible
SDCI_TC_0351	MTU sends Event in PREOPERATE	See REF 4
SDCI_TC_0352	MTU sends Event in PORT_DIAG	See REF 4 & Note1
SDCI_TC_0353	Master sends Port Event 0x6000 due to a requested invalid cycle time	Not possible
DataStorage		
SDCI_TC_0354	Delete stored DS object after reconfiguration	See REF 4, apply only TPL3, TPL4, TPL6
SDCI_TC_0355	Check the maximum size limits of DS upload/download	See REF 4
SDCI_TC_0356	Write consistent DS data object from upper level system	See REF 4
SDCI_TC_0357	Write inconsistent DS data object from upper-level system (checksum mismatch)	See REF 4
SDCI_TC_0358	Write DS data object from upper-level system to improper Port configuration	See REF 4
SDCI_TC_0359	Detection of upload request Event in OPERATE and Backup + Restore	See REF 4
SDCI_TC_0360	Detection of upload request Event in OPERATE and Restore	See REF 4
SDCI_TC_0361	Detection of upload request Event in OPERATE and Backup + Restore inactive	See REF 4
SDCI_TC_0362	Start-up with empty/invalid DS data object and deactivated Data Storage	See REF 4
SDCI_TC_0363	Start-up with empty/invalid DS data object and activated Data Storage	See REF 4
SDCI_TC_0364	Start-up after Device replacement with DS Download (checksum mismatch)	See REF 4
SDCI_TC_0365	Start-up after Device replacement without DS Download (checksum match)	See REF 4
SDCI_TC_0366	Start-up after Device replacement with raised DS upload flag	See REF 4
SDCI_TC_0367	Start-up after Device replacement with raised DS upload flag – DS upload blocked	See REF 4
SDCI_TC_0368	DS error in case of read Index_List fault during Port start-up	See REF 4 & Note3

Testcase	Description	Reference Remark
SDCI_TC_0369	DS error during DS download at Port start-up	See REF 4 & Note3
SDCI_TC_0370	DS error during DS Upload at Port start-up	See REF 4 & Note3
SDCI_TC_0371	DS in case of identification fault (incompatible Device)	See REF 4 & Note3
SDCI_TC_0372	Non-volatile storage of Port configuration and DS data	See REF 4
SDCI_TC_0280	DS Upload trial with locked Device Data Storage	See REF 4 & Note1
Legacy Device		
SDCI_TC_0285	Master detects legacy Device and establishes connection	See REF 4
SDCI_TC_0286	Master detects legacy Device and establishes interleave mode	See REF 4
SDCI_TC_0287	Master receives an Event without details	See REF 4
SDCI_TC_0289	ISDU Write interrupted by an Event leads to write error	See REF 4
SDCI_TC_0290	Master transforms PD_invalid and PD_valid Event into appropriate propagation	See REF 4

Note1: Use macro TM_AWAIT_PORT_STATUS_WBRIDGE instead of TM_AWAIT_PORT_STATUS in order to reach final state PORT_DIAG

Note2: Use SMI_PortConfiguration(ABPS_TYPE_COMP) instead of SMI_PortConfiguration(ABPS_NOTYPE_CHECK) for initial port configuration to ensure that the W-Bridge is not in standalone mode.

Note3: Use SMI_PortConfiguration(ABPS_NOTYPE_CHECK) instead of SMI_PortConfiguration(ABPS_PORTTODI) to ensure a proper different port configuration.

Note4: Precondition: Use “EUT: PORT_AUTOSTART” instead of “EUT: PORT_DI”

Note5: There will be a delay necessary between writing of PDOut and readback of PDIn

SMI_PortConfiguration(PORT_INACTIVE) shall be followed by TM_POWER_CONTROL(OFF). For all other port configurations, the SMI_PortConfiguration request shall be followed by TM_POWER_CONTROL(ON). This enables correct handling in precondition where the W-Bridge is powered off.

9.4 Air-Tester-System

9.4.1 Reverberation Chamber (RC)

A definition of a Reverberation Chamber (RC) in this context is given in REF 10. Rotational mode-stirres, linear moving plate stirrers, turntable(s), polarization stirring techniques can be used in order to “stirr” the electromagnetic field inside the RC. For measurements inside the RC, step-mode operation with (if not stated otherwise) at least 150 mode-stirrer steps (or at least 150 combinations of steps of different mode-stirrers or stirring techniques) shall be used.

The RC shall be loaded appropriately with absorptive material and the EUT that the Power-Delay –Profile (PDP) has an $\tau_{\_RMS}$=50 ns±5 ns, according to the procedure given in REF 14 with a noise threshold level of 30 dB according to REF 11. The $\tau_{\_RMS}$≈50 ns is a typical value for prospective industrial environments (see e.g., REF 11 for reference). Thereby a point-symmetric Hamming window shall be applied for the Inverse FFT-Operation (IFFT-Operation).

The EUT has to be placed within the “Test Volume” of the RC. Therefore, mounting instructions given by the manufacturer should be regarded. If the manufacturer prescribe that the EUT has to be placed on a metal surface, a mounting plate made of metal with a size of up to 30 cm by 30 cm should be used. The EUT and, if applicable the mounting plate shall be placed at least one wavelength (in the frequency range of interest) away from the walls, mode-stirrers and absorbers of the RC. Therefore, EUT holders made of low loss material (e.g. polystyrene foam, polytetrafluoroethylene) shall be used.

The Test Volume within the RC has to be verified. Therefore 9 Test Volume Validation Positions (TVVPs) shall be chosen, and each shall be evaluated in 3 (orthogonal) orientations (polarizations) according to REF 14, with the extends to REF 12, REF 13 and REF 14 that the minimal distance of the electrical center of the reference antenna to objects shall be at least one wave length in the frequency range of interest.

The reference antenna shall comply with REF 13 and meet the requirements of the CTIA Probe Antenna Symmetry Test, according to REF 15.

Frequency stirring techniques shall not be applied, according to REF 16. In particular, frequency stirring techniques shall also not applied for obtaining the reference transfer function.

9.4.2 Anechoic Chamber (AC)

The Anechoic Chamber (AC) used for IOLW Over-the-Air (OTA) testing shall be a shielded, fully anechoic chamber according to REF 17 and REF 15.

Measurements shall be made in the far-field, i.e., at a distance of at least

$$d_{(far\text{-}field)} \geq \frac{2*D^2 max}{\lambda}$$

Equation 1 Far-field distance

whereby λ is the wavelength and D_max is the maximum dimension of the EUT.

Example: With a frequency f=2.44 GHz, the velocity of light in free space c_0≈3·10^8 m/s a wavelength of λ=c_0/f≈12.3 cm and assuming D_max=30 cm a minimum measurement distance of d_(far-field)≥1.46 m shall be used.

The EUT has to be placed within the “Quiet Zone” of the AC. Therefore, mounting instructions given by the manufacturer should be regarded. If the manufacturer prescribe that the EUT has to be placed on a metal surface, a mounting plate made of metal with a size of up to 30 cm by 30 cm should be used. The Quiet Zone for the EUT shall be validated according to REF 15. Therefore, the reference antenna shall comply with REF 13 and should meet the requirements of the CTIA Probe Antenna Symmetry Test, according to REF 15.

In order to achieve comparable results between the RC and an Anechoic Chamber (AC), the sampling grid size in the AC shall be 15° (if not stated otherwise) or smaller, for each, elevation and azimuth, according to REF 13.

9.4.3 HT01 Conformity Check

The procedure of the physical layer test case “Test of AHT for W-Master“ requires a check that the new hopping table is conform to HT01.

The following method checks the HT01 conformity of a new hopping table for first track or single track without the knowledge of the block list. It can be also extended to check the hopping tables of tracks 2, 3, 4 and 5.

The idea behind the check is to perform reversed calculations of steps (vii) to (iii) of clause H.2.1 in REF 2. The result of will be a frequency array (compare to step ii of clause H.2.1). If this array has an ascending order, then the hopping table is HT01 conform.

Starting point.

- The W Master Tester has received the new hopping table. Frequency channels (Frequency_Table) and table length are known.
- Master ID is known.
- Blocklist is not required.
- The Permutation Index P is equal to table length (according to step vii, see clause H.2.1 in REF 2.

Step 1:

Calculate the Sequence Number N (according to step v, see clause H.2.1 in REF 2)

```
if((MasterID % 2) == 0) then
     N = int16((P-1)/2) + (MasterID/2);
else
     N = int16((P-1)/2) – ((MasterID - 1)/2);
end if;
```

Step 2:

Calculate the Possible_Freq_Array by reversing the permutation of (vii), see clause H.2.1 in REF 2 as follows:

```
for (index = 0:(P-1))
     Sequence_index = (N * index)%P;
     Possible_Freq_Array(Sequence_index ) = Frequency_Table(index);
end for;
```

Step 3:

Calculate the frequency array by reversing the circular shift of (iii) in clause H.2.1 under consideration that the array length can be greater than P. Finally, the order of the array will be checked. If it has an ascending order then, the result will be true which means the hopping table is HT01 conform:

```
result = false;
repeat
```



```
2357        array = CircularShift(Possible_Freq_Array, -1*MasterID);
2358        if array has an ascending order then
2359            result = true;
2360            break;
2361        end if;
2362        /* Increase the size of Possible_Freq_Array */
2363        i = size of Possible_Freq_Array
2364        if MasterID % (i+1) >= P then
2365            Possible_Freq_Array(i+1) = Possible_Freq_Array(1)
2366        else
2367            Possible_Freq_Array(i+1) = Possible_Freq_Array(i)
2368        end if;
2369    until i+1 is prime or i >= MasterID
2370    return result;
2371
2372
```


9.5 Components of W-Master test cases

9.5.1 Overview

9.5.2 EUT preconditions (W-Master/Port)

Table 259 shows preconditions of the EUT. They can represent a description of a state or a sequence of activities to reach a certain state of the EUT.

Table 259 Preconditions of the EUT

Identifier	Description of state or activities to reach state	
PORT_DI	W-Bridge is powered off	
PORT_DO	W-Bridge is powered off	
PORT_INACTIVE	W-Bridge is powered off	
PORT_AUTOSTART	W-Bridge is powered on (Port is in AutoStart Mode)	
WMASTER_CYCLIC	W-Master is configured and all tracks are in Cyclic Mode	
PORT_INACTIVE	Port is in Inactive Mode	NOTE
PORT_CYCLIC_AUTOPAIRING	Port is in Cyclic AutoPairing Mode	NOTE
PORT_CYCLIC	Port is in Cyclic Mode	NOTE
PORT_ROAMING_AUTOPAIRING	Port is in Roaming AutoPairing Mode	NOTE
PORT_ROAMING	Port is in Roaming Mode	NOTE

NOTE: As default configurations the ABPS_NOTYPE_CHECK shall be used

9.5.3 WMTU preconditions

Table 260 shows macros of preconditions of the WMTU playing the role of a controllable and observable W-Device. They describe values (instances) of parameters of a state or a sequence of activities to reach a certain state of the WMTU.

Table 260 Preconditions of the WMTU

Identifier	Description of state or activities to reach state
WMTU_STANDARD_STATE	DS_UPLOAD_FLAG = "0" ;no DS_UPLOAD_REQ WMasterCycleTimeIn = 0x41 ;5ms WMasterCycleTimeOut = 0x41 ;5ms DPP1(MinCycleTime) = 0x00 ;Not used in IO-Link Wireless DPP1(M-SequenceCapability) = 0x01 ;Not used in IO-Link Wireless DPP1(RevisionID) = 0x11 ;Revision = V1.1.x DPP1(ProcessDataIn) = 0x08 ;PDIn = 8 bit DPP1(ProcessDataOut) = 0x08 ;PDOut = 8 bit DPP1(VendorID) = 0xFDE8 ;ID of IO-Link Community (Tester) DPP1(DeviceID) = 002BD2 (NOTE) ;DID = 11218 DPP1(FunctionID) = 0x0000 ;FID is reserved Device is activated ;W-Device responds to Master PD status ChC = 1 ;Process Data valid **Mandatory Indices:** Index 0x0010 (VendorName) = "IO-Link Community" ;UTF8 coding Index 0x0012 (ProductName) = "WMTU" ;UTF8 coding Index 0x0003 (DataStorageIndex) = PARSET1 ;see REF 4 Table A.13 No Events pending All states and counters reset
MTU_STANDARD_STATE	See Table A.7 in IOL-Test Spec_10032_V113_Jan21.

9.5.4 TestMacros (TM) of the Master-Tester-Program

See Table A.8 in IOL-Test Spec_10032_V113_Jan21.

Some W-Bridge test cases reset the wireless communication resulting in a ComLost (NO_DEVICE) status, in these cases we will first wait for NO_DEVICE and then the actual status the was given in the variable.

Table 261 TestMacros of the Master-Tester-Program

TestMacro identifier	Variable	Test Service Action to enter mode	**Comment**
TM_AWAIT_PORT_STATUS_WBRIDGE	NO_DEVICE, PORT_DIAG, OPERATE, PREOPERATE	a) TM_AWAIT_PORT_STATUS(NO_DEVICE) b) TM_AWAIT_PORT_STATUS(Variable)	Monitored by Test_Timeout

9.5.5 SMI ArgBlock parameter sets (ABPS)

See REF 4 Table A9 in IOL-Test Spec_10032_V113_Jan21

9.5.6 SMI ArgBlock parameter sets (ABPS)

Table 262 contains a list of ArgBlock parameter sets (ABPS). They contain predefined values for ArgBlock elements. The data types of the elements are specified in REF 1. ABPS shall use the prefix "ABPS_".

ABPS names can be used in the description of SMI service instances. Predefined elements of an ABPS can be overwritten via the following syntax:

ABPS_xxxx<element1 = value, element2 = value, …>

For example, ABPS_PORTTODI<VendorID = 286> uses all element definitions of the ABPS_PORTTODI but replaces the default value "0" the element "VendorID" by the value "286".

Table 262 ArgBlock Parameter Sets (ABPS)

ABPS	ArgBlock	Element	Type	Value
ABPS_MASTERCYCLIC	WMasterConfigList	ArgBlockID	Unsigned16	0x0200
		WMasterID	Unsigned8	1
		Advanced Connectivity	Unsigned16	0
		BlockList	OctetString[10]	0x4000 0000 0000 0000 0002
		PairingTimeout	Unsigned8	5
		Reserved	Unsigned8	0
		ServiceTrackN	Unsigned8	1
		ServiceTrackMode	Unsigned8	0 (CYCLIC)
		NumberOfTracks	Unsigned8	Number_Of_Tracks
		Track1TxPower	Unsigned8	31
		Track2TxPower	Unsigned8	31
		Track3TxPower	Unsigned8	31
		Track4TxPower	Unsigned8	31
		Track5TxPower	Unsigned8	31
ABPS_PORTINACTIVE	WPortConfigList	ArgBlockID	Unsigned16	0x8200
		PortMode	PortMode	0 (Deactivated)
		Validation&Backup	DSType	0 (No_Device_Check)

ABPS	ArgBlock	Element	Type	Value
		Reserved (I/Q behavior)	Unsigned8	0
		Reserved (PortCycleTime)	Unsigned8	0
		VendorID	Unsigned16	0xFDE8
		DeviceID	Unsigned8	0x002BD2
		Slot_N	Unsigned8	0
		Track_N	Unsigned8	1
		DeviceTXPower	Unsigned8	31
		MaxRetry	Unsigned8	2
		IMATime Base	Unsigned8	3
		IMATime Multi	Unsigned8	1
		SlotType	Unsigned8	1 (DSLOT)
		LowEnergyDevice	Unsigned8	0
		MaxPDSegLength	Unsigned8	32
		WMasterCycleTimeOut	Unsigned8	0
		WMasterCycleTimeIn	Unsigned8	0
		UniqueID	OctetString[9]	UniqueID_of_EUT
ABPS_NOTYPE_CHECK	WPortConfigList	ArgBlockID	Unsigned16	0x8200
		PortMode	PortMode	52 (Cyclic AutoPairing)
		Validation&Backup	DSType	0 (No_Device_Check)
		Reserved (I/Q behavior)	Unsigned8	0
		Reserved (PortCycleTime)	Unsigned8	0
		VendorID	Unsigned16	0xFDE8
		DeviceID	Unsigned8	0x002BD2
		Slot_N	Unsigned8	0
		Track_N	Unsigned8	0
		DeviceTXPower	Unsigned8	31
		MaxRetry	Unsigned8	2
		IMATime Base	Unsigned8	3
		IMATime Multi	Unsigned8	1
		SlotType	Unsigned8	1 (DSLOT)
		LowEnergyDevice	Unsigned8	0
		MaxPDSegLength	Unsigned8	32
		WMasterCycleTimeOut	Unsigned8	0
		WMasterCycleTimeIn	Unsigned8	0
		UniqueID	OctetString[9]	UniqueID_of_EUT
ABPS_TYPE_COMP	WPortConfigList	ArgBlockID	Unsigned16	0x8200
		PortMode	PortMode	52 (Cyclic AutoPairing)
		Validation&Backup	DSType	2 (TYPE_compati-ble_Device_V1.1)
		Reserved (I/Q behavior)	Unsigned8	0
		Reserved (PortCycleTime)	Unsigned8	0

ABPS	ArgBlock	Element	Type	Value
		VendorID	Unsigned16	0xFDE8
		DeviceID	Unsigned8	0x002BD2
		Slot_N	Unsigned8	0
		Track_N	Unsigned8	1
		DeviceTXPower	Unsigned8	31
		MaxRetry	Unsigned8	2
		IMATime Base	Unsigned8	3
		IMATime Multi	Unsigned8	1
		SlotType	Unsigned8	1 (DSLOT)
		LowEnergyDevice	Unsigned8	0
		MaxPDSegLength	Unsigned8	32
		WMasterCycleTimeOut	Unsigned8	0
		WMasterCycleTimeIn	Unsigned8	0
		UniqueID	OctetString[9]	UniqueID_of_EUT

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9.5.7 MTU instructions

See clause A.4.7 in IOL-Test Spec_10032_V113_Jan21.

Table 263 WMTU instructions

Name	Parameter	Return value	Definition
WMTU_State_CheckUnpairing	-	sent/not sent	The WMTU checks 'UnPairing' (0x5F) MasterCommand was sent
WMTU_State_PairingByButton	-	-	The WMTU triggers a pairing button activation
WMTU_State_CheckCyclic	-	TRUE/FALSE	Returns CheckCyclic value and reset to TRUE. Value set to FALSE when every 5th downlink is missing for at least 3 consecutive times
WMTU_State_RespondNack	-	-	The WMTU sets the ACK bit of uplinks always to NACK (0).
WMTU_State_MonitorDownlinks	-	priority_errors	MTU counts number of MTU priority errors. Reset after invocation.

9.5.8 MTU data sets

9.5.8.1 MTU Index lists for Data Storage tests

See REF 4 Table A12 in IOL-Test Spec_10032_V113_Jan21.

9.5.8.2 MTU parameter sets

See REF 4 Table A13 in IOL-Test Spec_10032_V113_Jan21.

9.5.8.3 MTU specialties

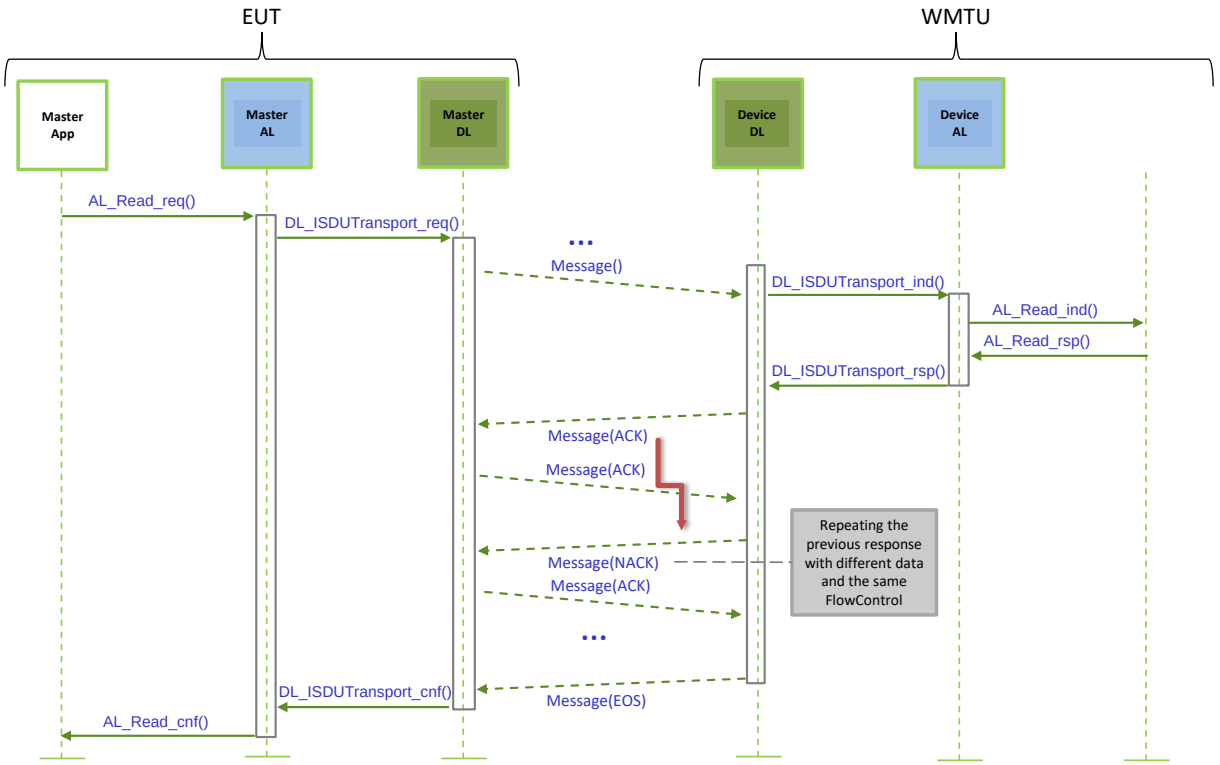
See REF 4 Table A14 in IOL-Test Spec_10032_V113_Jan21.

Table 264 shows specialties used for WMTU instructions "MTU_ISDU_Add" and "MTU_ISDU_Write" (see REF 4 Table A.11).

Table 264 MTU specialties

Name	Definition
WRITE_NACK	WMTU responds to the ISDU write request indicating "NACK" to simulate an incorrectly received packet.
READ_NACK	WMTU responds two times with different data to the ISDU read request, first with an “ACK” and second responds with a "NACK" (both with the same FlowControl) to simulate a not received ACK from the EUT (see Figure 13).
WRITE_NACK_SEG	Perform WRITE_NACK on the second segment.
READ_NACK_SEG	Perform READ_NACK on the second segment.
FC_NO_START	WMTU responds to the ISDU read request with missing START in the flow control, the response starts directly with the COUNT (0x01).
FC_COUNT_GAP	WMTU responds to the ISDU read request with a gap in the flow control COUNT (e.g., 0x08 (START), 0x01, 0x03, 0x09 (EOS)).

2429 Figure 13 shows the sequence of the WMTU in case of READ_NACK



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2431 **Figure 13 ISDU Read data in case of not received ACK from the EUT**

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Annex B

10 W-Master-Tester-System multiple W-Device setup

W-Master functionality is tested via W-Master Tester acting as one W-Device.

In some test cases additional W-Devices are required for testing a track behavior with multiple W-Devices.

Annex B describes the properties of the different W-Device types needed in this document.

Any W-Device which meets these properties can be used in the specified test cases.

10.1 W-Device type A (SSlot) setup

W-Device type A shall support the minimum functionality of Table 265.

Table 265 W-Device type A

Configuration Parameter	Value
PDoutLength	2 octet
PDinLength	0 or 1 octet
MinCycleTime	5 ms
SlotType	SSlot

10.2 W-Device type B (DSlot) setup

W-Device type B shall support the minimum functionality of Table 266.

Table 266 W-Device type B

Configuration Parameter	Value
SlotType	Dslot
ISDU: Config7 shall be supported	

11 Bibliography

REF 1 IO-Link Interface and System Specification

REF 2 IO-Link wireless - System Extensions

REF 3 IO-Link Community, IO Device Description (IODD), V1.1,3,Order No. 10.012.

REF 4 IOL-Test Spec_10032_V113_Jan21

REF 5 ISO/IEC 19505-2:2012 *Information technology – OMG Unified Modeling Language (OMG* 3317 *UML), Revision 2*

REF 6 ISTQB Standard Glossary of Terms used in Software Testing Version 3.2

REF 7 IO-Link Community, IO-Link Common Profile, V1.1, 2021, Order No. 10.072

REF 8 reserved

REF 9 IEC 61131-9, Programmable controllers – Part 9: Single-drop digital communication interface for small sensors and actuators (SDCI)

REF 10 Electromagnetic compatibility (EMC) - Part 4-21: Testing and measurement techniques - Reverberation chamber test methods (IEC 61000-4-21:2011)

REF 11 ITU Recommendation P.1238

REF 12 ETSI TS 134 114

REF 13 ETSI TR 125 914

REF 14 ETSI TR 137 977

REF 15 CTIA Test Plan for Wireless Device Over-the-Air Performance

REF 16 CTIA Test Plan for Wireless Large-Form-Factor Device Over-the-Air Performance

REF 17 ETSI TR 102 273-2

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