

# **IO-Link**

## **Corrigendum & Package 2015**

including "How to use the IO-Link Change Request database"

related to  
**IO-Link Interface and System Specification V1.1.2,  
IO-Link Test Specification V1.1.2,  
IODD – IO Device Description Specification, V1.1**

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This document has been prepared by the technology working groups of the IO-Link community. It is – together with the "IO-Link Interface and System" specification Version 1.1.2, the "IO-Link Test" specification Version 1.1.2, and the "IODD – IO Device Description" specification V 1.1 – the basis for implementation and test of Masters and Devices and for the corresponding manufacturer declarations.

**Important notes:**

NOTE 1 The IO-Link Community 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](http://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](http://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](http://www.io-link.com).


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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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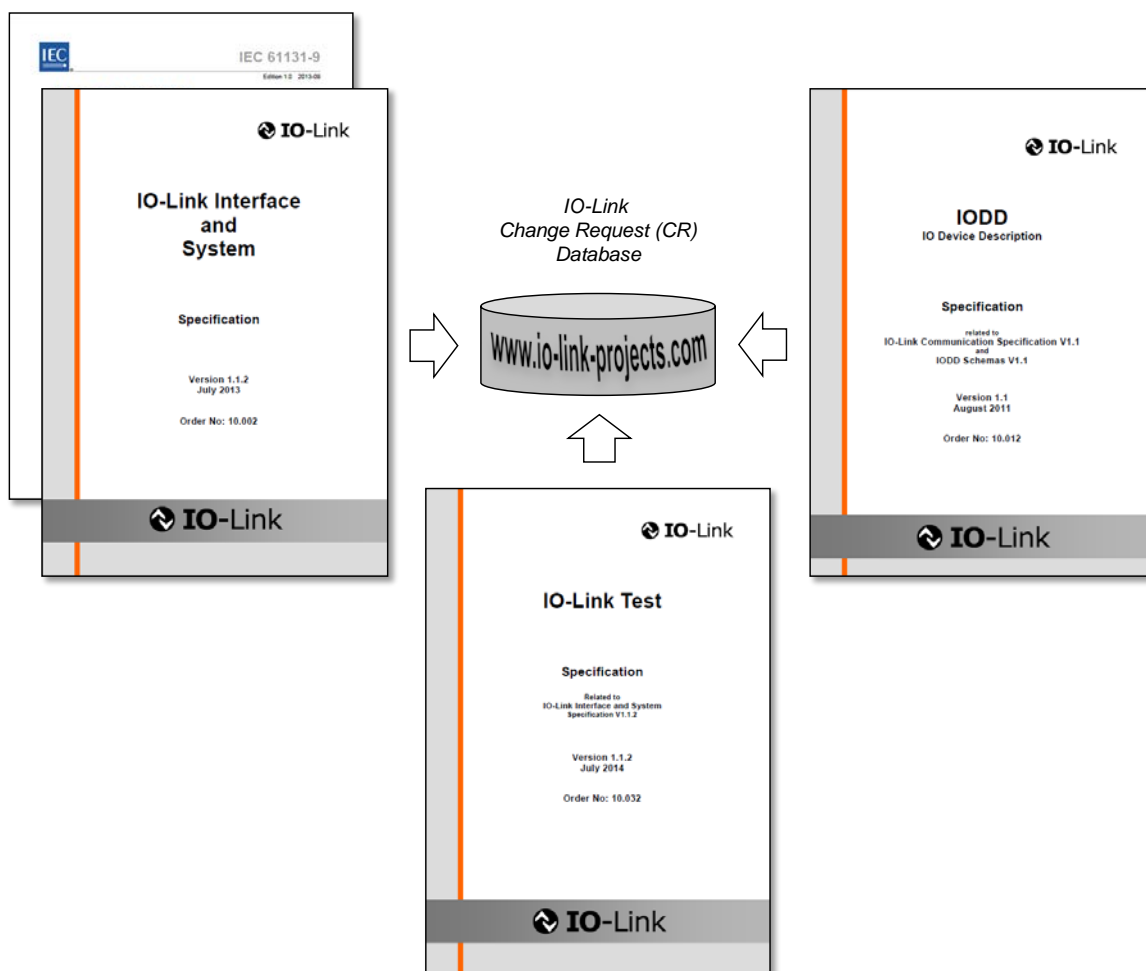
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## 0 Introduction

The Single-drop Digital Communication Interface (SDCI) and system technology (IO-Link™<sup>1</sup>) for low-cost sensors and actuators is standardized within IEC 61131-9 [2] as well as in [1]. The technology is an answer to the need of these digital/analog sensors and actuators to exchange process data, diagnosis information and parameters with a controller (PC or PLC) using a low-cost, digital communication technology while maintaining backward compatibility with the current DI/DO signals as defined in IEC 61131-2.

Tools allow the association of Devices with their corresponding electronic IO Device Descriptions (IODD) and their subsequent configuration to match the application requirements [3].

A test specification [5] supplements the technology specifications and guarantees quality assurance together with a manufacturer declaration.



**Figure 1 – Ensemble of IO-Link relevant standards and specifications**

The IO-Link Community established and maintains a so-called Change-Request database for those users having problems to understand while reading the specifications, or who found real bugs, or who would like to get an advice at particular implementation situations. The IO-Link working groups are obliged to provide answers within a reasonable timeframe. This corrigendum is a collection of approved answers to important change requests (CR).

A manual on "How to use the IO-Link change request database" can be found in Annex C.

<sup>1</sup> IO-Link™ is a trade name of the "IO-Link Community". This information is given for the convenience of users of this specification. Compliance to this specification does not require use of the registered logos for IO-Link™. Use of the registered logos for IO-Link™ requires permission of the "IO-Link Community".

## IO-LINK Corrigendum & Package 2015 — Related to IO-Link specifications and reports

### 1 Motivation and scope

Over time, the number of applications in the field is growing and users of the IO-Link specifications

- IO-Link Interface and System, V1.1.2 [1],
- IO-Link Test, V1.1.2 [5], and
- IODD – IO Device Description, V1.1 [3],

may realize some problems with the published versions of the IO-Link specifications. Usually, it is possible for them to enter these problems into a so-called Change-Request database maintained by the IO-Link community. Information on how to access the database is available on the second page of each and every specification. It is the task of each associated working group to respond to the individual user problem report or change request (see Figure 1).

A particular release package of the relevant versions of the specifications and the relevant concluded change requests (CR) or problem reports out of the databases respectively has been defined in 2015.

This document lists those CRs for all three specifications and provides pointers to the particular locations within the specifications. Additional explanations and figures serve for easier reading and better understanding.

All of these listed changes within the CRs are mandatory to observe for implementation and testing, as well as for the test equipment by the time of the release of this document. For transitions see Annex A.2.

Annex C provides a manual for those users, who are not familiar with the usage of the IO-Link CR database.

### 2 Normative references

The referenced documents in [2] apply.

### 3 Symbols and abbreviated terms

CR-xx	Change Request (Identification number of the particular database)
IP	IO Device Description Specification V1.1
SP	IO-Link Interface and System Specification V1.1.2
TP	IO-Link Test Specification V1.1.2

## 4 Part1: Reports on Interface and System Specification

### 4.1 Overview

Table 1 shows the IO-Link Interface and System specification reports sorted by CR-ID. Problem descriptions are hyper-linked with the individual reports (click on text).

**Table 1 – IO-Link Interface and System specification reports**

SP CR-ID	Abstract/Problem	Affected clauses	Affected TP, IP
39	ASIC specifications deviate from IOL specification (-0,3 V versus -1,0 V)	5.3.2.2	
46	Voltage rating for C/Q line: $VILD_{,M}$ and $VIHD_{,M}$ only for Devices	5.3.2.2	
57	Maximum Device consumption at power-up (charge considerations)	5.3.2.4	
58	Same predefined parameters and Events in V1.0 and V1.1 mode	10.6.3	
62	ErrorTypes for parameters containing value ranges and enumerations	C.2	
72	Block Parameterization in V1.0 mode	10.6.14	
75	ErrorTypes in case of Subindex access to a non-existing parameter	C.2.3 C.2.4	TP CR-ID 162
76	Missing rules for Data Storage as with Block Parameter transfer	10.4.2	
77	Usage of bits for Device access locks	10.6.10 B.2.4	
80	Device not supporting V1.0 connected to a Legacy-Master	7.3.2.5 Test Spec.	TP, see clause 5.20
88	Behaviour of Event flag in case of a subsequent Event	7.3.8.3 Test Spec.	
89	Fallback and Digital Input (DI) mandatory for Master	11.2.2.1	

See Annex B for another reference table sorted by clauses.



## 4.2 ASIC specifications deviate from IOL specification (-0,3 V versus -1,0 V)

This problem report refers to change request ID 39 in the database.

Table 2 shows the problem report and the solution.

**Table 2 – ASIC specifications deviate from IO-Link specification**

<b>Problem</b>	Table 5 "Electrical characteristics of receivers" specifies $V_{IL_{D,M}}$ , the permissible voltage range for 'L' as $(V_{0D} - 1,0 \text{ V})$ . However, the specifications of Master transceiver ASICs show maximum ratings for the C/Q line from $-0,3 \text{ V}$ to $(V_{CC} + 0,3 \text{ V})$ due to power dissipation problems.
<b>Solution</b>	The 1 Volt difference on the Master side is not required due to the sole powering of the Device from the Master port as already specified in clause 5.4.1. These preconditions prevent the Master from being damaged by the Device. Specification shall be augmented in 5.4.1: <i>Manufacturers/vendors shall emphasize this requirement within the user manual of the Master. Any additional measure for further increased robustness is within the responsibility of the designer/manufacture of the Master.</i>
<b>Clauses</b>	5.3.2 Electrical requirements
<b>Subclauses</b>	5.3.2.2 Receiver
<b>Impact on</b>	–
<b>Remark</b>	See SP-CR-ID 46

### 4.3 Voltage rating for C/Q line: $VIL_{D,M}$ and $VIH_{D,M}$ only for Devices

This problem report refers to change request ID 46 in the database.

Table 3 shows the problem report and the solution.

**Table 3 – Voltage rating for C/Q line**

<b>Problem</b>	Table 5 "Electrical characteristics of receivers" specifies $VIL_{D,M}$ , the permissible voltage range for 'L' as ( $V_{OD} - 1,0$ V). However, the specifications of Master transceiver ASICs show maximum ratings for the C/Q line from $-0,3$ V to ( $V_{CC} + 0,3$ V) due to power dissipation problems.
<b>Solution</b>	The 1 Volt difference on the Master side is not required due to the sole powering of the Device from the Master port as already specified in clause 5.4.1. These preconditions prevent the Master from being damaged by the Device. Specification shall be changed in 5.3.2.2, Table 5: split $VIL_{D,M} \rightarrow VIL_D$ and $VIL_M$ as well as $VIH_{D,M} \rightarrow VIH_D$ and $VIH_M$
<b>Clauses</b>	5.3.2 Electrical requirements and 5.4 Power supply
<b>Subclauses</b>	5.3.2.2 Receiver and 5.4.1 Power supply options
<b>Impact on</b>	–
<b>Remark</b>	See SP-CR-ID 39

#### 4.4 Maximum Device consumption at power-up (charge considerations)

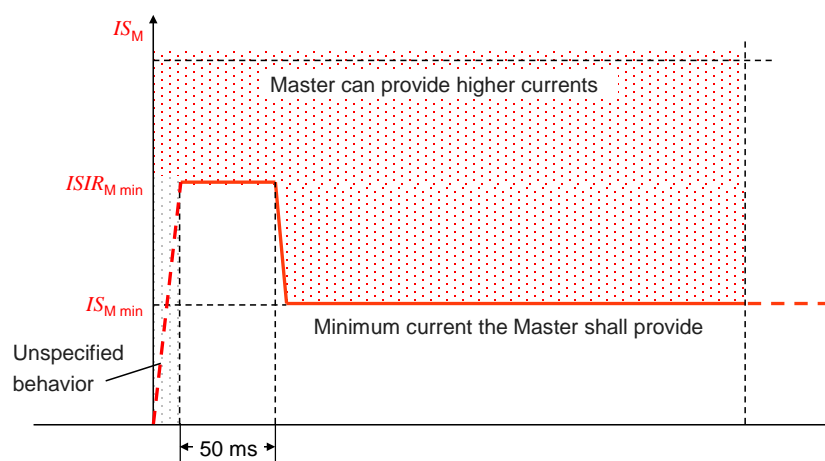
This problem report refers to change request ID 57 in the database.

Table 4 shows the problem report and the solution.

**Table 4 – Maximum Device consumption at power-up**

<b>Problem</b>	$ISIR_M$ has only a minimum value defined in Table 6. Refined specification required for the maximum Device consumption based on electric charge considerations.
<b>Solution</b>	<p><b>Device:</b>            New row in Table 7:            - Property: <math>QIS_D</math>            - Designation: <i>Power-up consumption</i>            - Maximum: 70 mAs            - Remark: See Equation (n). <math>T_{RDL}</math> is specified in clause 5.4.2</p> <p>Insert after Table 7:  <i>The Device shall be able to reach a stable operational state (ready for Wake-up) consuming the maximum charge (see Equation (n)).</i></p> $QIS_D = ISIR_M \times 50ms + (T_{RDL} - 50ms) \times IS_M \quad (n)$ <p><b>Master:</b>            Insert after Table 6:  <i>The Master shall provide a charge of 400 mA * 50 ms = 20 mAs within the first 50 ms after power-on without any overload-shutdown. After 50 ms the current limitation of the specification applies.</i></p> <p>Insert new Figure (see Figure xyz)            In Table 6:            Property: <math>ISIR_M</math>            Change Remark: Delete text</p>
<b>Clauses</b>	5.3.2 Electrical requirements
<b>Subclauses</b>	5.3.2.4 Device
<b>Impact on</b>	–
<b>Remark</b>	–

Figure 2 shows the new Figure xyz "Inrush current and charge".



**Figure 2 – New Figure xyz (Inrush current and charge)**

**4.5 Same predefined parameters and Events in V1.0 and V1.1 mode**

This problem report refers to change request ID 58 in the database.

Table 5 shows the problem report and the solution.

**Table 5 – Same predefined parameters and Events in V1.0 and V1.1 mode**

<b>Problem</b>	Devices according to V1.1 should be permitted to use the same predefined parameters and Events in IO-Link 1.1 and 1.0 mode in order to improve integration of such Devices and to simplify the development of IODDs.
<b>Solution</b>	Devices supporting both V1.0 and V1.1 modes are permitted to use the same predefined parameters and Events in both modes. Corresponding sentence will be inserted after clause 10.6.3.
<b>Clauses</b>	10.6 Device features, Annex B
<b>Subclauses</b>	10.6.3 Protocol revision compatibility, Annex B.1.5
<b>Impact on</b>	IODD Checker (Version for Package 2015)
<b>Remark</b>	–

**4.6 ErrorTypes for parameters containing value ranges and enumerations**

This problem report refers to change request ID 62 in the database.

Table 6 shows the problem report and the solution.

**Table 6 – ErrorTypes for parameters containing value ranges and enumerations**

<b>Problem</b>	It is unclear which error code to use for a parameter with a combination of single values and value ranges.
<b>Solution</b>	The ErrorType C.2.9 “Parameter value out of range” shall be used for a write service to a parameter outside its permitted range of values. Insert at the end of C.2.9: Example: Enumerations (list of single values), combination of value ranges and enumeration.
<b>Clauses</b>	Appendix C
<b>Subclauses</b>	Appendix C.2.9
<b>Impact on</b>	–
<b>Remark</b>	–

**4.7 Block Parameterization in V1.0 mode**

This problem report refers to change request ID 72 in the database.

Table 7 shows the problem report and the solution.

**Table 7 – Block Parameterization in V1.0 mode**

<b>Problem</b>	Devices with support of V1.0 backward compatibility support commands for Block Parameterization. The reaction of the Device is unclear when receiving commands for Block Parameterization in V1.0 mode.
<b>Solution</b>	<i>A Device supporting V1.0 mode is permitted in V1.0 mode to also support Block Parameterization with full functionality, including the Event "DS_UPLOAD_REQ". A Legacy Master propagates such an Event without any further action.</i> This sentence shall be inserted after clause 10.6.14.
<b>Clauses</b>	10.6 Device features
<b>Subclauses</b>	10.6.14 Block Parameter
<b>Impact on</b>	–
<b>Remark</b>	–

**4.8 ErrorTypes in case of Subindex access to a non-existing parameter**

This problem report refers to change request ID 75 in the database.

Table 8 shows the problem report and the solution.

**Table 8 – ErrorTypes in case of Subindex access to a non-existing parameter**

<b>Problem</b>	The expected behaviour for a subindex access to a non-existing parameter is not clearly specified
<b>Solution</b>	<p>The correct ErrorType in this case is "Index not available" (0x8011) since the Index has priority over the Subindex.</p> <p>Changes to the specification:</p> <p>a) C.2.3 (0x8011): <i>This ErrorType shall be used whenever a read or write access occurs to a non-existing Index with or without Subindex access.</i></p> <p>b) C.2.4 (0x8012): <i>This ErrorType shall be used whenever a read or write access occurs to a non-existing Subindex of an existing Index.</i></p>
<b>Clauses</b>	C.2 Application related ErrorTypes
<b>Subclauses</b>	C.2.3 Index not available, C.2.4 Subindex not available
<b>Impact on</b>	Test specification (see 5.2 in this document)
<b>Remark</b>	–

**4.9 Missing rules for Data Storage as with Block Parameter transfer**

This problem report refers to change request ID 76 in the database.

Table 9 shows the problem report and the solution.

**Table 9 – Missing rules for Data Storage as with Block Parameter transfer**

<b>Problem</b>	No rules for Data Storage exist in respect to consistency, access, structure checking and to invalid parameter sets as is specified for the Block Parameter transfer in 10.3.5
<b>Solution</b>	During Data Storage the Device shall apply the same rules as specified for the Block Parameter transfer. Changes to specification: 1) Create list of 3 bullets for the checking rules in 10.3.5 (after Figure 87) 2) Refer at the end of 10.4.1 to this bullet list in 10.3.5
<b>Clauses</b>	10.3 Parameter Manager (PM); 10.4 Data Storage (DS)
<b>Subclauses</b>	10.3.5 Block Parameter; 10.4.1 General
<b>Impact on</b>	–
<b>Remark</b>	–



**4.10 Usage of bits for Device access locks**

This problem report refers to change request ID 77 in the database.

Table 10 shows the problem report and the solution.

**Table 10 – Usage of bits for Device access locks**

<b>Problem</b>	It is not clear whether a teach-in button shall be locked via "Device parameter locking" (10.6.10) or "Device user interface locking" (10.6.11). Both mention teach-in buttons as an example. In B.2.4 the difference between "local control elements" (line 4335) and "human machine interface" (line 4337) is not clearly specified.
<b>Solution</b>	<p>The term "Local" in the specification means parameter entries independent from IO-Link communication.</p> <p>The recommendation for future implementations are:</p> <p>1) "Local parameterization" locking shall have the effect of read only or write protection for local entries at the Device (Bit 2 in Table B.12). Heading text of clause 10.6.10 shall be changed to "<i>Locking of local parameter entries</i>".</p> <p>2) "Local user interface" locking shall have the effect of a complete disabling of controls and displays (e.g. shut down of the human machine interface) at the Device (Bit 3 in Table B.12). Heading text of clause 10.6.11 shall be changed to "<i>Locking of local user interface</i>" as well as the body text: "<i>Setting this lock will disable the operation of on-board human machine interface displays and controls such as keypads on a Device (see B.2.4).</i>"</p> <p>The IODD specification shall implement additional descriptions for "Device locking possibilities" according to these new definitions.</p> <p>Corresponding test cases in the test specification shall be adapted to these new definitions.</p> <p>The default text in the IODD-StandardDefinitions1.1.xml should be extended and improved.</p>
<b>Clauses</b>	10.6 Device features; B.2.4 Device Access Locks
<b>Subclauses</b>	10.6.10 Device parameter locking; Table B.12
<b>Impact on</b>	Test specification, IODD specification
<b>Remark</b>	–

**4.11 Device not supporting V1.0 connected to a Legacy-Master**

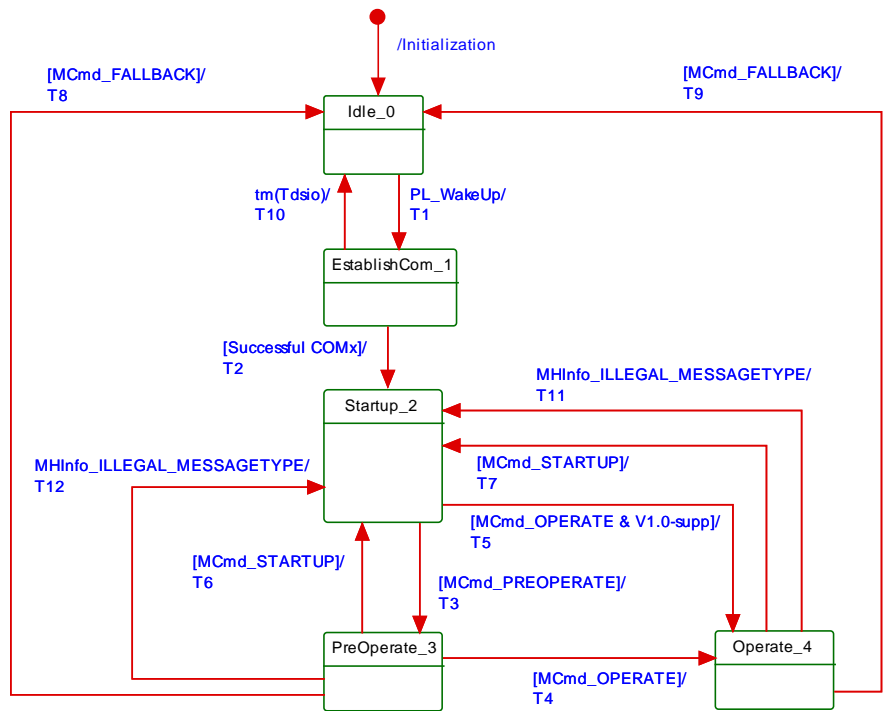
This problem report refers to change request ID 80 in the database.

Table 11 shows the problem report and the solution.

**Table 11 – Device not supporting V1.0 connected to a Legacy-Master**

<b>Problem</b>	A Device not supporting V1.0 connected to a Legacy-Master leads to undefined system behaviour
<b>Solution</b>	If a Device does not support communication with Legacy Masters, the Device shall ignore the MasterCommand "DeviceOperate" and remain in the STARTUP state. Changes in specification: In 7.3.2.5, Figure 35: the guard at T5 shall be extended by [& V1.0-supp] → new state chart (see Figure 3) and definition of the internal item "V1.0-supp" within the state and transition Table 43. Changes to the Test Specification are documented in 5.20.
<b>Clauses</b>	7.3 Data Link Layer protocol
<b>Subclauses</b>	7.3.2.5 State machine of the Device DL-mode handler
<b>Impact on</b>	Test specification: 4.4, 6.2.2, 6.8.3, 6.8.4, 6.8.5, 6.8.2.2, B.5
<b>Remark</b>	–

Figure 3 shows the new Figure 35 "State machine of the Device DL-mode handler".



**Figure 3 – New Figure 35**

#### 4.12 Behaviour of Event flag in case of a subsequent Event

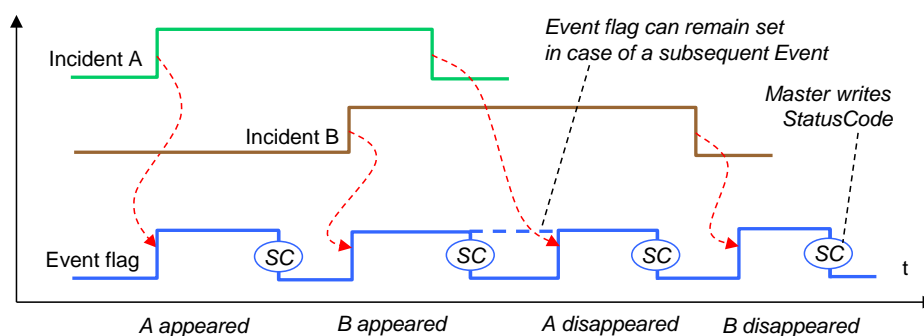
This problem report refers to change request ID 88 in the database.

Table 12 shows the problem report and the solution.

**Table 12 – Behaviour of Event flag in case of a subsequent Event**

<b>Problem</b>	The behaviour of the Event flag (according to chapter A.1.5) is not defined. The Event handler and the Message handler are only coupled when receiving a Write of the StatusCode and not at the response. Therefore both behaviours of a Device are possible: the next message contains a "1" or "0" in the Event flag. Master implementations may trigger the Event referred to the state of the Event flag or referred to the edge of the Event flag from "0" to "1". Thus, interoperability cannot be guaranteed in specific cases.
<b>Solution</b>	It is not required for the Event flag to change status after writing the StatusCode in case of a subsequent Event. Figure 91 shall be changed for clarification (see Figure 4).
<b>Clauses</b>	7.3.8 Event handler
<b>Subclauses</b>	7.3.8.3 State machine of the Master Event handler
<b>Impact on</b>	Test specification, Figure 12 (same as Figure 91)
<b>Remark</b>	–

Figure 4 demonstrates the behaviour of the Event flag in case of a subsequent Event.



**Figure 4 – New Figure 91**

**4.13 Fallback and Digital Input (DI) mandatory for Master**

This problem report refers to change request ID 89 in the database.

Table 13 shows the problem report and the solution.

**Table 13 – Fallback and Digital Input (DI) mandatory for Master**

<b>Problem</b>	It is not clear whether a Master is compliant if the function "Fallback into SIO mode" is not supported.
<b>Solution</b>	For conformity with IO-Link, a Master shall support the Fallback and the operating mode Digital Input (DI) as specified in clause 11.2.2.1 (all modes are mandatory).
<b>Clauses</b>	11.2 Configuration Manager
<b>Subclauses</b>	11.2.2.1 OperatingMode
<b>Impact on</b>	Test specification: In TC_0213 the Fallback test shall be included
<b>Remark</b>	–

## 5 Part 2: Reports on Test Specification

### 5.1 Overview

Table 14 shows the Test specification reports sorted by CR-ID. In some cases clause 4.4 (Tables 5 and 6) are affected. Problem descriptions are hyper-linked with the individual reports (click on text).

**Table 14 – Test specification reports sorted by CR-ID**

TP CR-ID	Problem	Affected clauses	Affected SP
162	ErrorTypes in case of Subindex access to a non-existing parameter	6.5.12	CR-ID 75
163	Testing of error count in case stimulus is not provided	6.10.21, 4.4	-
164	Test of "protocol revision" is optional	6.2.3, 4.4	-
165	ISDU capability test for Devices without ISDU support	6.8.3, 4.4	-
166	ISDU Read/Write test for Devices without ISDU support	6.8.4, 4.4	-
167	Deviating resistor values between test cases and test instructions	5.5.3, A.1.2.10 5.5.4, A.1.2.11	-
168	Test for PREOPERATE with Legacy Device not possible	6.3.6, 4.4	-
169	Test case name is incorrect	6.3.7	-
170	"Test failed" definition is incomplete	6.4.5	-
171	Frequencies in EMC test "Conducted RF" incorrect	9.4.5	-
172	References to Figures and Tables are outdated; Clause "0"	6.6.4 6.6.7 6.6.8	-
174	ISDU capability test for Devices without ISDU support	6.8.3, 4.4	-
176	Remodel test case from ISDU to M-sequence TYPE_0	6.2.6	-
178	Vendor to select variable that does not change value after Write	6.5.6	-
179	Purpose of test cases not comprehensible: collisions?	6.3.5 6.4.4	-
180	IODD reset to factory settings verification: refine test passed/failed	7.3.5	
181	Test exceeds specified maximum voltage of 30 V by 1 V	5.3.11	-
184	SystemCommand testing: vendor specific & write only	6.10.3 7.3.4	-
	Consequences of CR_ID 80 against Interface and System Specification (see 4.11)	6.2.2 6.8.2.2 6.8.3 6.8.4 6.8.5 B.5	CR-ID 80
	Consequences of the test case changes for Table 5 and 6		

## 5.2 ErrorTypes in case of Subindex access to a non-existing parameter

This problem report refers to change request ID 162 in the database and to SP\_CR-ID 75.

Table 15 shows the problem report and the solution.

**Table 15 – ErrorTypes in case of Subindex access to a non-existing parameter**

<b>Problem</b>	The negative Read response to a Subindex of a non-existing Index results in "Index Not Available" (0x8011). The test case TC_SDCI_0062 expects 0x8012. The problem with this test case arises whenever there are no Indices in the 16 bit range.
<b>Solution</b>	Both ErrorTypes shall be permitted.
<b>Clauses</b>	6.5.12 Read 16 bit Index with unavailable Subindex
<b>Test case</b>	SDCI_TC0062 (see changes with yellow markings below)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	–

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0062
Name	TCD_DLIC_ISDU_READ16NOSUBINDEX
Purpose (short)	Check 16 bit Read response when Subindex not available
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.1
Category / type	Device ISDU, test to fail (negative testing)
Specification (clause)	[9], see 7.3.6, and Annex C, Table C.1
Configuration / setup	Device-Tester
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master sends ISDU read request for Config2 and a Subindex = 0x02 (not specified). This results in a negative Read response.
Precondition	a) Device in PREOPERATE or OPERATE respectively b) Master in PREOPERATE or OPERATE respectively
Procedure	a) Master: Sends ISDU Read request <i>Segment 1:</i> 0xA4 (Service: Read request: 0b1010 / Length:0b0100) <i>Segment 2:</i> 0xnn (Index in Config2, part1) <i>Segment 3:</i> 0xnn (Index in Config2, part2) <i>Segment 4:</i> 0xzz (Checksum) b) Receive Read response "busy" (0x01) until Device is ready c) Receive Read response and check whether it contains a negative read response with ErrorCode and AdditionalCode
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the Read response is negative (Service: 0b1100, Length: 0b0100) b) Compare ErrorCode with 0x80 c) Compare AdditionalCode with 0x12 "Subindex not available" and 0x11 "Index not available".
Test passed	Checks and comparison b) and one of the comparisons c) are valid
Test failed (examples)	Positive response from Device or incorrect ErrorCode or AdditionalCode
Results	Negative Read response received upon unavailable Subindex: <pass/fail>.

### 5.3 Testing of error count in case stimulus is not provided

This problem report refers to change request ID 163 in the database. Table 16 shows the problem report and the solution.

**Table 16 – Testing of error count in case stimulus is not provided**

<b>Problem</b>	The test case TC_0124 assumes that a change in the variable Error Count can be simulated via an external stimulation. An exception should be permitted for those Devices not being able to provide such stimulation.
<b>Solution</b>	Exception is permitted.
<b>Clauses</b>	6.10.21 Error Count
<b>Test case</b>	SDCI_TC0124 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	–

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0124
Name	TCD_DLIC_DEFP_ERRCOUNT
Purpose (short)	Test of parameter Error Count
Equipment under test (EUT)	Device and Legacy-Device; external stimulation of Error Count should be possible
Test case version	1.2
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[13], see Annex B.2.15
Configuration / setup	Device-Tester; user interaction for stimulation required
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter Error Count
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Error Count marked as implemented within the IODD.
Procedure	a) Read parameter Error Count (Index 0x0020) b) Stimulate error within Device technology specific application (registered for Error Count) c) Read parameter Error Count (Index 0x0020) d) Power cycle the Device (switch off and on) e) Read parameter Error Count (Index 0x0020)
Input parameter	Manufacturer defined stimulation of an error
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on read access b) Check parameter length c) Compare values from step a) and step c), if stimulation is provided d) Check value of step e)
Test passed	a) No negative response and b) Parameter length is 2 octets and c) Evaluation c) shows an increment of 1 and d) Evaluation d) returns the value '0x0000'
Test failed (examples)	Any of the evaluation a) through d) fails
Results	ErrorCount: <length> <pass/fail> ErrorCount: <increment> <pass/fail> ErrorCount: <value> <pass/fail> Exception: <yes/no>

#### 5.4 Test of "protocol revision" is optional

This problem report refers to change request ID 164 in the database. Table 17 shows the problem report and the solution.

**Table 17 – Test of "protocol revision" is optional**

<b>Problem</b>	Protocol revision compatibility is optional (Clause 10.6.3 last sentence in SP). According to Tables 5 and 6 and associated text this test case seems to be mandatory.
<b>Solution</b>	Exception is permitted. Change Tables 5 and 6 and insert exception to EUT.
<b>Clauses</b>	6.2.3 Master start-up with overwrite of the RID
<b>Test case</b>	SDCI_TC0306 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	See 5.21 in this document

This test is optional if compatibility to "1.0" is not entered in V1.1-IODD ("compatibility with")

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0306
Name	TCD_DLPC_CHK_OVERRIDOK
Purpose (short)	Check Device start-up behavior with overwrite of the Device RID (compatible)
Equipment under test (EUT)	Device; exception if IODD (1.1) does not provide compatibility to "1.0"
Test case version	1.1
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[13], 10.6.3
Configuration / setup	-
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Device start-up behavior with overwrite of the RevisionID (compatible). This test supposes the active switching to protocol revision 1.0. The Master overwrites the RID and the Device accepts the requested protocol version. The configured Device identification is equal to the Device identification and the RevisionID is 0x10.
Precondition	a) Master is in STARTUP mode. b) Master is configured to the Device under test and RevisionID 0x10 c) Protocol revision of the Device is V1.1 (0x11)
Procedure	a) Master establishes communication with the Device b) Master detects the wrong "RevisionID" c) Master overwrites the RevisionID with the requested legacy RevisionID d) Master writes the Master-Command 0x96 e) Device accepts the written RID f) Master reads communication parameters again g) Master turns the "modified" Device into the OPERATE mode
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check if the read RID matches the written RID 0x10
Test passed	The Device provides the requested RID 0x10
Test failed (examples)	The Device provides the RID 0x11
Results	Active switching to legacy protocol revision accepted: <pass/fail> Exception: <yes/no> <pass/fail>



## 5.5 ISDU capability test for Devices without ISDU support

This problem report refers to change request ID 165 in the database. Table 18 shows the problem report and the solution.

**Table 18 – ISDU capability test for Devices without ISDU support**

<b>Problem</b>	This test case can only completely pass if ISDU is supported. However, ISDU is optional. Thus, test case cannot be stated for Devices without ISDU in Table 5.
<b>Solution</b>	Exception is accepted. Change Tables 5 and 6 and insert exception to EUT. Additional changes according to 5.13 (TP-CR174)
<b>Clauses</b>	6.8.3 From STARTUP to OPERATE (V1.0)
<b>Test case</b>	SDCI_TC0085 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	See 5.21 in this document

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE	
Identification (ID)	SDCI_TC_0085	
Name	TCD_DLIC_COMP_STARTUP	
Purpose (short)	Establish a connection from Wakeup to OPERATE in V1.0 way of SDCI protocol	
Equipment under test (EUT)	Device and Legacy-Device; exceptions if ISDU is not supported	
Test case version	1.1	
Category / type	Device protocol test; test to pass (positive testing)	
Specification (clause)	[13]	
Configuration / setup	Device-Tester	
TEST CASE	CONDITIONS / PERFORMANCE	
Purpose (detailed)	Establish a connection from Wakeup to OPERATE in V1.0 way of SDCI protocol. The Device-Tester initiates a Wakeup request, reads out the parameter 0x02 – 0x06 (Direct Parameter page 1) and then tries to turn the Device in OPERATE mode. After this, the Device shall be able to exchange Process Data and accept ISDU services. This test shall ensure that a V1.1 Device can be accessed from a V1.0 Master.	
Precondition	-	
Procedure	a) Master initiates a Wakeup (with reading of parameter 0x02) b) After the transmission rate detection the Master reads parameter 0x03 – 0x06 c) After reading the parameter it will write the MasterCycleTime d) Master sends MasterCommand 0x99 (OPERATE) e) Master switches to target M-sequence type and exchanges Process Data f) Master initiates a Read or Write to Direct Parameter page 1 g) Master initiates an ISDU Read or Write to test the Device capability (only with ISDU support)	
Input parameter	-	
Post condition	-	
TEST CASE RESULTS	CHECK / REACTION	
Evaluation	a) Check if Device responds with the correct values during STARTUP b) Check if the Device responds with the correct M-sequence type after OPERATE c) Check if the ISDU Read or Write is responded (only with ISDU support)	
Test passed	a) If Device exchanges Process Data after STARTUP b) If ISDU is working (only with ISDU support) c) Device did not stop communication in step f)	
Test failed (examples)	a) MasterCommand 0x99 (OPERATE) results in a communication error or b) Device does not use the target M-sequence type c) Device does not respond to ISDU Read or Write (only with ISDU support)	
Results	Exchange of PD: <yes/no> ISDU is working: <yes/no> Exceptions: <yes/no>	<pass/fail> <pass/fail> <pass/fail>

## 5.6 ISDU Read/Write test for Devices without ISDU support

This problem report refers to change request ID 166 in the database. Table 19 shows the problem report and the solution.

**Table 19 – ISDU Read/Write test for Devices without ISDU support**

<b>Problem</b>	This test case can only completely pass if ISDU is supported. However, ISDU is optional. Thus, test case cannot be stated for Devices without ISDU in Table 5.
<b>Solution</b>	Master shall use Read or Write to Direct Parameter page 1 to ensure a response from the Device. Change Tables 5 and 6 and insert exception to EUT.
<b>Clauses</b>	6.8.4 From STARTUP to OPERATE - interleave (V1.0)
<b>Test case</b>	SDCI_TC0086 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	See 5.21 in this document

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0086
Name	TCD_DLIC_COMP_TYPE1INTERLEAVE
Purpose (short)	Interleave test
Equipment under test (EUT)	Device and Legacy-Device; exceptions if ISDU is not supported
Test case version	1.1
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[13]
Configuration / setup	Device-Tester
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Interleave test. In V1.1 the SDCI protocol defines new M-sequence types for large Process Data transfers (more than 2 octets). In Version V1.0, SDCI communication uses the TYPE_1_x M-sequences with interleaving of PD and OD. A compatible Device shall be able to switch to the interleave mode (TYPE_1_x) during communication with the Device-Tester.
Precondition	Device supports more than 2 octets of Process Data
Procedure	a) Master initiates a Wakeup request (with reading of parameter 0x02) b) After detection of the transmission rate the Master reads parameter 0x03 – 0x06 c) After reading the parameter it will write the MasterCycleTime to 0x01 d) Master sends MasterCommand 0x99 (OPERATE) e) Master switches to M-sequence TYPE_1_1/2 and exchanges Process Data f) Master initiates a Read or Write to Direct Parameter page 1 g) Master initiates an ISDU Read or Write to ensure a response from the Device
Input parameter	"PD size" taken from the IODD.
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check if Device responds with the correct values during STARTUP b) Check if the Device responds with the correct M-sequence type after OPERATE c) Check if the Read or Write to Direct Parameter page 1 is responded d) Check if the ISDU Read or Write is responded
Test passed	a) If Device exchanges Process Data in interleave mode after STARTUP b) If Read or Write to Direct Parameter page 1 is responded c) If ISDU is working (only with ISDU support)
Test failed (examples)	a) MasterCommand 0x99 (OPERATE) results in a negative response or b) Device does not use the target M-sequence type c) Device does not respond to ISDU Read or Write (only with ISDU support)
Results	Exchange of PD in interleave mode: <yes/no> <pass/fail> Read or Write to Direct Parameter page 1 is working: <yes/no> <pass/fail> ISDU is working: <yes/no> <pass/fail> Exception: <yes/no> <pass/fail>

## 5.7 Deviating resistor values between test cases and test instructions

This problem report refers to change request ID 167 in the database. Table 20 shows the problem report and the solution.

**Table 20 – Deviating resistor values between test cases and test instructions**

<b>Problem</b>	Resistor values depicted in the test cases deviate from the values in the test instructions in A.1.2.10 (Figure A.10) and in A.1.2.11 (Figure A.11).
<b>Solution</b>	Refer to Figure A.10 and Figure A.11 respectively within the test cases
<b>Clauses</b>	5.5.3 Wake-up receive enable delay (C/Q high); 5.5.4 Wake-up receive enable delay (C/Q low);
<b>Test case</b>	SDCI_TC0027; SDCI_TC0028 (see changes below with yellow markings)
<b>Impact on</b>	-
<b>Remark</b>	-

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0027
Name	TCD_PHYL_INTF_TRENHIGH
Purpose (short)	Detect Receive Enable Delay after Wake-up Request
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.2
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.3, Table 8
Configuration / setup	See A.1.2.10 and Figure A.10
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Device shall release the high-side output driver after successful reception of a wake-up request. Measure wake-up receive enable delay of the Device with high signal at C/Q. The delay time is measured with a resistive voltage divider applied between L+ to C/Q and C/Q to L-. This test is only applicable for Devices with SIO mode support or for Devices with physical layer test mode.
Precondition	Device configured to SIO mode
Procedure	a) Apply resistive voltage divider to C/Q ( $V_{static} < V_{THL_{min}}$ ). See Figure A.10. b) Apply supply voltage ( $V_{SD} = 24\text{ V}$ ) to Device c) Stimulate Device for SIO mode output signal = high e) Apply wake-up request pulse (negative pulse) d) Measure time TREN between start of wake-up request and level of C/Q = $V_{static}$ e) Check if $TREN_{max}$ is within specified limits
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Delay time TREN within specified value range ( $\leq 500\text{ }\mu\text{s}$ )
Test failed (examples)	Delay time TREN outside specified value range ( $> 500\text{ }\mu\text{s}$ )
Results	TREN @ C/Q=high: <value>

Figure A.10:

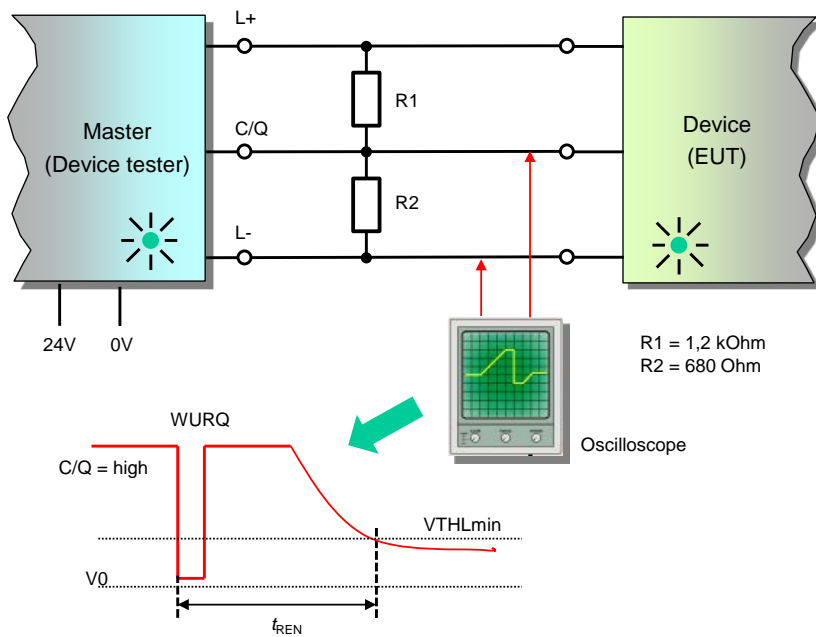
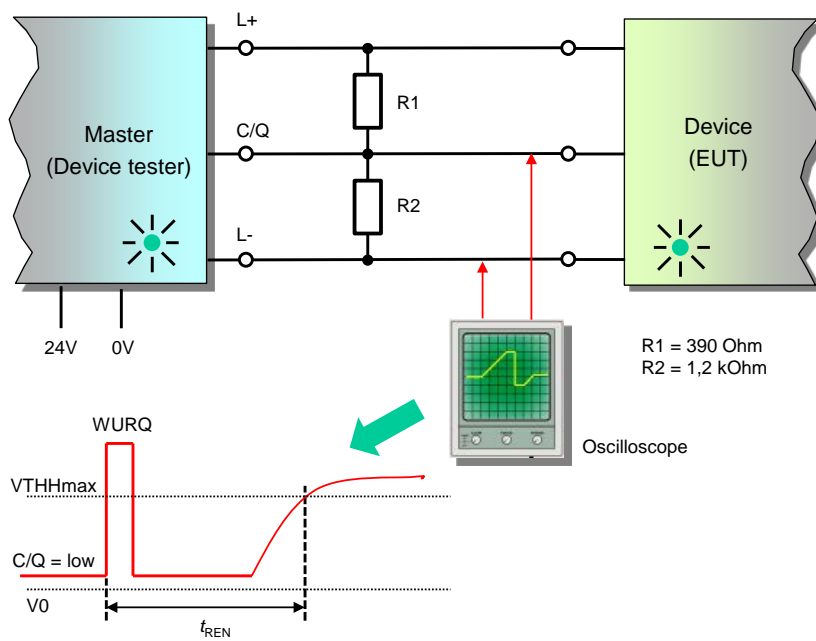


Figure A.11:



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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0028
Name	TCD_PHYL_INTF_TRENLOW
Purpose (short)	Detect Receive Enable Delay after Wake-up Request
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.2
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.3, Table 8
Configuration / setup	See A.1.2.11 and Figure A.11

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Device shall release the output driver after successful reception of a wake-up request. Measure wake-up receive enable delay of the Device with low signal at C/Q. The delay time is measured with a resistive voltage divider applied between L+ to C/Q and C/Q to L-. The test is only applicable for Devices with SIO mode support and with push-pull output or for Devices with physical layer test mode.
Precondition	Device configured to SIO mode
Procedure	a) Apply resistive voltage divider to C/Q ( $V_{static} > V_{THH_{max}}$ ). See Figure A.11. b) Apply supply voltage ( $V_{SD} = 24\text{ V}$ ) to Device c) Stimulate Device for SIO mode output signal = low e) Apply wake-up request pulse (positive pulse) d) Measure time TREN between start of wake-up request and level of C/Q = $V_{static}$ e) Check if TREN <sub>max</sub> is within specified limits (500 $\mu\text{s}$ )
Input parameter	-
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Delay time TREN within specification ( $\leq 500\text{ }\mu\text{s}$ )
Test failed (examples)	Delay time TREN outside specification ( $> 500\text{ }\mu\text{s}$ )
Results	TREN @ C/Q=low: <value>

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## 5.8 Test for PREOPERATE with Legacy Device not possible

This problem report refers to change request ID 168 in the database. Table 21 shows the problem report and the solution.

**Table 21 – Test for PREOPERATE with Legacy Device not possible**

<b>Problem</b>	Test not possible for a Legacy Device due to missing PREOPERATE state. "Passed condition" is incomplete.
<b>Solution</b>	Delete Legacy Device at EUT. Insert at "test passed" condition: "...after second Read attempt". Complement "test failed" condition: Device responds in procedure step b) and/or e): a)..., b)...
<b>Clauses</b>	6.3.6 From PREOPERATE to STARTUP via simulated reset
<b>Test case</b>	SDCI_TC0043 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	See 5.21 in this document

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0043
Name	TCD_DLPC_PROP_SIMRESET
Purpose (short)	Set Device from PREOPERATE back to STARTUP state via simulation of a reset
Equipment under test (EUT)	Device without TYPE_0 in PREOPERATE state
Test case version	1.2
Category / type	Device protocol test - PREOPERATE, positive testing
Specification (clause)	[9], see 7.3.2.5, Figure 34 (T12), and Annex A, Table A.7
Configuration / setup	Device-Tester
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master and Device are in PREOPERATE state. The Master sends a TYPE_0 message (simulation of a Master reset – FHInfo_ILLEGAL_FRAMETYPE). The Device shall switch in STARTUP state (deactivate on-request data, service and event handler) and shall send a TYPE_0 response.
Precondition	a) Establish an SDCI communication (WURQ) b) Communication between Master and Device successful (both in STARTUP state) c) Save M-sequenceCapability, PDIn, and PDOOut for later comparison d) Master sends PREOPERATE command 0x9A e) Master and Device in PREOPERATE
Procedure	a) Master sends TYPE_0 read request to get MinCycleTime. b) Device does not respond c) Master sends TYPE_0 read request to get MinCycleTime again d) Device changes state to STARTUP e) Device responds with "MinCycleTime" message
Input parameter	M-sequenceCapability, PDIn, and PDOOut
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check whether the Master TYPE_0 request results in a response message of TYPE_0 from the Device with "MinCycleTime"
Test passed	Received "MinCycleTime" with TYPE_0 message after 2 <sup>nd</sup> Read attempt
Test failed (examples)	Any response of the Device in procedure step b), Device responds in procedure step e): a) Device used wrong M-sequence TYPE b) No or wrong response from Device
Results	Received "MinCycleTime" within TYPE_0 Device message: <pass/fail>

## 5.9 Test case name is incorrect

This problem report refers to change request ID 169 in the database. Table 22 shows the problem report and the solution.

**Table 22 – Test case name is incorrect**

<b>Problem</b>	Test case name is incorrect. Test passed conditions to be complemented: a) with TYPE_0 → response at 2 <sup>nd</sup> message; b) OPERATE M-sequence type (not TYPE_0) → no response on 3 <sup>rd</sup> message.
<b>Solution</b>	Test objective shall be changed; new title: " <i>From PREOPERATE to STARTUP with M-sequence fault</i> ". Change "Test passed" and "Results".
<b>Clauses</b>	6.3.7 From PREOPERATE to PREOPERATE with M-sequence fault
<b>Test case</b>	SDCI_TC0044 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	See 5.21 in this document

Change title of test case: "From PREOPERATE to STARTUP with M-sequence fault"

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0044
Name	TCD_DLPC_PROP_FRAMEFAULT
Purpose (short)	Force Device into STARTUP by sending the OPERATE M-sequence type
Equipment under test (EUT)	Device
Test case version	1.1
Category / type	Device PREOPERATE, test to pass (positive testing)
Specification (clause)	[9], see 7.3.2.5, Figure 34 (T12), and Annex A, Table A.7
Configuration / setup	Device-Tester
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Device shall not support another different M-sequence type while in PREOPERATE state. The Device shall switch to STARTUP when detecting an illegal M-sequence type. In case of equal M-sequence types for PREOPERATE and OPERATE, the test case causes no error.
Precondition	Device in PREOPERATE
Procedure	a) Invoke first Read on parameter "MinCycleTime" with the OPERATE M-sequence type b) Invoke second Read on parameter "MinCycleTime" with the PREOPERATE M-sequence type c) Invoke third Read on parameter "MinCycleTime" with the STARTUP M-sequence type
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check the responses to the three Reads with appropriate M-sequence types.
Test passed	a) PREOPERATE M-sequence type is TYPE_0 and not equal to OPERATE M-sequence type: - First Read shall not be responded by the Device - Second and third Read shall provide correct data b) PREOPERATE M-sequence type is not TYPE_0 and not equal to OPERATE M-sequence type: - First and second Read shall not be responded by the Device - Third Read shall provide correct data c) PREOPERATE M-sequence type is TYPE_0 and equal to OPERATE M-sequence type: - All Read requests shall be responded by the Device d) PREOPERATE M-sequence type is not TYPE_0 and equal to OPERATE M-sequence type: - No response on third Read (procedure c))
Test failed (examples)	-

TEST CASE RESULTS	CHECK / REACTION
Results	Test passed a): <pass/fail> Test passed b): <pass/fail> Test passed c): <pass/fail> Test passed d): <pass/fail>



**5.10 "Test failed" definition is incomplete**

This problem report refers to change request ID 170 in the database. Table 23 shows the problem report and the solution.

**Table 23 – "Test failed" definition is incomplete**

<b>Problem</b>	Test passed conditions to be complemented: Only the second message should be answered. Device-Tester accepted response at 1 <sup>st</sup> message (did not test at procedure step b).
<b>Solution</b>	1) Insert " <i>at 2<sup>nd</sup></i> " in "Test passed" condition. 2) Insert " <i>Device responds in procedure step b) and/or e).</i> " in "Test failed" condition.
<b>Clauses</b>	6.4.5 From OPERATE to STARTUP via simulated reset
<b>Test case</b>	SDCI_TC0049 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	See 5.21 in this document

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0049
Name	TCD_DLPC_OPER_SIMRESET
Purpose (short)	Set Device from OPERATE back to STARTUP state via a simulated reset
Equipment under test (EUT)	Device and Legacy-Device without TYPE_0 in OPERATE state
Test case version	1.2
Category / type	Device OPERATE, test to pass (positive testing)
Specification (clause)	[9], see 7.3.2.5, Figure 34 (T11), and Annex A, Table A.8
Configuration / setup	Device-Tester
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master and Device are in OPERATE state. The Master sends a TYPE_0 message (simulation of a Master reset). The Device shall switch into the STARTUP state (deactivate on-request data, service and event handler) and shall send a TYPE_0 response.
Precondition	a) Master and Device in PREOPERATE state b) Master sends OPERATE command 0x99 c) Master and Device in OPERATE state
Procedure	a) Master sends TYPE_0 read request for the MinCycleTime parameter. b) Device does not respond c) Master sends TYPE_0 read request for the MinCycleTime parameter again d) Device changes state to STARTUP e) Response from Device with the MinCycleTime parameter value
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check whether the Master TYPE_0 request results in a Device TYPE_0 response message with the MinCycleTime parameter value
Test passed	Received the MinCycleTime parameter value at 2 <sup>nd</sup> TYPE_0 message
Test failed (examples)	Any response of the Device in procedure step b), Device responds in procedure step e): a) Device used wrong M-sequence TYPE b) No or wrong response from Device
Results	Received MinCycleTime parameter value within TYPE_0 message: <pass/fail>

### 5.11 Frequencies in EMC test "Conducted RF" incorrect

This problem report refers to change request ID 171 in the database. Table 24 shows the problem report and the solution.

**Table 24 – Frequencies in EMC test "Conducted RF" incorrect**

<b>Problem</b>	Form sheet RFC is incorrect. The stated frequencies don't belong to the stated tests but are frequencies for wireless communication. The frequency range is between 150 kHz - 80 MHz.
<b>Solution</b>	The form sheet in Figure 17 (Conducted RF) to be corrected.
<b>Clauses</b>	9.4.5 Conducted RF
<b>Test case</b>	Figure 17
<b>Impact on</b>	-
<b>Remark</b>	-

Excerpt from Figure 17:

Test Requirements/Results:							
Type of Frequency MHz				Requirement fulfilled?		Achieved Immunity Test Voltage V	Performance Criterion
				yes	no		
0,15 to 80							

**5.12 References to Figures and Tables are outdated; Clause "0"**

This problem report refers to change request ID 172 in the database. Table 24 shows the problem report and the solution.

**Table 25 – References to Figures and Tables are outdated; Clause "0"**

<b>Problem</b>	TC_0071, 0074 and 0075 contain an outdated reference in body text (draft V1.09 from 2010). Clause 4.2 contains references to "Clause 0".
<b>Solution</b>	References to draft version in body text to be removed (complete parentheses). Incorrect "clause 0" references to be corrected (WORD bug) in clause 4.2: 4.2 Structure of the document Clause 5... Clause 6... Clause 7...
<b>Clauses</b>	6.6.4, 6.6.7, 6.6.8, and 4.2
<b>Test case</b>	TC_0071, 0074 and 0075
<b>Impact on</b>	-
<b>Remark</b>	-

**5.13 ISDU capability test for Devices without ISDU support**

This problem report refers to change request ID 174 in the database. Table 26 shows the problem report and the solution.

**Table 26 – ISDU capability test for Devices without ISDU support**

<b>Problem</b>	TC_0085 requires ISDU-Access in Devices without ISDUs.
<b>Solution</b>	See 5.5 (TP-CR165). Additional changes: f) Master initiates a Read or Write to Direct Parameter page 1 to ensure a response of the Device. g) Master initiates a ISDU Read or Write to test the Device capability (only with ISDU support) → adapt evaluation and test passed and test failed section accordingly
<b>Clauses</b>	6.8.3 From STARTUP to OPERATE (V1.0)
<b>Test case</b>	SDCI_TC0085 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	See 5.21 in this document.

Duplicate to ID 165 (see 5.5)

#### 5.14 Remodel test case from ISDU to M-sequence TYPE\_0

This problem report refers to change request ID 176 in the database. Table 27 shows the problem report and the solution.

**Table 27 – Remodel test case from ISDU to M-sequence TYPE\_0**

<b>Problem</b>	Change test case objective from ISDU to M-sequence TYPE_0: Adapt TC_0038 title and change text in procedure a) + b): "Master sends M-sequence TYPE_0 to read direct parameter page address 0x02"
<b>Solution</b>	Accepted.
<b>Clauses</b>	6.2.6 From OPERATE to STARTUP via M-sequence TYPE_0
<b>Test case</b>	SDCI_TC0038 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	-

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0038
Name	TCD_DLPC_OPER_OPERSTAR2
Purpose (short)	Test state transition OPERATE to STARTUP
Equipment under test (EUT)	Device and Legacy-Device, except Devices with M-sequence TYPE_0 in OPERATE
Test case version	1.2
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 7.2.3.5, 9.3.3.2
Configuration / setup	-
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test state transition OPERATE to STARTUP
Precondition	Device is in OPERATE state
Procedure	a) Master sends M-sequence TYPE_0 to read Direct Parameter page address 0x02 b) Master sends M-sequence TYPE_0 to read Direct Parameter page address 0x02 c) Master sends ISDU idle command, using the M-sequence TYPE for OPERATE
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check the Device response
Test passed	The Device responds to ISDU idle command b), but not to a) and c).
Test failed (examples)	-
Results	Illegal M-sequence in OPERATE state: <pass/fail>

## 5.15 Vendor to select variable that does not change value after Write

This problem report refers to change request ID 178 in the database. Table 28 shows the problem report and the solution.

**Table 28 – Vendor to select variable that does not change value after Write**

<b>Problem</b>	Read out of test variable values should match previously written values (no change by the Device during this test).
<b>Solution</b>	Manufacturer/Vendor shall choose a variable for the test which doesn't change after writing to ensure that the test is running without error.
<b>Clauses</b>	6.5.6 Write 8 bit Index
<b>Test case</b>	SDCI_TC0056 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	-

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0056
Name	TCD_DLIC_ISDU_WRITE8
Purpose (short)	Check whether a write request with 8 bit Index is possible
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.2
Category / type	Device ISDU, test to pass (positive testing)
Specification (clause)	[9], see 7.3.6.4
Configuration / setup	Device-Tester
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master sends ISDU write request according Config1. Check whether the Write request has been successful.
Precondition	a) Device in PREOPERATE or OPERATE respectively b) Master in PREOPERATE or OPERATE respectively c) Read data according Config1 and write it to a Config1 variable for comparison and length
Procedure	a) Master: Sends ISDU Write request <i>Segment 1:</i> 0x93 (Service: Write request + possible Length from precondition) <i>Segment 2:</i> 0xnn (Address according Config1) <i>Segment 3:</i> 0x01 (data 1) <i>Segment ...</i> <i>Segment m:</i> 0x01 (data n - possible Length received in precondition ) <i>Segment n:</i> Checksum b) Receive Write response "busy" (0x01) until Device is ready c) Receive Write response d) Read Config1
Input parameter	Config1 according to 6.5.1. Manufacturer/vendor is responsible for choosing a variable for the test not changing value after Write.
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the Write response is positive with expected length 0x52 (Service: 0b0101, Length: 0b0010). b) Compare the Config1 variable from precondition with the Config1 content. It shall be different as the content now shall be identical with the Write request data.
Test passed	a) Positive write response; Config1 contents as expected. b) Response "Index not available"
Test failed (examples)	a) Negative write response from Device b) Octets of Config1 not written
Results	"Config1" changed after Write request: <pass/fail>.

**5.16 Purpose of test cases not comprehensible: collisions?**

This problem report refers to change request ID 179 in the database. Table 29 shows the problem report and the solution.

**Table 29 – Purpose of test cases not comprehensible: collisions?**

<b>Problem</b>	It is not predicatable what collisions on physical layer will cause. SDCI_TC_0042/0048 should be marked as optional.
<b>Solution</b>	Both test cases to become optional.
<b>Clauses</b>	6.3.5 From STARTUP to PREOPERATE collision, 6.4.4 From PREOPERATE to OPERATE collision
<b>Test case</b>	SDCI_TC0042, SDCI_TC0048 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	-

Insert text after first section: "This test case is optional".

No changes to Table 64 of SDCI\_TC0042 and Table 70 of SDCI\_TC0048.

### 5.17 IODD reset to factory settings verification: refine test passed/failed

This problem report refers to change request ID 180 in the database. Table 30 shows the problem report and the solution.

**Table 30 – IODD reset to factory settings verification: refine test passed/failed**

<b>Problem</b>	Complement Test passed a) If no errors occur for evaluation a) and Test failed: a) Errors occur during evaluation a)
<b>Solution</b>	Accepted.
<b>Clauses</b>	7.3.5 IODD reset to factory settings verification
<b>Test case</b>	SDCI_TC0155 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	-

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0155
Name	TCD_IODD_PARV_FACTORYSETTINGS
Purpose (short)	Test parameters after SystemCommand "Restore factory settings" (Option)
Equipment under test (EUT)	Device and Legacy-Device and associated IODD (see B.12)
Test case version	1.1
Category / type	IODD parameter verification test; test to pass (positive testing)
Specification (clause)	[3] 5.3.2.1, 5.3.2.3; [9] 10.6.4, B.2.2, Table C.1
Configuration / setup	Device-Tester
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Device-Tester tests if parameters are set to default values via the SystemCommand "Restore factory settings". Non-dynamic parameters are set to default values if applicable. Only parameters are read out and tested, - if they do not own the attribute "dynamic", - if they show access rights "Read/Write", - if they provide a default value. For Legacy-Devices see B.12.
Precondition	Device is in SDCI communication mode, matching VendorID and ProductID
Procedure	a) Write SystemCommand 0x82 ("Restore factory settings") into Index 0x0002 b) Identify non-dynamic parameter with Read access and default value from IODD c) Read identified parameter
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	For each read parameter: a) Check for ErrorType according Table C.1 b) Check whether read value matches default value in the IODD If the response does not match the expectation, the Device tester shall raise a warning and display the response value. User manual of the Device shall explain the deviation. For Legacy-Devices see B.12.
Test passed	a) If no errors occur at evaluation a) b) If evaluation b) is successful
Test failed (examples)	a) Errors occur at evaluation a) b) If evaluation b) is not successful
Results	For each and every non-dynamic parameter with Read access in the IODD: Parameter Read access: <no error/ErrorType> <pass/fail> Default value: <value> <pass/fail>



**5.18 Test exceeds specified maximum voltage of 30 V by 1 V**

This problem report refers to change request ID 181 in the database. Table 31 shows the problem report and the solution.

**Table 31 – Test exceeds specified maximum voltage of 30 V by 1 V**

<b>Problem</b>	Test exceeds specified maximum voltage of 30 V by 1 V?
<b>Solution</b>	Change procedure: a) Apply maximum supply voltage (VSD = 29 V) to Device
<b>Clauses</b>	5.3.11 Permissible voltage range at Device C/Q port
<b>Test case</b>	SDCI_TC0300 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	-

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0300
Name	TCD_PHYL_INTF_VOLTRANGECQ
Purpose (short)	Test of permissible voltage range at Device C/Q port
Equipment under test (EUT)	Device and Legacy Device
Test case version	1.1
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.2, Table 5, VIL and VIH
Configuration / setup	See A.1.2.13 and Figure A.13
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The receiver behavior at signal voltages exceeding the supply voltages is tested. Measurement of the voltage at the C/Q terminal with reference to the positive supply L+ and negative supply L- with voltages applied via a series resistance above or below the supply voltages.
Precondition	a) Device is in SDCI mode b) Disconnect C/Q from Master port c) Device is waiting for reception of SDCI messages (C/Q in receive state)
Procedure	a) Apply maximum supply voltage (VSD = 29 V) to Device b) Apply voltage of +1 V between C/Q and L+ via a series resistance of 1 Ohm for at least 1 min c) Apply voltage of -1 V between C/Q and L- via a series resistance of 1 Ohm for at least 1 min d) Attach a Master conform to [9] and perform communication
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check communication
Test passed	Communication established
Test failed (examples)	Communication not established
Results	Communication established : <yes/no> <passed/failed>

## 5.19 SystemCommand testing: vendor specific & write only

This problem report refers to change request ID 184 in the database. Table 32 shows the problem report and the solution.

**Table 32 – SystemCommand testing: vendor specific & write only**

<b>Problem</b>	Exclude SystemCommands from being tested whenever internal vendor specific functions are performed. Thus, it also makes no sense to test vendor specific SystemCommands.
<b>Solution</b>	Remove SDCI_TC0105 TC0152, Input parameter: "Write only parameters are excluded"
<b>Clauses</b>	6.10.3 SystemCommand – implemented commands, 7.3.4 IODD parameter write verification
<b>Test case</b>	SDCI_TC0152 (see changes below with yellow markings)
<b>Impact on</b>	Device-Tester
<b>Remark</b>	-

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0152
Name	TCD_IODD_PARV_WRITEVERIFY
Purpose (short)	Test verifies index space and value ranges defined within the Device's IODD
Equipment under test (EUT)	Device and Legacy-Device and associated IODD
Test case version	1.1
Category / type	IODD parameter verification test; test to pass (positive testing)
Specification (clause)	[3] 5.3.2.1, 5.3.2.3; [9] Table C.1, E.2.2 to E.2.9, E.3.2, E.3.3
Configuration / setup	Device-Tester
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Device-Tester writes dedicated IODD parameters to the Device. Verify that all parameters in the IODD can be accessed within their value ranges. 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, and enum); see section "Input parameter".
Precondition	Device is in SDCI communication mode, matching VendorID and ProductID
Procedure	a) Identify parameter with Write access in the associated IODD. b) Identify a valid <value> for the Write access (see field "Input parameter"). c) Write parameter according to IODD including Subindices.
Input parameter	Write only parameters are excluded. For each and 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: 2011-04-18T12:00:00 - Timespan: P1S - Enum (single value): first single value
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	For each written parameter: Check for ErrorType according Table C.1
Test passed	If Write access without error. Device may enter undefined technology states, but it shall continue to communicate.
Test failed (examples)	ErrorType C.2.3 occurred (0x8011 = IDX_NOTAVAIL)
Results	For each and every parameter with Write access in the IODD: Parameter Write access: <OK/ErrorType>                      <pass/fail>

**5.20 Consequences of SP CR\_ID 80 on Test Specification**

The following changes to test cases and to clauses within the Test Specification are a consequence of change request ID 80 of the Interface and System Specification V1.1.2 as documented in 4.11. The changes are specified in Table 33.

**Table 33 – Changes to TP as a consequence of SP CR-ID 80**

Clause in TP	Test case	Field	Change to
4.4	-	Table 5 + 6	Exceptions to TC0035, TC0085, TC0086, and TC0087
6.2.2	TC0035	Test passed	Response b) shall be received, MasterCommands cannot be rejected on the transportation layer "If 1.0 supported" = true, then the response to c) shall be received "If 1.0 supported" = false, then the response to c) shall not be detected
6.8.2.2	-	Title	"Device 1.1" without backward compatibility (V1.0 not supported)
6.8.3	TC0085	Equipment under test (EUT)	Device supporting V1.0 and Legacy-Device ...
6.8.4	TC0086	Equipment under test (EUT)	Device supporting V1.0 and Legacy-Device ...
6.8.5	TC0087	Equipment under test (EUT)	Device supporting V1.0 and Legacy-Device ...
B.5	-	Text	A manufacturer or vendor of a Device without backward compatibility (V1.0 not supported) shall document...

## 5.21 Consequences of the test case changes for Table 5 and 6

Table 34 shows the new Table 5 of the Test specification with the changes due to (see Table 14): CR-IDs 164, 165, 168, 174.

**Table 34 – New Table 5**

Major feature	Test cases	Remarks
STARTUP	TC_0034 to TC_0038, TC_0306	New TC_0306 for test of revision management (can be omitted if IODD for V1.0 mode is not provided)
PREOPERATE	TC_0039 to TC_0044	
OPERATE	TC_0045 to TC_0049	TC_0051 removed from list
Events	TC_0069 to TC_0076	Exceptions exist (see 6.6.1)
Legacy Master (V1.0)	TC_0085 to TC_0087	If restricted to 134 ms; Exceptions for PDInvalid exist (see Table 108). Exceptions for TC_0085 and TC_0086
Direct Parameter page 1	TC_0089 to TC_0097 TC_0100 to TC_0101	

Table 35 shows the new Table 6 of the Test specification with the changes due to (see Table 14): CR-IDs 162, and 163.

**Table 35 – New Table 6**

Major feature	Test cases	Remarks
STARTUP	TC_0034 to TC_0038 TC_0306	New TC_0306 for test of revision management
PREOPERATE	TC_0039 to TC_0044	
OPERATE	TC_0045 to TC_0049	TC_0051 removed from list.
ISDU	TC_0052 to TC_0068	Extensions in TC_0062
Events	TC_0069 to TC_0076	Exceptions exist (see 6.6.1)
Data Storage	TC_0077 to TC_0084	
Legacy Master (V1.0)	TC_0085 to TC_0087	If compatible; Exceptions for PDInvalid exist (see Table 108)
Direct Parameter page 1	TC_0089 to TC_0097 TC_0100 to TC_0101	
Predefined parameters	TC_0104 to TC_0105 TC_0107 to TC_0124 TC_0128 to TC_0137 TC_0140 to TC_0142	Exception for TC_0124
Block parameter	TC_0143 to TC_0145 TC_0147 to TC_0148	
IODD based tests	TC_0149 to TC_0152 TC_0155 to TC_0157	

## 6 Part 3: Reports on IODD – IO Device Description Specification

### 6.1 Overview

Table 36 shows the IODD specification reports sorted by CR-ID. Problem descriptions are hyper-linked with the individual reports (click on text).

**Table 36 – IODD specification reports sorted by CR-ID**

IP CR-ID	Problem	Affected clauses	Affected SP, TP
1	The type of xml:lang is xsd:language	7.1	
2	Standard description of 'Device Access Locks'	-	
3	V_ProductID defaultValue	7.5.4.1	
5	Rounding and Stepwidth	7.5.8.3	
6	Config Elements in Test optional	7.6	
7	Implicit referencing of standard SystemCommands	7.5.4.1	
8	Description of usage of the Device access locks (local) bits	7.5.1	SP CR-ID77
9	Clarify excludedFromDataStorage	7.5.4.1, 7.5.4.2	
10	Reference to Standard ErrorCodes in IODD	7.5.6	
11	Remove Device access locks "datastorage"	7.5.1	SP CR-ID59

**6.2 The type of xml:lang is xsd:language**

This problem report refers to change request ID 1 in the database.

Table 37 shows the problem report and the solution.

**Table 37 – The type of xml:lang is xsd:language**

<b>Problem</b>	The bullet point "the XML type xml:lang as defined in xml.xsd" is incorrect. xml:lang is the name of an attribute. Its XML type is xsd:language. This type is already covered by the first bullet point, so this bullet point should simply be deleted.
<b>Solution</b>	Will delete.
<b>Clauses</b>	7.1
<b>Subclauses</b>	
<b>Impact on</b>	none
<b>Remark</b>	–

**6.3 Standard description of 'Device Access Locks'**

This problem report refers to change request ID 2 in the database.

Table 38 shows the problem report and the solution.

**Table 38 – Standard description of 'Device Access Locks'**

<b>Problem</b>	The files IODD-StandardDefinitions1.1.xml and IODD-StandardDefinitions1.1-de.xml provide the parameter V_DeviceAccessLocks incompletely. Customers have access to this parameter via a tools menu, thus a reliable description has to be provided from the IODD standard.
<b>Solution</b>	Amend "IODD-StandardDefinitions1.1.xml" and the associated language files (DE, ES, FR, IT, JA, KO, PT, RU, ZH, etc.)
<b>Clauses</b>	–
<b>Subclauses</b>	
<b>Impact on</b>	IODD Checker
<b>Remark</b>	–

**6.4 V\_ProductID defaultValue**

This problem report refers to change request ID 3 in the database.

Table 39 shows the problem report and the solution.

**Table 39 – V\_ProductID defaultValue**

<b>Problem</b>	The latest state of discussion is stated in the IODD Guideline V1.1, clause 3.7 and 7.8. But the specification still says "For references to V_ProductID, [...] this attribute shall not be specified." This is not true anymore and needs to be amended.
<b>Solution</b>	Will change the IODD specification according to the definitions within the IODD Guideline.
<b>Clauses</b>	7.5.4.1
<b>Subclauses</b>	
<b>Impact on</b>	–
<b>Remark</b>	–



## 6.5 Rounding and Stepwidth

This problem report refers to change request ID 5 in the database.

Table 40 shows the problem report and the solution.

**Table 40 – Rounding and Stepwidth**

<b>Problem</b>	<p>The UserInterfaces gradient-offset-displayFormat attributes provide a calculation rule for the parameters for the tools. The experience of our customers shows us that this is not sufficient. Our customers always get into conflict with the absence of a rounding rule and the absence of the stepwidth. For example:</p> <ol style="list-style-type: none"><li>1. Rounding: If the values coming from a Device have to be tool-calculated into a specific physical unit, the Device and the user are dependent on the tool's rounding algorithm. A Device parameter error can be possible if lowerValue or upperValue is reached, because the tool's rounding rule sets the internal transmitted value to 'out of range'.</li><li>2. Stepwidth: Devices may work with a stepwidth inside the value range which can be greater than 'one'. This cannot be described within the IODD. However, the Device has a range from 0 to 1000 and provides an internal stepwidth of 'five'. The user is able to adjust 798, the Device rounds up to 800. The user can only get this feedback via an upload.</li></ol>
<b>Solution</b>	<p>Rounding: The IODD Guideline provides some guidance on how to proceed with floating point values and rounding.</p> <p>Stepwidth: The current version of IODD does not allow a more sophisticated solution. Topic for a future IODD release.</p> <p>Suggested work-arounds:</p> <ul style="list-style-type: none"><li>- Inform the user about the implemented behaviour.</li><li>- The variable should only use values contiguously in an ascending order. Use the stepwidth in the gradient attribute to spread the values in the user display.</li><li>- Use single value elements to enumerate the allowed values.</li></ul>
<b>Clauses</b>	7.5.8.3
<b>Subclauses</b>	
<b>Impact on</b>	–
<b>Remark</b>	–

**6.6 Config Elements in Test optional**

This problem report refers to change request ID 6 in the database.

Table 41 shows the problem report and the solution.

**Table 41 – Config Elements in Test optional**

<b>Problem</b>	The elements config 1 to 7 are marked as optional in the specification. However, depending on selected features, the text describes them as mandatory. The 'conditional' shall/should be eliminated for elements config 1 to 7 in order to allow test parameters for Device specific test procedures to be extended or changed.
<b>Solution</b>	Will change from "optional" to "conditional". Will specify the conditions.
<b>Clauses</b>	7.6
<b>Subclauses</b>	
<b>Impact on</b>	Test specification [5], clause 7; IODD Checker
<b>Remark</b>	–

**6.7 Implicit referencing of standard SystemCommands**

This problem report refers to change request ID 7 in the database.

Table 42 shows the problem report and the solution.

**Table 42 – Implicit referencing of standard SystemCommands**

<b>Problem</b>	The following rule is given for SystemCommand: When neither SingleValue nor ValueRange nor StdSingleValueRef elements are given, the standard variable's value range as defined in IODD-StandardDefinitions1.1.xml is taken. This sentence will not allow IODDs for Devices with support of Block Parameterization but no further standard commands being implemented. → The rule has to be deleted. No described StdSingleValueRefs means that these are not available.
<b>Solution</b>	Will delete the rule.
<b>Clauses</b>	7.5.4.1
<b>Subclauses</b>	
<b>Impact on</b>	IODD Checker
<b>Remark</b>	–

**6.8 Description of usage of the Device access locks (local) bits**

This problem report refers to change request ID 8 in the database.

Table 43 shows the problem report and the solution.

**Table 43 – Description of usage of the Device access locks (local) bits**

<b>Problem</b>	See SP CR-ID77: Today the usage of the two bits is not clear. CR 77 gives a recommendation for future use. To make this clear for the user, a description text should be added to the record items. The standard text for this (in StdDefinitions) should be overwritable with a textRedefine in the IODD.
<b>Solution</b>	Current standard texts are very short and not very informative. Will extend and improve the standard text in an upward compatible manner.
<b>Clauses</b>	
<b>Subclauses</b>	
<b>Impact on</b>	IODD Checker (with StandardDefinitions)
<b>Remark</b>	–

**6.9 Clarify excludedFromDataStorage**

This problem report refers to change request ID 9 in the database.

Table 44 shows the problem report and the solution.

**Table 44 – Clarify excludedFromDataStorage**

<b>Problem</b>	The sentence (in clause 7.5.4.1) "This attribute shall not be set to true if the accessRights of the standard variable are not 'rw' ... " should be extended by a comment such as "as exclusion from datastorage is implicitly stated for variables with restricted access rights". Similar changes should be applied to 7.5.4.2 and 7.5.4.3
<b>Solution</b>	Will change.
<b>Clauses</b>	7.5.4.1, 7.5.4.2, 7.5.4.3
<b>Subclauses</b>	
<b>Impact on</b>	–
<b>Remark</b>	–

**6.10 Reference to Standard ErrorCodes in IODD**

This problem report refers to change request ID 10 in the database.

Table 45 shows the problem report and the solution.

**Table 45 – Reference to Standard ErrorCodes in IODD**

<b>Problem</b>	The ErrorTypeCollection describes the possibility to reference Standard ErrorCodes via StdError-TypeRef (optional). It is not defined if a tool shall evaluate only the referenced entry StdError-TypeRef in the IODD or directly use the entries from Standard Definitions. Proposal (from core-team 04.02.2015): StdErrorTypeRef shall be removed from ErrorTypeCollection in IODD specification (is optional anyway). Tools shall use Standard ErrorCodes directly from Standard Definitions.
<b>Solution</b>	Tools shall use Standard ErrorCodes directly from Standard Definitions and not only use the referenced StdErrorTypes.
<b>Clauses</b>	7.5.6
<b>Subclauses</b>	
<b>Impact on</b>	–
<b>Remark</b>	–

**6.11 Remove Device access locks "datastorage"**

This problem report refers to change request ID 11 in the database.

Table 46 shows the problem report and the solution.

**Table 46 – Remove Device access locks "datastorage"**

<b>Problem</b>	Refer to SP CR-ID 59: Set the bit Device access lock: datastorage to "reserved"
<b>Solution</b>	Will enforce this restriction in future release.
<b>Clauses</b>	7.5.1
<b>Subclauses</b>	
<b>Impact on</b>	IODD Checker
<b>Remark</b>	–

Annex A

(normative)

Conformity

A.1 Package 2015

Package 2015 comprises everything required to achieve conformity of Masters and Devices. It is based on the current versions of the IO-Link specifications together with the Corrigendum 2015 within this document. The Corrigendum impacts the IO-Link test tools. Their manufacturers are obliged to publish updated versions. As soon as the tools are available, the Master and Device manufacturers can test their products and achieve the necessary preconditions for a Manufacturer Declaration. A corresponding form can be downloaded from the Internet (see Figure A.1).

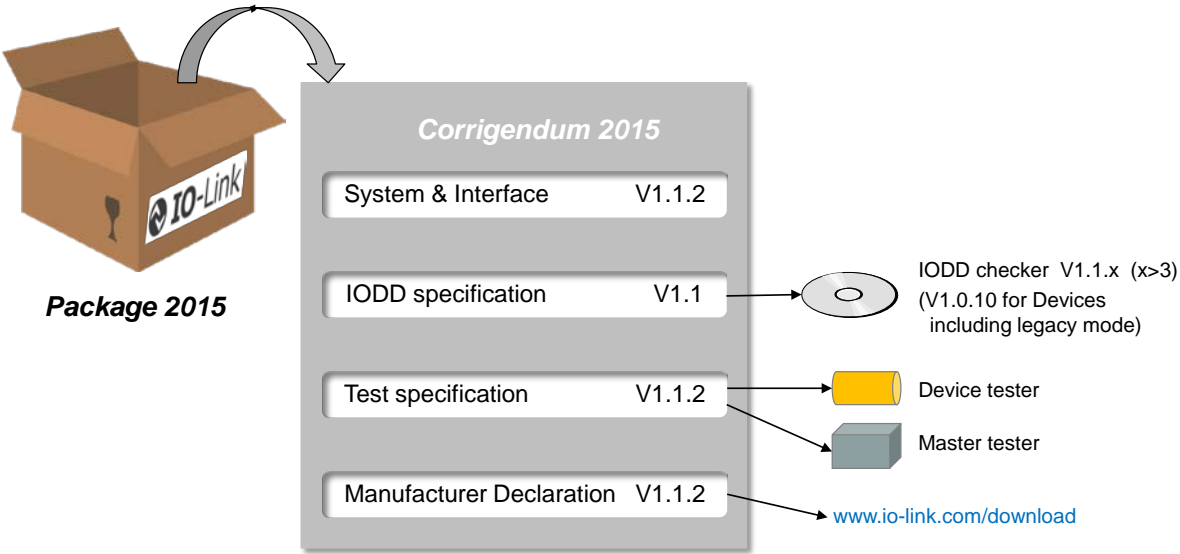


Figure A.1 – Ensemble of package 2015

A.2 Transitions

Figure A.2 shows the relationship between the IEC standard and possible packages.

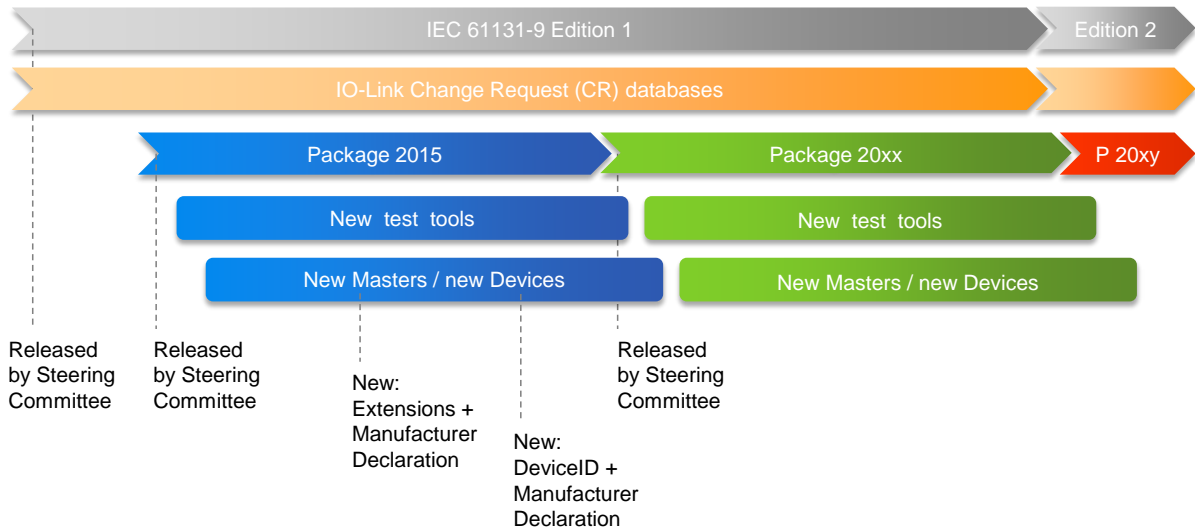


Figure A.2 – Transitions



While the IEC standard remains constant for some years, the IO-Link Community reacts as soon as possible on problem reports (CRs) posted in the change request database.

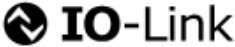
Major functional steps can cause the IO-Link Community to create a consistent package for Master and Devices using important CRs to achieve correct interoperability between Masters and Devices through conformity.

The following transition rules apply:

- Masters and Devices can operate in non-conformity under a variance or continuation permit from the IO-Link Community upon request ("godfathering").
- Legacy Devices according to [4] shall not be put on the market after January 1<sup>st</sup>, 2017.

### A.3 Manufacturer declaration

Figure A.3 shows the principle layout of the Manufacturer Declaration. The currently valid version can be downloaded from the Internet ([www.io-link.com](http://www.io-link.com)).


(Company logo)

**MANUFACTURER'S DECLARATION  
OF CONFORMITY**

**We:**

*<Company's name and address>*

**declare under our own responsibility that the product(s):**

*<Trademark,  
IO-Link product types /product families>*

*(annotate "IO-Link Master" or "IO-Link Device")*

*(product families can be listed on a separate page )*

**to which this declaration refers conform to:**

☐ • IO-Link Interface and System Specification, V1.1, July 2013 (NOTE 1,2)  
☐ • IO Device Description, V1.1, August 2011  
☐ • IO-Link Interface and System Specification, V1.0, January 2009 (NOTE 1)  
☐ • IO Device Description, V1.0.1, March 2010

**The conformity tests are documented in the test report:**

*<Test report identification>*

**Issued at** *<location, date>*

**Authorized signatory**

**Name:** *<First, last name>*

**Title:** *<Job title>*

**Signature:** *<Signature>*

Reproduction and all distribution without written authorization prohibited

NOTE 1 Relevant Test specification is V1.1, July 2014

NOTE 2 Additional validity In Corrigendum Package 2015

**Figure A.3 – Form of the "Manufacturer Declaration"**

## Annex B (informative)

### Reference tables

#### B.1 References for the Interface and System Specification

Table B.1 shows the Interface and System Specification reports sorted by clauses.

**Table B.1 – Interface and System Specification reports sorted by clauses**

Clauses	Title	SP CR-ID	Tables/ Figures
5.3.2.2	ASIC specifications deviate from IOL specification (-0,3 V versus -1,0 V)	39	–
5.3.2.2	Voltage rating for C/Q line: $VILD_{,M}$ and $VIHD_{,M}$ only for Devices	46	–
5.3.2.4	Maximum Device consumption at power-up (charge considerations)	57	New figure
7.3.2.5	Device not supporting V1.0 connected to a Legacy-Master	80	Figure 35
7.3.8.3	Behaviour of Event flag in case of a subsequent Event	88	Figure 91
10.4.2	Missing rules for Data Storage as with Block Parameter transfer	76	–
10.6.3	Same predefined parameters and Events in V1.0 and V1.1 mode	58	–
10.6.10 B.2.4	Usage of bits for Device access locks	77	–
10.6.14	Block Parameterization in V1.0 mode	72	–
11.2.2.1	Fallback and Digital Input (DI) mandatory for Master	89	–
C.2	ErrorTypes for parameters containing value ranges and enumerations	62	–
C.2.3 C.2.4	ErrorTypes in case of Subindex access to a non-existing parameter	75	–

#### B.2 References for the Test specification

Table B.2 shows the Test specification reports sorted by Test Cases.

**Table B.2 – Test specification reports sorted by Test Cases**

TC	TP CR-ID	Tables/ Figures	Clauses	Title
SDCI_TC_0027 SDCI_TC_0028	167	37 38	5.5.3 5.5.4	Wake-up receive enable delay (C/Q high) Wake-up receive enable delay (C/Q low)
SDCI_TC_0035	see 5.20	55	6.2.2	From STARTUP to OPERATE
SDCI_TC_0038	176	59	6.2.6	From OPERATE to START-UP via M-sequence TYPE_0
SDCI_TC_0042 SDCI_TC_0048	179	64 70	6.3.5 6.4.4	From START-UP to PREOPERATE collision From PREOPERATE to OPERATE collision
SDCI_TC_0043	168	65	6.3.6	From PREOPERATE to START-UP via simulated reset
SDCI_TC_0044	169	66	6.3.7	From PREOPERATE to START-UP with M-sequence fault
SDCI_TC_0049	170	71	6.4.5	From OPERATE to START-UP via simulated reset
SDCI_TC_0056	178	77	6.5.6	Write 8 bit Index
SDCI_TC_0062	162	83	6.5.12	Read 16 bit Index with unavailable Subindex
SDCI_TC_0071 SDCI_TC_0074 SDCI_TC_0075	172	92 95 96 Clause "0"	6.6.4 6.6.7 6.6.8 4.2	Event clearance in OPERATE state Event appears/disappears Multi Event handling WORD bug

TC	TP CR-ID	Tables/ Figures	Clauses	Title
SDCI_TC_0085	165	106	6.8.3	From START-UP to OPERATE (V1.0)
SDCI_TC_0085	174	106	6.8.3	From START-UP to OPERATE (V1.0)
SDCI_TC_0085	see 5.20	106	6.8.3	From START-UP to OPERATE (V1.0)
SDCI_TC_0086	166	107	6.8.4	From START-UP to OPERATE – interleave (V1.0)
SDCI_TC_0086	see 5.20	107	6.8.4	From START-UP to OPERATE – interleave (V1.0)
SDCI_TC_0087	see 5.20	108	6.8.5	Events – PDInvalid / PDValid (V1.0)
SDCI_TC_0105	175	121	6.10.3	System command – implemented commands
SDCI_TC_0105 SDCI_TC_0152	184	121 162	6.10.3 7.3.4	System command – implemented commands IODD parameter write verification
SDCI_TC_0105	177	121	6.10.3	System command – implemented commands
SDCI_TC_0124	163	139	6.10.21	Error Count
SDCI_TC_0155	180	163	7.3.5	IODD reset to factory settings
SDCI_TC_0300	181	30	5.3.11	Permissible voltage range at Device C/Q port
SDCI_TC_0306	164	56	6.2.3	Master start-up with overwrite of the RID (compatible)
-	171	Figure 17	9.4.5	Conducted RF

427

428 Table B.3 shows the Test specification reports sorted by clauses.

429

**Table B.3 – Test specification reports sorted by clauses**

Clauses	Title	TC	Tables/ Figures	CR-ID
5.3.11	Permissible voltage range at Device C/Q port	SDCI_TC_0300	30	181
5.5.3	Wake-up receive enable delay (C/Q high)	SDCI_TC_0086	27	167
5.5.4	Wake-up receive enable delay (C/Q low)	SDCI_TC_0087	28	167
6.2.3	Master start-up with overwrite of the RID (compatible)	SDCI_TC_0306	56	164
6.2.6	From OPERATE to START-UP via M-sequence TYPE_0	SDCI_TC_0038	59	176
6.3.5	From START-UP to PREOPERATE collision	SDCI_TC_0042	64	179
6.3.6	From PREOPERATE to START-UP via simulated reset	SDCI_TC_0043	65	168
6.3.7	From PREOPERATE to START-UP with M-sequence fault	SDCI_TC_0044	66	169
6.4.4	From PREOPERATE to OPERATE collision	SDCI_TC_0048	70	179
6.4.5	From OPERATE to START-UP via simulated reset	SDCI_TC_0049	71	170
6.5.6	Write 8 bit Index	SDCI_TC_0056	77	178
6.5.12	Read 16 bit Index with unavailable Subindex	SDCI_TC_0062	83	162
6.6.4	Event clearance in OPERATE state	SDCI_TC_0071	92	172
6.6.7	Event appears/disappears	SDCI_TC_0074	95	172
6.6.8	Multi Event handling	SDCI_TC_0075	96	172
6.8.3	From START-UP to OPERATE (V1.0)	SDCI_TC_0085	106	165
6.8.3	From START-UP to OPERATE (V1.0)	SDCI_TC_0085	106	174
6.8.4	From START-UP to OPERATE – interleave (V1.0)	SDCI_TC_0086	107	166
6.10.3	System command – implemented commands	SDCI_TC_0105	121	175
6.10.3	System command – implemented commands	SDCI_TC_0105	121	177
6.10.3	System command – implemented commands	SDCI_TC_0105	121	184
6.10.21	Error Count	SDCI_TC_0124	139	163
7.3.4	IODD parameter write verification	SDCI_TC_0152	162	184

<b>Clauses</b>	<b>Title</b>	<b>TC</b>	<b>Tables/ Figures</b>	<b>CR-ID</b>
7.3.5	IODD reset to factory settings	SDCI_TC_0155	163	180
9.4.5	Conducted RF	-	Figure 17	171
	References to draft V1.0.9; Clause "0"	-		172

## Annex C (informative)

### How to use the IO-Link change-request (CR) database?

#### C.1 Access CR database

Figure C.1 demonstrates the access to the CR database of a particular specification.

Figure C.1 – Access the CR database

On second page (behind the title sheet) you will find the link (URL) to the database to be entered in a web browser.

#### C.2 Access CR project associated with the specification

The browser will display the entry to the database with its Login (Name) and Password, which can be copied from the second page of the PDF document (see Figure C.1). In this case you will be first an anonymous user for the system.

Members of working groups, who are already registered within the IO-Link Community and assigned to the related project, should use their personal account provided by the business office.

Figure C.2 – Access CR project

### C.3 Projects view

After login, the system will display either one particular project or several of them as shown in Figure C.3. The specification related project can be found in third blue row.



















C1/WG32 - Sub-WG Requirements Management <i>You are an anonymous user.</i>									
Project	TRM	Priority	Certification Required	Last Author	Last Update	State	State Deadline	Actions	
Collection and Management of Requirements				Jens Hauße	14.07.2015	PI Review	Not Set	  	View
C2/WG7 - Quality <i>You are an anonymous user.</i>									
Project	TRM	Priority	Certification Required	Last Author	Last Update	State	State Deadline	Actions	
30_Test specification IO-Link				Dr.-Ing. Wolfgang Striif	13.07.2014	PI Review	Not Set	  	View
CC/PG1 - Technology <i>You are an anonymous user.</i>									
Project	TRM	Priority	Certification Required	Last Author	Last Update	State	State Deadline	Actions	
02_IO-Link Interface and System V1.1				Frank Moritz	12.08.2015	PI Review	Not Set	  	View
CC/PG2 - IO-Link Safety <i>You are an anonymous user.</i>									
Project	TRM	Priority	Certification Required	Last Author	Last Update	State	State Deadline	Actions	
00_IO-Link Safety "White Paper"				Dr.-Ing. Wolfgang Striif	17.11.2014	PI Review	Not Set	  	View
01_IO-Link Safety (single platform) Requirements and Use Cases				Dr.-Ing. Wolfgang Striif	17.11.2014	PI Review	Not Set	  	View
02_IO-Link Safety System Extensions; specification				Dr.-Ing. Wolfgang Striif	20.07.2015	PI Review	Not Set	  	View

Figure C.3 – Projects view

In menue "Actions" (red circle) you will find three icons allowing for a new entry of a CR (see Annex C.4), for a view on all existing CRs within this project (see Annex C.5), and a view on the project information (see Annex C.6) as shown in Figure C.4.

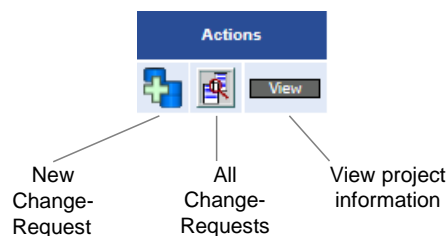


Figure C.4 – Possible actions on the project

Members of the working group can get access to intermediate working draft documents or meeting minutes via the view on the project information.

### C.4 CR entry

Figure C.5 demonstrates the entry fields of a new CR.

First of all it is necessary to enter at least one of your identifications, preferably the E-Mail address. This allows the working group to send you an E-Mail in case of an inquiry.

In the *Priority* field you are able to overwrite "*n/a*" and chose one of three other levels: *low*, *medium*, or *high*.

In the *Cause* field you are able to overwrite "*New Feature*" and chose one of five other levels: *Change feature*, *Layout change*, *Bug*, *Optimization*, or *Management*.

In the *Type of comment* field you are able to overwrite "*General*" and chose one of two other levels: *Technical* or *Editorial*.

The field *Precendent CR* can be skipped.

Create CR No. 100 for Project	"02_IO-Link Interface and System V1.1" (CC/PG1)	
*First Name	<input type="text"/>	
*Last Name	<input type="text"/>	
*Company	<input type="text"/>	
*E-mail	<input type="text"/>	
Priority	n/a <input type="button" value="v"/>	
Cause	New Feature <input type="button" value="v"/>	
Type of comment	General <input type="button" value="v"/>	
Precedent CR	<input type="text"/> <input type="button" value="v"/>	
*Abstract	<input type="text"/>	
*Description	<input type="text"/>	
Context / Constraint	<input type="text"/>	
Found in Version	V1.1.2 (file: IOL-Interface-Spec_10002_V112_Nov12.pdf)	
*Line	<input type="text"/>	
*Clause / Subclause	<input type="text"/>	<input type="text"/>
*Page	<input type="text"/>	
Create more CRs	<input type="checkbox"/> (check to report more CRs)	
Send Mail	<input type="checkbox"/> Send Mails	
<div> <div>* required</div> <div>* at least one</div> </div> <input type="button" value="Submit CR"/>		

**Figure C.5 – Entry of a new CR**

In field *Abstract* you should enter a brief description characterizing best your problem. This is very import, since many readers rely on a quick and comprehensible idea of this problem when scrolling through the CRs before reading the details within the description field.

In field *Description* you should enter a comprehensive description as precise as possible using references to the specification such as Figures, Tables, etc.

NOTE The IO-Link Community plans for a new release of the database where it will be possible to attach any commonly readable file of limited size such as scans of handwritten papers as PDF, or WORD or POWERPOINT documents.

In field *Context/Constraints* you may enter information on used hardware or software for your particular problem.

Field *Found in Version* shows you the current valid specification you can refer to. It is not possible to enter a CR for older versions of the specification.

The database system will only allow you to submit the CR if you provided at least a number in field *Line*, or the related number (e.g. 6.2) in field *Clause/Subclause*, or a related number in field *Page*. Usually, the working group prefers the Line indication. The IO-Link Community decided to publish also all released specifications with line numbers.

In case you want to enter more than one CR you can check the box in *Create more CRs* saving you time by omitting the entry of the identification over and over again.

In case you want to alert all members of the working group you can check the box in *Send Mail*. The members will receive a standardized e-mail from the database system.

## C.5 View of all project CRs

Figure C.6 shows only one out of the possible list of several CRs in the project as an example.

The system assigned ID numbers automatically when the CR was entered (here: 41). Next to the ID you will find the state of this CR (here: *Closed*), which means, the working group decided already and the result is shown in the field *Responses*. Other possible states you may encounter are: *Created*, *FAQ*, *Implementation*, *Review*, *ReOpened*, *Deferred*, *Closed*, and *Refused*.



[Home](#) | [Logout](#)

---

**Display-Filter**

Project: 02\_IO-Link Interface and System V1.1

Working Group: CC / PG1

☒ Show additional CR columns  

---

Change Request:

☒ All (State) (State)

☐ CR's which have been found in document version  and have been closed >>OK

---

Displaying Change-Requests of Project: 02\_IO-Link Interface and System V1.1 New CR

Originator	Assignee	Found in Version	Fixed in Version
	Moritz, Frank	V1.1.2	1.1.3
ID	State	Creation Date	Last Changed
41	Closed	04.03.2013 16:45:57	17.05.2013 15:12:01
Line	Clause / Subclause Number	Clause / Subclause Title	Page
---	---	---	215

**Abstract:**  
Table B.1 DeviceID octet 3 misspelled

**Description:**  
correct octet to octet. additional add a space for MSB at Device ID 1 (cosmetic)

**Responses:**  
accepted. will be changed response from IOL coreteam 13/03/14

**Figure C.6 – View of all project CRs**

With the help of the selection box within the red circle you can filter the view by one of the listed states or optionally show *All* CRs (as in Figure C.6) or all *Not closed* CRs.

## C.6 View of the project information

Figure C.7 shows the project information. An anonymous user cannot see and access intermediate documents of the working group.

[Home](#) | [Logout](#)

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<

**View Project**

<b>Project Name</b>	02_IO-Link Interface and System V1.1.x
<b>Abstract</b>	IO-Link Technology is an international Standard in IEC 61131-9. The IO-Link Community publishes their own intermediate releases to support the users of this technology in case of change requests, clarifications, etc. Current version of this specification is V 1.1.2. This project to collect those change requests from all over the world.
<b>Belonging to</b>	CC/PG1 - Technology
<b>Project Creation Date</b>	18.11.2010
<b>Last Update</b>	11.01.2016 by
<b>Attached Files</b>	<input checked="" type="checkbox"/> Show downloadable Files

Intermediate documents only for working group members.

**Figure C.7 – Project information**



## Bibliography

- [1] IO-Link Community, *IO-Link Interface and System*, V1.1.2, July 2013, Order No. 10.002
- [2] IEC 61131-9, *Programmable controllers – Part 9: Single-drop digital communication interface for small sensors and actuators (SDCI)*
- [3] IO-Link Community, *IO Device Description (IODD)*, V1.1, July 2011, Order No. 10.012
- [4] IO-Link Community, *IO-Link Communication*, V1.0, January 2009, Order No. 10.002
- [5] IO-Link Community, *IO-Link Test Specification*, V1.1.2, July 2014, Order No. 10.032

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