IO-Link Test

Specification

**Related to
IO-Link Interface and System
Specification V1.1**

**Version 1.1
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NOTE 2 Any IO-Link device shall provide an associated IODD file. Easy access to the file and potential updates shall be possible. It is the responsibility of the IO-Link Device manufacturer to test the IODD file with the help of the IODD-Checker tool available per download from www.io-link.com.

NOTE 3 Any IO-Link Master or Device shall provide an associated manufacturer declaration on the conformity of the device with the "IO-Link Interface and System" specification V1.1 (IEC 61131-9). The manufacturer declaration is available for download from 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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CONTENTS

0   Introduction

0.1   General

This document together with its parent IEC 61131-9 is part of a series of standards on programmable controllers and the associated peripherals and should be read in conjunction with the other parts of the series.

IEC 61131-9 specifies the Single Drop digital Communication Interface (IO-Link™[1]) technology as a generic interface for connecting digital/analog sensors and actuators to a Master unit, which may be combined with gateway capabilities to become a fieldbus remote I/O node.

The SDCI physical interface is backward compatible with the usual 24 V I/O signalling specified in IEC 61131-2 and allows in addition digital point-to-point communication at transmission rates of 4,8 kbit/s, 38,4 kbit/s and 230,4 kbit/s.

The SDCI technology specifies parameterization, cyclic exchange of process data, and diagnosis as well as parameter Data Storage capabilities.

This subpart specifies the test cases and associated test environments for SDCI Master and Devices designed and developped according to IEC 61131-9. It provides the necessary preconditions for conformity testing to ensure interoperability and enables manufacturers of Master and Devices to sign a corresponding conformity declaration.

The structure of this document is described in clause 4.2.

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

Conformity with IEC 61131-9 cannot be claimed unless the requirements of this document are met.

Terms of general use are defined in IEC 61131-1 or in [1]. More specific terms are defined in each part.

0.2   Patent declaration

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

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1 **PROGRAMMABLE CONTROLLERS —**

2

3 **Test specification for Master and Devices according to IEC 61131-9 (Sin-**
4 **gle-drop Digital Communication Interface - SDCI)**

5

6 **1   Scope**

7 The single-drop digital communication interface (SDCI) technology described in part 9 of the
8 IEC 61131 series focuses on simple sensors and actuators in factory automation, which are
9 nowadays using small and cost-effective microcontrollers. With the help of the SDCI technol-
10 ogy, the existing limitations of traditional signal connection technologies such as switching
11 0/24 V, analog 0 to 10 V, etc. can be turned into a smooth migration. Classic sensors and ac-
12 tuators are usually connected to a fieldbus system via input/output modules in so-called re-
13 mote I/O peripherals. The (SDCI) Master function enables these peripherals to map SDCI De-
14 vices onto a fieldbus system or build up direct gateways. Thus, parameter data can be trans-
15 ferred from the PLC level down to the sensor/actuator level and diagnosis data transferred
16 back in turn by means of the SDCI communication. This is a contribution to consistent pa-
17 rameter storage and maintenance support within a distributed automation system. SDCI is
18 compatible to classic signal switching technology according to part 2 of the IEC 61131 series.

19 This subpart specifies the test cases and associated test environments for Master and De-
20 vices designed and developped according to IEC 61131-9. It provides the necessary precon-
21 ditions for conformity testing to ensure interoperability and allows manufacturers of Master
22 and Devices to sign a corresponding conformity declaration

23 **2   Normative references**

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

27 IEC 60947-5-2, *Low-voltage switchgear and controlgear – Part 5-2: Control circuit Devices*
28 *and switching elements – Proximity switches*

29 IEC 61131-2, *Programmable controllers – Part 2: Equipment requirements and tests*

30 IEC 61131-9, *Programmable controllers – Part 9: Single-drop digital communication interface*
31 *for small sensors and actuators (SDCI)*

32 **3   Terms, definitions, symbols, abbreviated terms and conventions**

33 **3.1   Terms and definitions**

34 For the purposes of this document, the following terms and definitions in addition to those
35 given in IEC 61131-1, IEC 61131-2, and IEC 61131-9 apply.

36 **3.1.1**
37 **address**
38 part of the F-sequence control to reference data within data categories of a communication
39 channel

40 **3.1.2**
41 **application layer (AL)**
42 <SDCI> part of the protocol responsible for the transmission of Process Data objects and On-
43 Request Data objects

44 **3.1.3**
45 **block parameter**
46 consistent parameter access via multiple Indices or Subindices

47 **3.1.4**
48 **checksum**
49 <SDCI> complementary part of the overall data integrity measures in the data link layer in ad-
50 dition to the UART parity bit

51 **3.1.5**
52 **CHKPDU**
53 integrity protection data within an ISDU communication channel generated through XOR proc-
54 essing the octets of a request or response

55 **3.1.6**
56 **coded switching**
57 SDCI communication, based on the standard binary signal levels of IEC 61131-2

58 **3.1.7**
59 **COM1**
60 SDCI communication mode with transmission rate of 4,800 kbit/s

61 **3.1.8**
62 **COM2**
63 SDCI communication mode with transmission rate of 38,400 kbit/s

64 **3.1.9**
65 **COM3**
66 SDCI communication mode with transmission rate of 230,400 kbit/s

67 **3.1.10**
68 **COMx**
69 one out of three possible SDCI communication modes COM1, COM2, or COM3

70 **3.1.11**
71 **communication error**
72 unexpected disturbance of the SDCI transmission protocol

73 **3.1.12**
74 **cycle time**
75 time to transmit a frame between a Master and its Device including the following idle time

76 **3.1.13**
77 **communication channel**
78 logical connection between Master and Device

79 NOTE   Four communication channels are defined: process channel, page and ISDU channel (for parameters) and
80 diagnostic channel.

81 **3.1.14**
82 **Device**
83 single passive peer to a Master such as a sensor or actuator

84 NOTE   Uppercase "Device" is used for SDCI equipment, while lowercase "Device" is used in a generic manner.

85 **3.1.15**
86 **direct parameters**
87 directly (page) addressed parameters transferred acyclically via the page communication
88 channel without acknowledgement

89   **3.1.16**
90   **dynamic parameter**
91   part of a Device's parameter set defined by on-board user interfaces such as teach-in buttons
92   or control panels in addition to the static parameters

93   **3.1.17**
94   **event**
95   an instance of a change of conditions

96   NOTE   An event is indicated via the event flag within the Device's status cyclic information, then acyclic transfer of
97   event data (typically diagnostics information) is conveyed through the diagnostic communication channel.

98   [IEC 61158-5-x, modified]

99   **3.1.18**
100 **fallback**
101 transition of a port from coded switching to switching signal mode

102 **3.1.19**
103 **F-sequence (IEC 61131-9 → M-sequence)**
104 sequence of two messages (frames) comprising a Master message and its subsequent Device
105 message

106 **3.1.20**
107 **F-sequence control (IEC 61131-9 → M-sequence control)**
108 first octet in a Master message indicating the read/write operation, the type of the communica-
109 tion channel, and the address, for example offset or flow control

110 **3.1.21**
111 **F-sequence error (IEC 61131-9 → M-sequence error)**
112 unexpected or wrong frame content, or no response

113 **3.1.22**
114 **F-sequence type (IEC 61131-9 → M-sequence type)**
115 one particular F-sequence format out of a set of specified F-sequence formats

116 **3.1.23**
117 **framing error**
118 perturbed UART frames (physical layer)

119 **3.1.24**
120 **interleave**
121 segmented cyclic data exchange for process data with more than 2 octets through subsequent
122 cycles

123 **3.1.25**
124 **ISDU**
125 indexed service data unit used for acyclic acknowledged transmission of parameters that can
126 be segmented in a number of F-sequences

127 **3.1.26**
128 **Legacy-Device**
129 Device developed according to version V1.0 [13], the predecessor of [9]

130 **3.1.27**
131 **Legacy-Master**
132 Master developed according to version V1.0 [13], the predecessor of [9]

133 **3.1.28**
134 **Master**
135 active peer connected through ports to one up to n Devices and which provides an interface
136 to the gateway to the upper level communication systems or PLCs

137 NOTE   Uppercase "Master" is used for SDCI equipment, while lowercase "Master" is used in a generic manner.

138 **3.1.29**
139 **message**
140 <SDCI> coherent set of data octets transferred either from a Master to its Device or vice
141 versa following the rules of the SDCI protocol

142 **3.1.30**
143 **on-request data**
144 acyclically transmitted data upon request of the Master application consisting of parameters
145 or event data

146 **3.1.31**
147 **PHY-3W ((IEC 61131-9 → 3-wire system)**
148 three wire connection to Devices for power, ground, communication and/or switching signals
149 defined in IEC 60947-5-2

150 **3.1.32**
151 **physical layer**
152 part of the communication protocol concerned with transmitting raw bits over a communication
153 channel

154 NOTE   Physical layer provides means for wake-up and fallback procedures.

155 **3.1.33**
156 **port**
157 communication medium interface of the Master to one Device

158 **3.1.34**
159 **port operating mode**
160 state of a Master's port that can be either INACTIVE, DO, DI, SDCI, or ScanMode

161 **3.1.35**
162 **process data**
163 input or output values from or to a discrete or continuous automation process cyclically trans-
164 ferred with high priority and in a configured schedule automatically after start-up of a Master

165 **3.1.36**
166 **process data cycle**
167 complete transfer of all process data from or to an individual Device that may comprise sev-
168 eral cycles in case of segmentation (interleave)

169 **3.1.37**
170 **single parameter**
171 independent parameter access via one single Index or Subindex

172 **3.1.38**
173 **SIO**
174 port operation mode in accordance with digital input and output defined in IEC 61131-2 that is
175 established after power-up or fallback or unsuccessful communication attempts

176 **3.1.39**
177 **static parameter**
178 part of a Device's parameter set to be saved in a Master for the case of replacement without
179 engineering tools

180 **3.1.40**
181 **switching signal**
182 binary signal from or to a Device when in SIO mode (as opposed to the "coded switching"
183 SDCI communication)

184 **3.1.41**
185 **system management (SM)**
186 <SDCI> means to control and coordinate the internal communication layers and the excep-
187 tions within the Master and its ports, and within each Device

188 **3.1.42**
189 **UART frame**
190 <SDCI> bit sequence starting with a start bit, followed by eight bits to carry a data octet, fol-
191 lowed by an even parity bit and ending with one stop bit

192 **3.1.43**
193 **wake-up**
194 procedure for causing a Device to change its mode from SIO to SDCI

195 **3.1.44**
196 **wake-up request (WURQ)**
197 physical layer service used by the Master to initiate wake-up of a Device, and put it in a re-
198 ceive ready state

199 **3.2   Symbols and abbreviated terms**

Δf_{DTR}	Permissible deviation from data transfer rate, measured in %
ΔPS	Power supply ripple, measured in V
AL	Application Layer
BEP	Bit error probability
C/Q	Connection for communication (C) or switching (Q) signal (SIO)
CL_{eff}	Effective total cable capacity, measured in nF
CQ	Input capacity at C/Q connection, measured in nF
DI	Digital input
DL	Data Link Layer
DO	Digital output
f_{DTR}	Data transfer rate, measured in bit/s
H/L	High/low signal at receiver output
I/O	Input / output
ILL	Input load current at input C/Q to V0, measured in A
IQ	Driver current in saturated operating status ON, measured in A
IQH	Driver current on high-side driver in saturated operating status ON, measured in A
IQL	Driver current on low-side driver in saturated operating status ON, measured in A
IQPK	Maximum driver current in unsaturated operating status ON, measured in A
IQPKH	Maximum driver current on high-side driver in unsaturated operating status ON, measured in A
IQPKL	Maximum driver current on low-side driver in unsaturated operating status ON,

	measured in A	
IQQ	Quiescent current at input C/Q to V0 with inactive output drivers, measured in A	
IQ_{WU}	Amplitude of Master's wake-up request current, measured in A	
IS	Supply current at V+, measured in A	
ISIR	Current pulse supply capability at V+, measured in A	
LED	Light emitting diode	
L-	Ground connection	
L+	Power supply connection	
NRZ	Non return to zero	
n_{WU}	Wake-up retry count	
On/Off	Driver's ON/OFF switching signal	
ON-REQ	On-request data	
OVD	Signal Overload Detect	
PDCT	Port and Device configuration tool	
PL	Physical layer	
PLC	Programmable logic controller	
PS	Power supply, measured in V	
r	Time to reach a stable level with reference to the beginning of the start bit, measured in TBIT	
RL_{eff}	Loop resistance of cable, measured in Ω	
s	Time to exit a stable level with reference to the beginning of the start bit, measured in TBIT	
SDCI	Single-drop digital communication interface	
SIO	Standard Input Output (digital switching mode)	[IEC 61131-2]
SM	System Management	
t_1	Character transfer delay on Master, measured in TBIT	
t_2	Character transfer delay on Device, measured in TBIT	
t_A	Response delay on Device, measured in TBIT	
T_{BIT}	Bit time, measured in s	
t_{CYC}	Cycle time on F-sequence level, measured in s	
t_{DF}	Fall time, measured in s	
T_{DMT}	Delay time while establishing Master port communication, measured in TBIT	
t_{DR}	Rise time, measured in s	
T_{DSIO}	Delay time on Device for transition to SIO mode following wake-up request, measured in s	
T_{DWU}	Wake-up retry delay, measured in s	
$t_{F-sequence}$	F-sequence duration, measured in TBIT	
t_{idle}	Idle time between two F-sequences, measured in s	
t_H	Detection time for high level, measured in s	
t_L	Detection time for low level, measured in s	
t_{ND}	Noise suppression time, measured in s	
T_{OFS}	Temporal offset for process data processing on the Device with reference to start of cycle, measured in s	
T_{PON}	Ramp-up time following power ON, measured in s	
T_{RDL}	Wake-up readiness following power ON, measured in s	

T_{REN}	Receive enable, measured in s
T_{SD}	Device detect time, measured in s
T_{WU}	Pulse duration of wake-up request, measured in s
UART	Universal asynchronous receiver transmitter
UML	Unified modelling language
V+	Voltage at L+
V0	Voltage at L-
VD-	Voltage drop on the line between the L- connections on Master and Device, measured in V
VD+	Voltage drop on the line between the L+ connections on Master and Device, measured in V
VDQ	Voltage drop on the line between the C/Q connections on Master and Device, measured in V
VHYS	Hysteresis of receiver threshold voltage, measured in V
VI	Input voltage at connection C/Q with reference to V0, measured in V
VIH	Input voltage range at connection C/Q for high signal, measured in V
VIL	Input voltage range at connection C/Q for low signal, measured in V
VRQ	Residual voltage on driver in saturated operating status ON, measured in V
VRQH	Residual voltage on high-side driver in operating status ON, measured in V
VRQL	Residual voltage on low-side driver in saturated operating status ON, measured in V
VTH	Threshold voltage of receiver with reference to V0, measured in V
VTHH	Threshold voltage of receiver for safe detection of a high signal, measured in V
VTHL	Threshold voltage of receiver for safe detection of a low signal, measured in V
WURQ	Wake-up request pulse

200

3.3   Conventions

3.3.1   Test case template

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

Table 1 – Test case template

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_nnnn (nnnn = 4 digit consecutive number starting with 0001)
Name	Characteristic name of the test case (see 3.3.1.1)
Purpose (short)	Short description of the purpose of the test case (one line maximum)
Equipment under test (EUT)	Master, Device, or SDCI communication
Test case version	Starts with 1.0. Incremented first number indicates significant changes due to new functionality, the second one indicates changes within the test case
Category / type	See 3.3.1.2
Specification (clause)	[Bibliography, nn], clause or subclause, figure, table, chart, etc.
Configuration / setup	E.g. Master-Tester ("Device") shall detect all transmission rates and measure the corresponding delays. It shall not react to the requests.
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Comprehensive description of the purpose of the test case (can be several lines).

TEST CASE	CONDITIONS / PERFORMANCE
Precondition	Mode of the test set (EUT and test environment) or ID of previous test
Procedure	Step by step description of the test
Input parameter	For example of an ISDU: Index, Subindex, Length, Data
Post condition	Mode of the EUT and its environment
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Expected reaction of the EUT and permitted ranges
Test passed	Describe reaction and check whether deviations can be tolerated
Test failed (examples)	Describe reaction and describe the reasons for failing
Results	Timings, voltages, currents, pulses, message sequences, etc.

207 The table contains explanations on how to use items.

3.3.1.1 Name of a test case

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

210
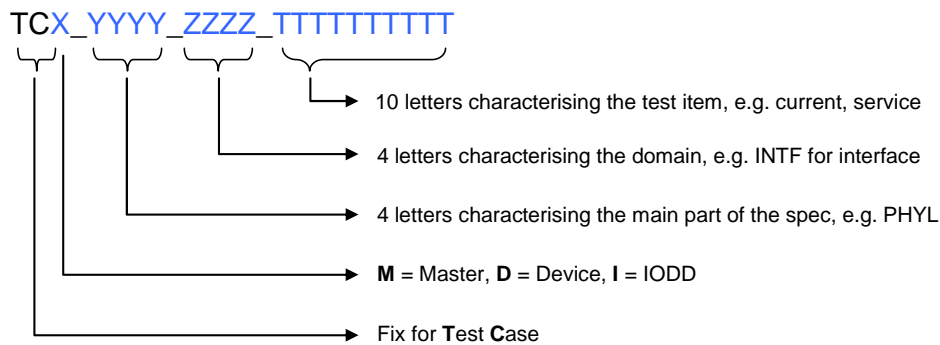
Figure 1 – Structure of the test case name

3.3.1.2 Categories and types of test cases

213 Table 2 shows the used test case categories within this document.

Table 2 – Test case categories

Category	Definition
Master Physical Layer test	Measure port voltages, currents, and timings
Device Physical Layer test	Measure Device voltages, currents, and timings
ASIC	These test cases are relevant for manufacturers of integrated circuits
Master DL protocol test	Check Master protocol on DL level
Device DL protocol test	Check Device protocol on DL level
Master/Device protocol test	Master/Device interaction test on DL level
Device PREOPERATE test	Device protocol test in PREOPERATE mode
Device OPERATE test	Device protocol test in OPERATE mode
Device ISDU test	Device ISDU protocol test
Device Event test	Test of Device Event handling
Device Direct Parameter test	Test of Device's Direct Parameter page handling
Device application test	Test of Device's application behavior

Category	Definition
IODD verification test	Test whether IODD and the real Device parameter are matching
Master Data Storage test	Test of Master's Data Storage mechanisms

215

216   Table 3 shows the used test case types within this document

217   **Table 3 – Test case types**

Category	Definition
Test to pass	Positive test. A function shall perform as specified.
Test to fail	Negative test. A function shall react for example with an error indication when boundary conditions are exceeded

218

219   3.3.2   Names of variables

220   Due to the possible implementation of the test cases in software, all used symbols and abbre-
221   viated terms in this document (see 3.2) are written in upper case letters without superscript or
222   subscript.

223   3.3.3   Memory and transmission octet order

224   Figure 2 demonstrates the order that shall be used when transferring WORD based data types
225   from memory to transmission and vice versa.
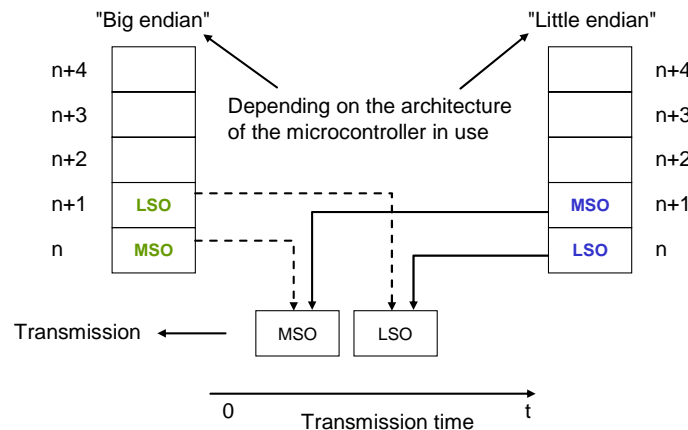
226

227   **Figure 2 – Memory and transmission octet order**

228   3.3.4   Behavioral descriptions

229   For the behavioral descriptions the notations of UML 2 [5] are used, mainly timing diagrams.

230 **4   Test strategy for SDCI (IO-Link™2) Master and Devices**

231 **4.1   Purpose of this specification**

232 This specification describes the test cases and specifies the necessary test equipment in con-
233 junction with its parent document IEC 61131-9. The functionality of legacy Devices according
234 to [13] is covered also. Necessary supplements or clarifications regarding [13] are covered in
235 Annex B.

236 This document provides the necessary information for the development of test instructions for
237 a particular test set in test laboratories.

238 **4.2   Structure of this document**

239 Clause 0 describes the test cases for the physical layer test of Master and Devices. Thea are
240 mainly requiring individual manual tests with variable power supplies, individual capacitive
241 and resistive loads, voltage and current meters as well as oscilloscopes and logic analyzers.

242 Clause 6 describes the test cases for the Device protocol tests, which can be performed
243 nearly automatically via a Device-Tester.

244 Clause 7 describes the XML schema and business rules tests for IODDs. Additional test
245 cases verify the consistency of the particular IODD and the real parameters within the associ-
246 ated Device.

247 Clause 8 describes the test cases for the Master protocol tests, which can be performed
248 automatically via a Master-Tester.

249 Clause 9 defines the standards for the environmental tests of Master and Devices. Annex A
250 describes the test tools, their requirements, and the test configurations. Annex B contains a
251 few supplementary specifications filling the gaps of [13]. Annex C provides cross reference
252 listings for test case IDs and test case names. Annex D provides information about an SDCI
253 support organization.

254 **4.3   Conformity classes**

255 **4.3.1   Legacy Devices (V1.0)**

256 Devices designed and implemented according to [13] shall pass all test cases marked corre-
257 spondingly in this document.

258 **4.3.2   Devices without ISDU**

259 Devices designed and implemented according to [9] that are not supporting the ISDU feature
260 shall either require no parameters or provide a system conform mechanism for the Device re-
261 placement without tools. These Devices shall pass all test cases marked correspondingly in
262 this document.

263 **4.3.3   Devices with ISDU**

264 Devices designed and implemented according to [9] shall pass all test cases marked corre-
265 spondingly in this document. If they omit to implement the Data Storage mechanism according
266 to [9] they still shall provide access to Index 3 and shall provide system conform means for

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267 the Device replacement without tools. These Devices shall pass all test cases marked corre-
268 spondingly in this document.

4.3.4 Legacy Master

269

270 Master designed and implemented according to [13] are providing a subset of the features in
271 [9], usually no Data Storage, no PREOPERATE state, no Events type 2, and reduced F-
272 sequence types. All the test cases within this document for Legacy Master apply.

4.3.5 Master

273

274 Master designed and implemented according to [9] shall provide all the specified features. All
275 test cases within this document for Master apply.

4.4 Test of Devices

276

277 The test of Devices consists of four steps: Physical layer test, IODD test, protocol test, and
278 environmental test. The protocol tests of SDCI Devices can be performed by a Device-Tester
279 that shall be approved by the organization noted in Annex D. The requirements for Device-
280 Tester are specified in Annex A.2.2.

281 Figure 3 shows step 1 of the Device test. It contains references to the relevant clauses in this
282 specification and consists of a visual check and manually performed measurements.

283 If the Device shows specific connectors, cables, or color codings, these deviations shall be
284 documented within the user manual in respect to the original definitions in the standard [9].
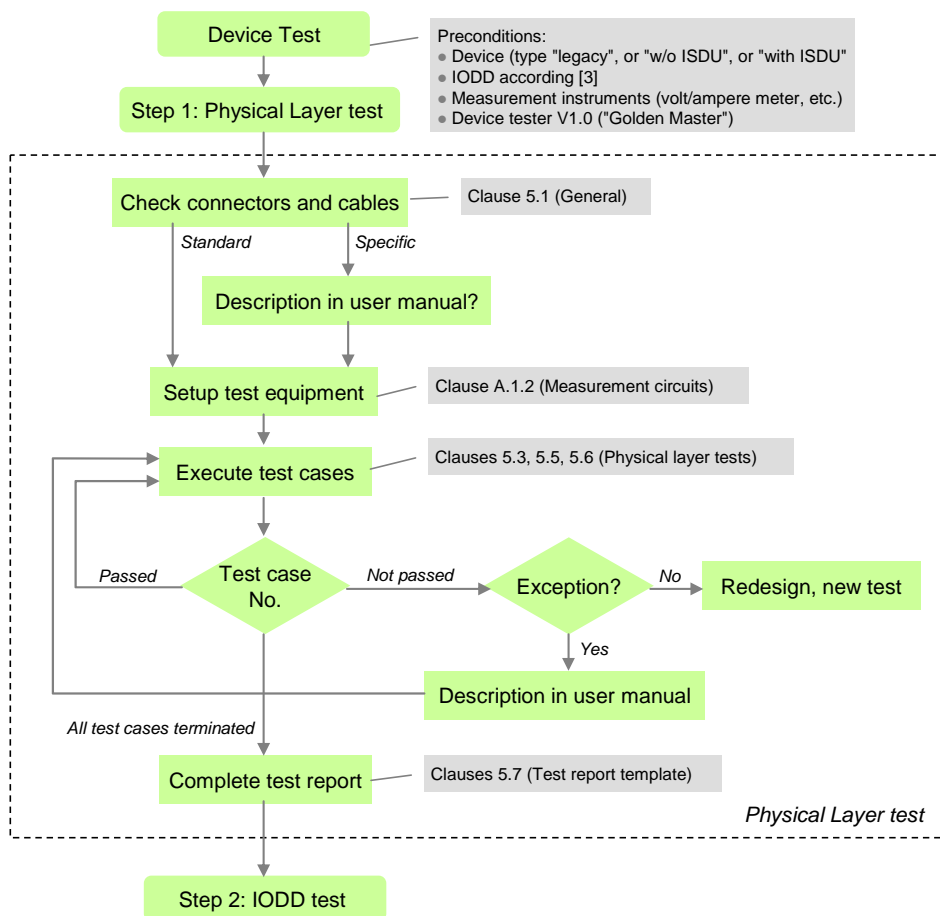
285

286   **Figure 3 – Step 1 of the Device test sequence (PL)**

287 If a Device did not pass a certain test case due to measurement values close to the tolerance
288 limits or similar situations it is possible to send an informal request to the organization listed
289 in Annex D. This request shall be comprehensive enough for the experts to allow for an ex-
290 ception under certain conditions or clarification of the specifications. If an exception applies, it
291 shall be documented in the user manual mentioning the possible implications.

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

294 Figure 4 shows step 2 of the Device test. It contains references to the relevant clauses in this
295 specification and consists of an IODD-Test with a so-called IODD-Checker-Tool (Annex A.2.3)
296 and a parameter verification test with the help of the protocol test (Device Tester).

297
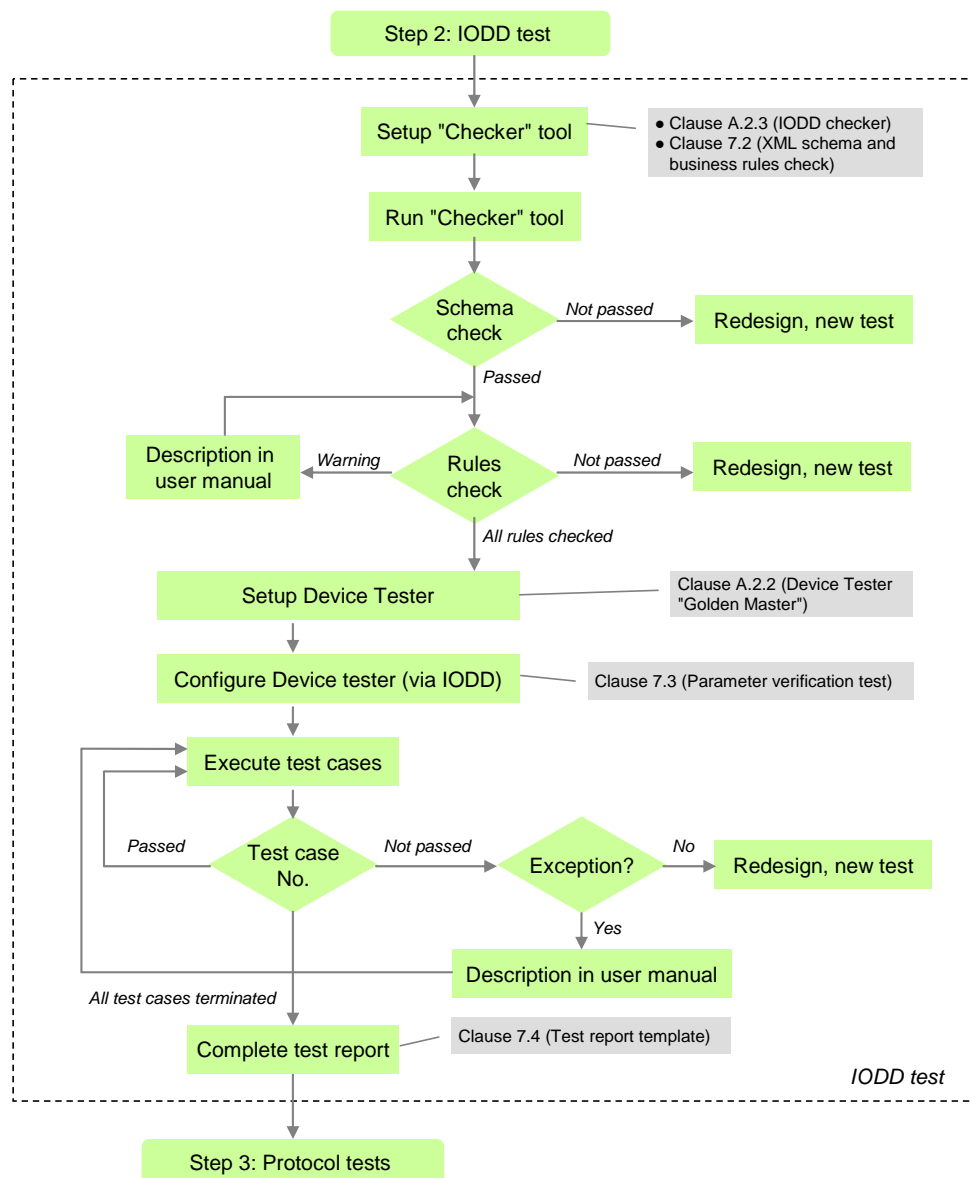
Figure 4 – Step 2 of the Device test sequence (IODD)

298

299 Figure 5 shows step 3 of the Device test. It contains references to the relevant clauses in this
300 specification and consists of an automated protocol test with the help of the Device Tester
301 defined in Annex A.2.2.

302 Three different sets of test cases are necessary to adjust the tests for the three Device con-
303 formity classes: Legacy Devices developed according to [13], Devices without the ISDU fea-
304 ture developed according to [9], and Devices with ISDU support developed according to [9].
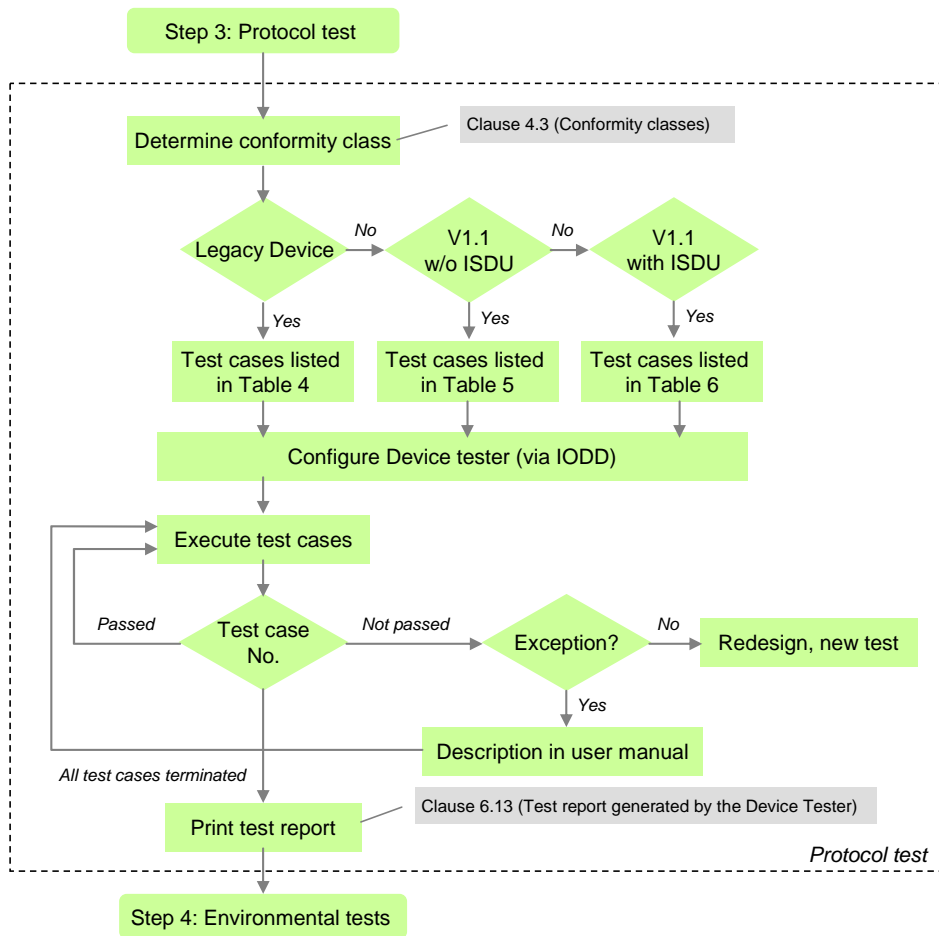
305

306   **Figure 5 – Step 3 of the Device test sequence (protocol)**

307 The set of test cases for Legacy Devices is defined in Table 4.

308   **Table 4 – Set of test cases for Legacy Devices (V1.0)**

Major feature	Test cases	Remarks
STARTUP	TC_0034 to TC_0038	
OPERATE	TC_0049, TC_0051	
ISDU	TC_0052 to TC_0054 TC_0055 to TC_0062 TC_0065 TC_0066 TC_0067, TC_0068	If tested in OPERATE mode If tested with ErrorCode 0x5600 If tested in OPERATE mode If tested in OPERATE mode. Abort not mentioned in state machine, but behavior shall be fulfilled.
Events	TC_0069 to TC_0075	
Legacy Master (V1.0)	TC_0085 to TC_0087	
Direct Parameter page 1	TC_0089 to TC_0091 TC_0092 to TC_0097 TC_0100 to TC_0101	If restricted to 134 ms
Predefined parameters	TC_0114 to TC_0121 TC_0122 to TC_0123 TC_0124 TC_0132 to TC_0133	If length < 16 permitted

Major feature	Test cases	Remarks
	TC_0140	
IODD based tests	TC_0149 TC_0151 to TC_0152 TC_0157	

309

310 The set of test cases for Devices without ISDU support is defined in Table 5.

311 **Table 5 – Set of test cases for Devices without ISDU support**

Major feature	Test cases	Remarks
STARTUP	TC_0034 to TC_0038	
PREOPERATE	TC_0039 to TC_0044	
OPERATE	TC_0045 to TC_0047 TC_0049 TC_0051	
Events	TC_0069 to TC_0076	
Legacy Master (V1.0)	TC_0085 to TC_0087	If restricted to 134 ms
Direct Parameter page 1	TC_0089 to TC_0097 TC_0100 to TC_0101	

312

313 The set of test cases for Devices with ISDU support is defined in Table 6.

314 **Table 6 – Set of test cases for Devices with ISDU support**

Major feature	Test cases	Remarks
STARTUP	TC_0034 to TC_0038	
PREOPERATE	TC_0039 to TC_0044	
OPERATE	TC_0045 to TC_0047 TC_0049 TC_0051	
ISDU	TC_0052 to TC_0068	
Events	TC_0069 to TC_0076	
Data Storage	TC_0077 to TC_0084	
Legacy Master (V1.0)	TC_0085 to TC_0087	If compatible
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	
Block parameter	TC_0143 to TC_0145 TC_0147 to TC_0148	
IODD based tests	TC_0149 TC_0151 to TC_0152 TC_0155 to TC_0157	

315

316 Figure 6 shows step 4 of the Device test. It contains references to the relevant clauses in this
317 specification and consists of an EMC test defined in [9] and possible tests according to rele-
318 vant product standards such as for example the IEC 60947 series. A successfully terminated
319 Device test can be completed by a manufacturer declaration as defined in [9].

Step 4: Environmental tests

Setup EMC testing — Clause 9.1 (General)

Execute tests

EMC test No.

Passed

Not passed → Exception? — *No* → Redesign, new test

Yes → Description in user manual

All test cases terminated

Complete test report — Clause 9.4 (EMC Test report)

Other relevant standards? — *Yes* → Excute tests — *Not passed* → Redesign, new test

Passed

No

Environmental test

Complete manufacturer declaration — Annex G.4 in [9] (Manufacturer declaration)

End of Device testing

320

321   **Figure 6 – Step 4 of the Device test sequence (environment)**

322   **4.5   Test of SDCI Masters**

323   The test of SDCI Masters consists of four steps: Physical layer test, protocol test, IODD inter-
324   preter test, and environmental test. The protocol tests of SDCI Master can be performed by a
325   Master-Tester that shall be approved by the organization noted in Annex D. The requirements
326   for Master-Tester are specified in Annex A.2.4.

327   Figure 7 shows step 1 of the Master test sequence. It contains references to the relevant
328   clauses in this specification and consists of a visual check and manually performed measure-
329   ments.

330   If the Master shows specific connectors, cables, or color codings, these deviations shall be
331   documented within the user manual in respect to the original definitions in the standard [9].

332   If a Master did not pass a certain test case due to measurement values close to the tolerance
333   limits or similar situations it is possible to send an informal request to the organization listed
334   in Annex D. This request shall be comprehensive enough for the experts to allow for an ex-
335   ception under certain conditions or clarification of the specifications. If an exception applies, it
336   shall be documented in the user manual mentioning the possible implications.

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

339
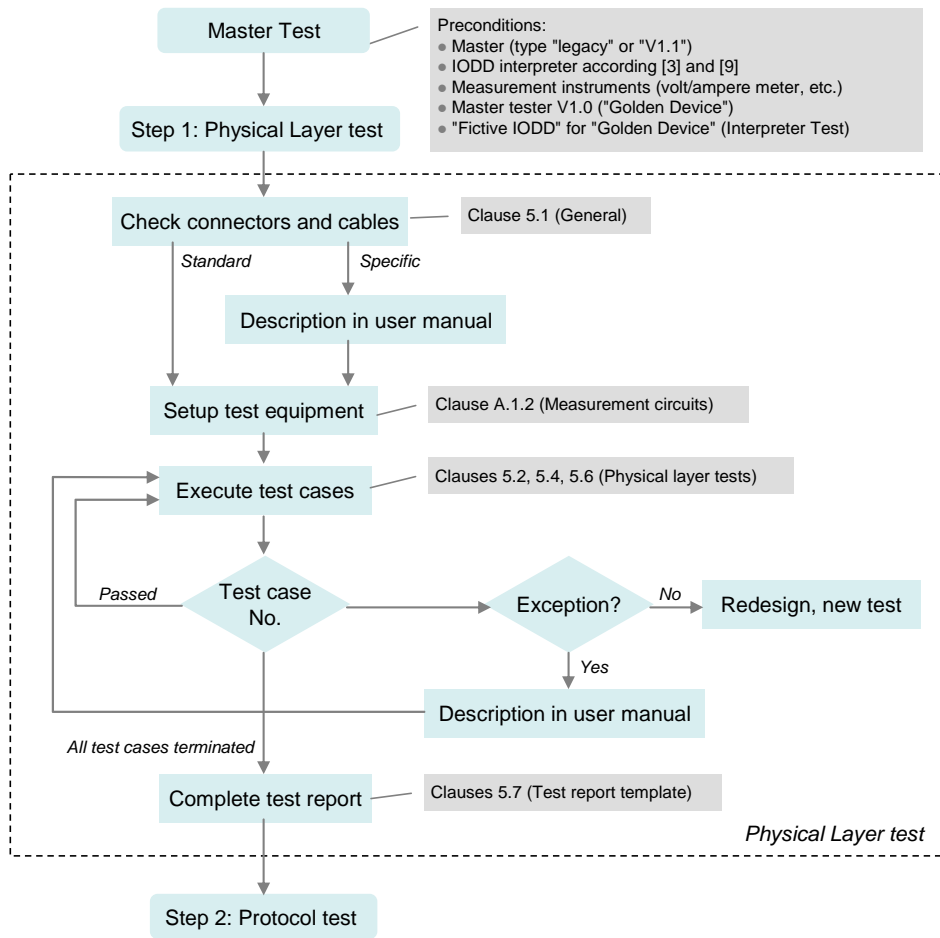
340

341 **Figure 7 – Step 1 of the Master test sequence (PL)**

342 Figure 8 shows step 2 of the Master test sequence. It contains references to the relevant
343 clauses in this specification and consists of an automated protocol test with the help of a Mas-
344 ter Tester tool defined in Annex A.2.4.

345 Two different sets of test cases are necessary to adjust the tests for the two Master confor-
346 mity classes: Legacy Masters developed according to [13] and Masters developed according
347 to [9].

348 The set of test cases for Legacy Masters is defined in Table 7.

349 **Table 7 – Set of test cases for Legacy Masters (V1.0)**

Major feature	Test cases	Remarks
Timings	TC_0158 to TC_0167	
Process Data (PD)	TC_0168 to TC_0176	
STARTUP	TC_0183, TC_0185 TC_0192 to TC_0196	
OPERATE	TC_0210 to TC_0212	
Fallback	TC_0215 to TC_0216	
Retry	TC_0217 to TC_0222	TC_0217 to TC_0220 without test execution while in PREOPERATE mode.
ISDU (application errors)	TC_0223 to TC_0238	
ISDU (derived errors)	TC_0239 to TC_0242 TC_0244	

Major feature	Test cases	Remarks
ISDU (Limit checks)	TC_0243 TC_0245 to TC_0246 TC_0248 to TC_0255	
Events	TC_0256 to TC_0267	
Legacy Device (V1.0)	TC_0285 to TC_0291	

350
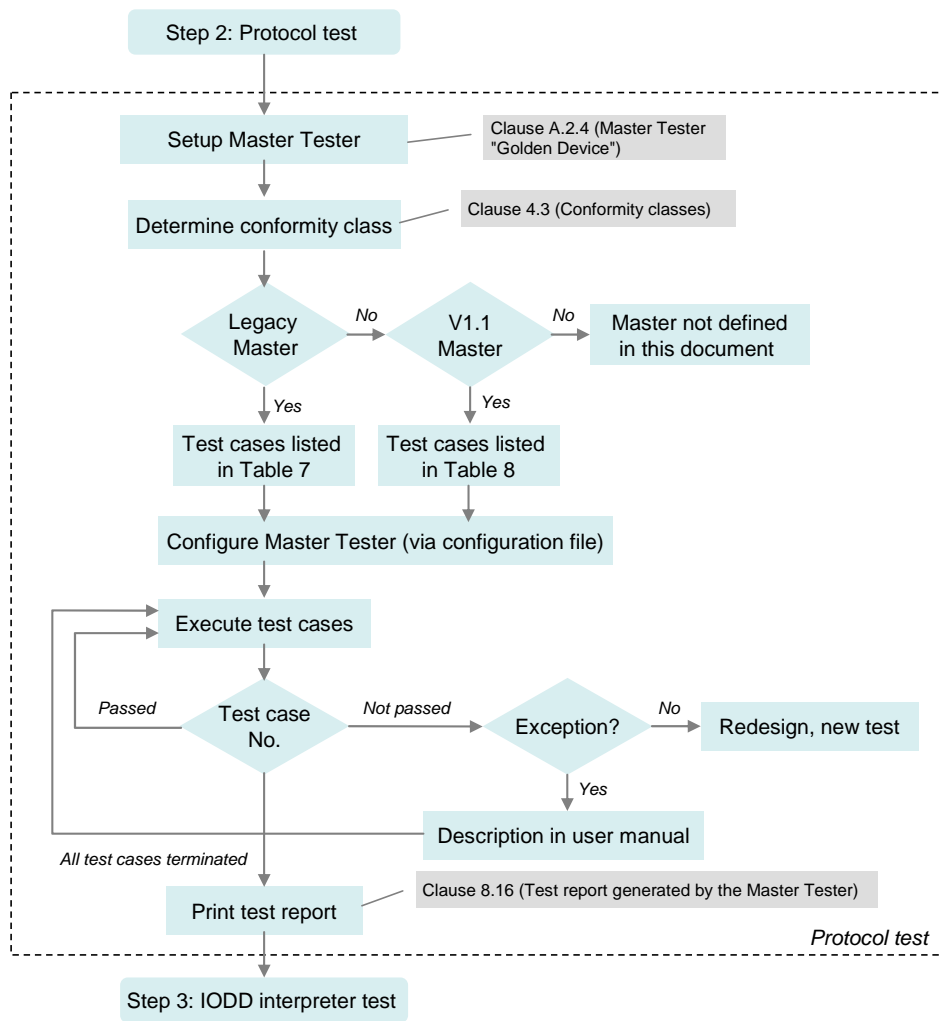
351

352 **Figure 8 – Step 2 of the Master test sequence (PL)**

353 The set of test cases for Masters is defined in Table 8.

354 **Table 8 – Set of test cases for Masters (V1.1)**

Major feature	Test cases	Remarks
Timings	TC_0158 to TC_0167	
Process Data (PD)	TC_0168 to TC_0178	
On-request Data (OD)	TC_0179 to TC_0182	
STARTUP	TC_0183 to TC_0196	
PREOPERATE	TC_0198 to TC_0209	TC_0200 and TC_0201 are optional
OPERATE	TC_0210 to TC_0212	
Fallback	TC_0213 to TC_0216	TC_0213 and TC_0214 are optional

Major feature	Test cases	Remarks
Retry	TC_0217 to TC_0222	
ISDU (application errors)	TC_0223 to TC_0238	
ISDU (derived errors)	TC_0239 to TC_0242 TC_0244	
ISDU (Limit checks)	TC_0243 TC_0245 to TC_0246 TC_0248 to TC_0255	
Events	TC_0256 to TC_0267	TC_0268 and TC_0269 are for future use.
Data Storage	TC_0270 to TC_0284	
Legacy Device (V1.0)	TC_0285 to TC_0291	

355

356 Figure 9 shows step 3 of the Master test sequence. It contains references to the relevant
357 clauses in this specification. The Master Tester tool ("Golden Device") defined in Annex A.2.4
358 provides a "Fictive IODD". The user manual of the tool demonstrates how this IODD shall be
359 presented to the user in respect to completeness and correctness.
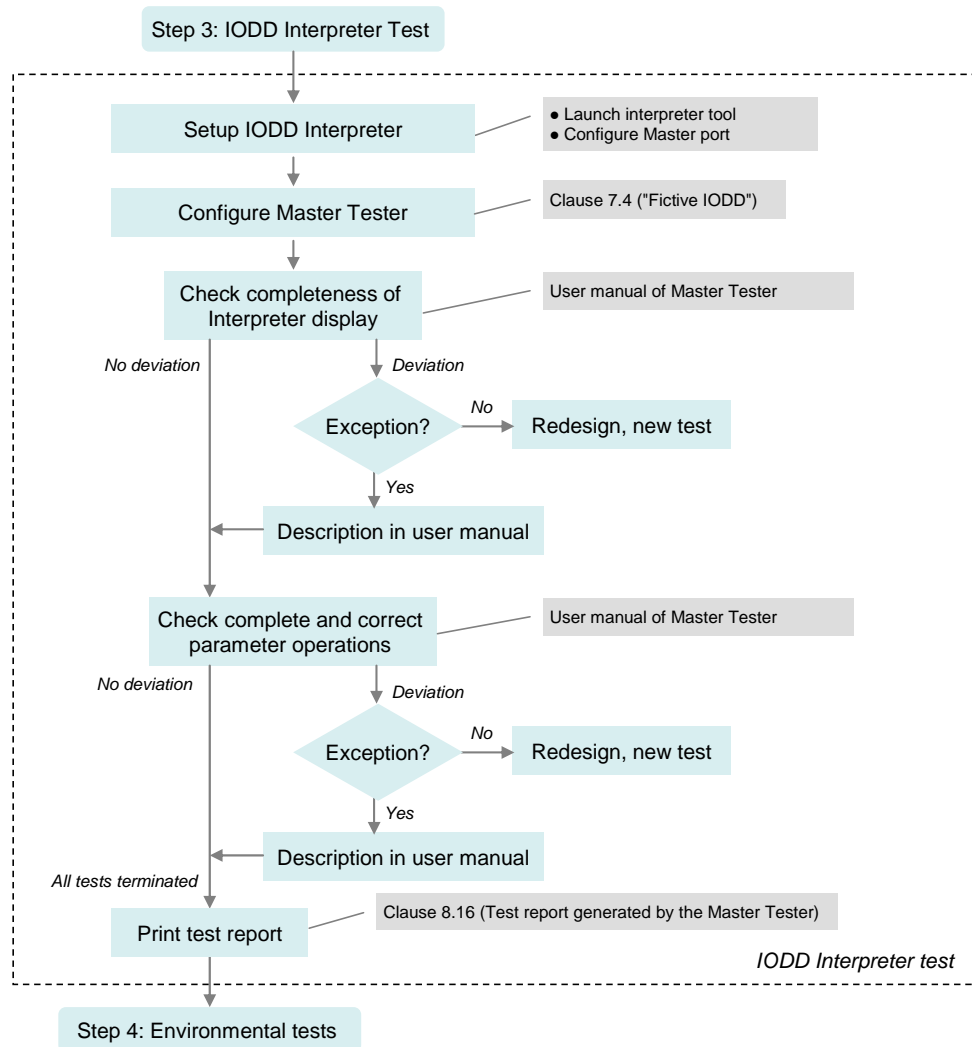
360

361 **Figure 9 – Step 3 of the Master test sequence (Interpreter)**

362 Figure 10 shows step 4 of the Master test. It contains references to the relevant clauses in
363 this specification and consists of an EMC test defined in [9] and possible tests according to

364 relevant product standards such as for example the IEC 61131-2. A successfully terminated
365 Master test can be completed by a manufacturer declaration as defined in [9].
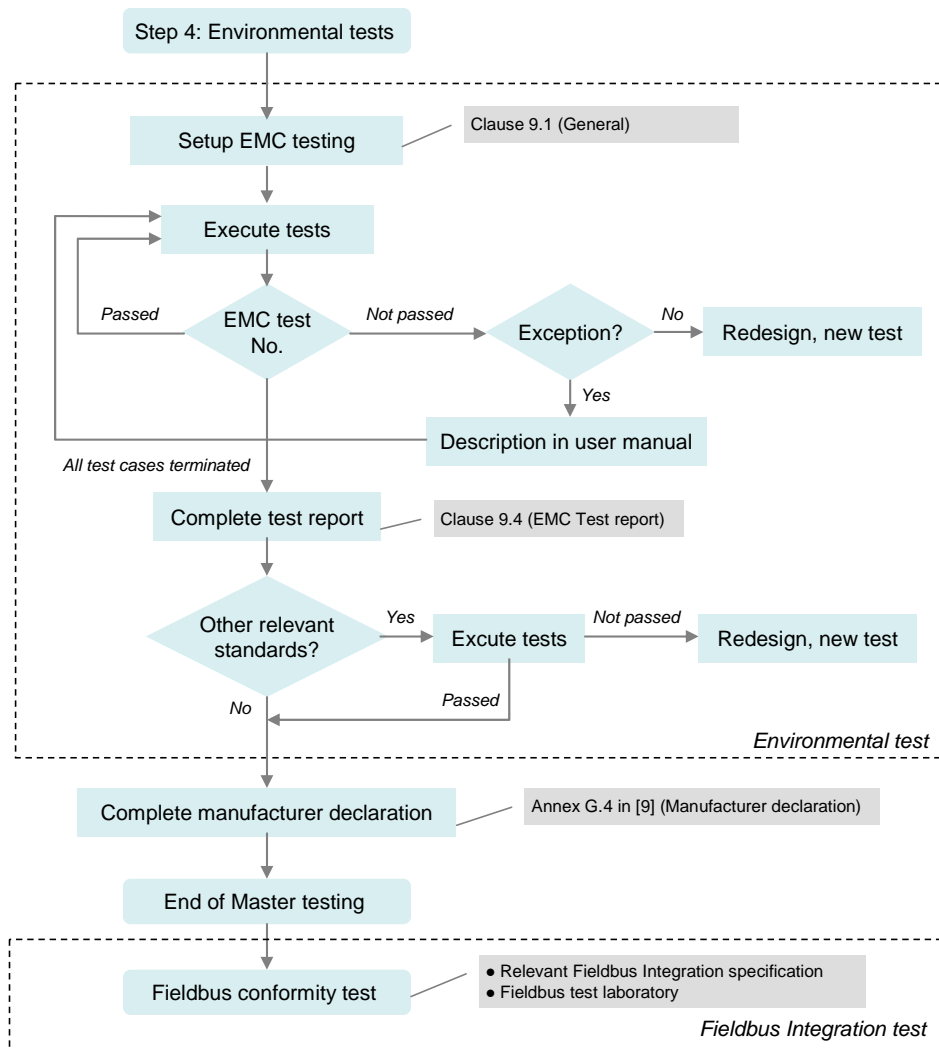
366

367   **Figure 10 – Step 4 of the Master test sequence (environment)**

368 **5   Physical Layer (PL) tests**

369 **5.1   General**

370 The physical layer tests comprise a visual inspection of the type of connector, cable, maxi-
371 mum cable length and color coding of the wires. If customer specific or region specific con-
372 nectors, cable, and the color coding of the wires deviate from the specifications in [9], the
373 user manual of the Device shall document clearly the differences in comparison with the defi-
374 nitions in the standard.

375 The physical layer tests comprise also measurements of voltage levels and currents as well
376 as timing limits, slopes and line and message signals. The necessary measurement instru-
377 ments are defined in Annex A.1.1 and the necessary measurement circuits are defined in An-
378 nex A.1.2.

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

382   ## 5.2   Static parameters of the Master interface

383   ### 5.2.1   DC supply current capability of Master L+ port

384   Table 9 defines the test conditions for this test case.

385   **Table 9 – DC supply current capability of Master L+ port**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0001
Name	TCM_PHYL_INTF_ISM
Purpose (short)	Test of DC supply current capability at Master port
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.3, Table 6
Configuration / setup	The supply current at the Master port is monitored.
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Driver capability of the Master port L+ supply. Monitor supply current drawn from the Master port.
Precondition	Master port set to SIO mode. L+ supply is switched on.
Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master b) Apply maximum dc supply current load (current sink 200 mA) to L+ terminal c) Monitor current ISM from L+ terminal d) Check if ISM is constantly flowing for 30 s e) Repeat test with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	The supply current shall not be interrupted by the Master.
Test passed	Current ISM is constantly flowing
Test failed (examples)	Current ISM is interrupted
Results	ISM capability (VSM = 20 V): <pass/fail> ISM capability (VSM = 30 V): <pass/fail>

386 (spans the upper portion of the table)
387 (spans the lower portion of the table)

388

389   ### 5.2.2   Power-On supply current capability of Master L+ port

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

391   **Table 10 – Power-On supply current capability of Master L+ port**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0002
Name	TCM_PHYL_INTF_ISIRM
Purpose (short)	Test of power-on / port turn-on supply current capability at Master port
Equipment under test (EUT)	Master and Legacy Master (see B.2).
Test case version	1.0
Category / type	Master Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.3, Table 6
Configuration / setup	The supply current at the Master port is monitored

392

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Driver capability of the Master port L+ supply at power-on or switch-on of Port L+ line. Monitor supply current drawn from the Master port.
Precondition	Master port in SIO mode
Procedure	a) Apply resistive load for minimum ISIRM supply current (400 mA) to L+ terminal b) Apply minimum voltage for power supply of the Master (VSM = 20 V) c) Monitor current ISIRM from L+ terminal d) Check if ISIRM is flowing for a minimum of 50 ms e) Repeat test with maximum voltage (VSM = 30 V) and an appropriate load
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	The supply current shall not be interrupted by the Master.
Test passed	Current ISIRM is flowing for a minimum of 50 ms after switching-on power supply
Test failed (examples)	Current ISIRM is interrupted before 50 ms after switching-on power supply (see B.2).
Results	ISM capability (VSM = 20 V): <pass/fail> ISM capability (VSM = 30 V): <pass/fail>

393

394

5.2.3   Load current at Master C/Q port

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

397   **Table 11 – Load current at Master C/Q port**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0003
Name	TCM_PHYL_INTF_ILLM
Purpose (short)	Test of load current at C/Q of Master port
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.3, Table 5
Configuration / setup	The input current at C/Q at the Master port is monitored
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Load or discharge current at the Master port C/Q output in input mode. Monitor current flowing into C/Q terminal.
Precondition	Master port set SIO mode – digital input
Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master b) Apply voltage VIM at C/Q terminal of 5 V c) Measure current ILLM into C/Q d) Check whether ILLM is below 15 mA e) Apply voltage VIM at C/Q terminal of 5,1 V f) Measure current ILLM into C/Q g) Check whether ILLM is between 5 mA and 15 mA h) Apply voltage VIM at C/Q terminal of 15 V i) Measure current ILLM into C/Q j) Check whether ILLM is between 5 mA and 15 mA k) Apply voltage VIM = VSM at C/Q terminal l) Measure current ILLM into C/Q m) Check whether ILLM is between 5 mA and 15 mA n) Repeat test with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-

398

399

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The supply current shall not exceed specified limits.
Test passed	Current ILLM is ≤ 15 mA Current ILLM is ≥ 5 mA for VIM = 5,1 V, 15 V, and VSM
Test failed (examples)	Current ILLM is > 15 mA Current ILLM is < 5 mA for VIM = 5,1 V, 15 V, and VSM
Results	ILLM (VIM = 5 V, VSM = 20 V): <value> <pass/fail> ILLM (VIM = 5,1 V, VSM = 20 V): <value> <pass/fail> ILLM (VIM = 15 V, VSM = 20 V): <value> <pass/fail> ILLM (VIM = VSM = 20 V): <value> <pass/fail> ILLM (VIM = 5 V, VSM = 30 V): <value> <pass/fail> ILLM (VIM = 5,1 V, VSM = 30 V): <value> <pass/fail> ILLM (VIM = 15 V, VSM = 30 V): <value> <pass/fail> ILLM (VIM = VSM = 30 V): <value> <pass/fail>

400

5.2.4 High-side residual voltage at Master C/Q port

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

403 **Table 12 – High-side residual voltage at Master C/Q port**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0004
Name	TCM_PHYL_INTF_VREShigh
Purpose (short)	Test of static high-side driver capability
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.3, Table 5
Configuration / setup	The output level at the Master C/Q output is measured.
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Driver capability of the Master port high-side driver. Measurement of the voltage drop between positive supply L+ and C/Q output.
Precondition	Master set to SIO mode – digital output C/Q output is high
Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master b) Apply maximum DC driver load (current sink - Master specification) to C/Q c) Measure voltage VRQHM between positive supply L+ and C/Q d) Check whether VRQHM is lower than the limit of 3 V e) Repeat test with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	The output level shall be within specified limits.
Test passed	Voltage VRQHM less than or equal specification value (≤ 3,0 V)
Test failed (examples)	Voltage VRQHM greater than specification value (> 3,0 V)
Results	VRQHM (VSM = 20 V): <value> VRQHM (VSM = 30 V): <value>

406

5.2.5 Low-side residual voltage at Master C/Q port

408 Table 13 defines the test conditions for this test case.

409 **Table 13 – Low-side residual voltage at Master C/Q port**

410

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0005
Name	TCM_PHYL_INTF_VRESLOW
Purpose (short)	Test of static low-side driver capability
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.3, Table 6
Configuration / setup	The output level at the Master C/Q output is measured.
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Driver capability of the Master port low-side driver. Measurement of the voltage drop between C/Q output and negative supply L-.
Precondition	a) Master set to SIO mode – digital output b) C/Q output is low
Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master b) Apply maximum DC driver load (current source - Master specification) to C/Q c) Measure voltage VRQLM between negative supply L- and C/Q d) Check whether VRQLM is lower than the limit of 3 V e) Repeat test with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	The output level shall be within specified limits.
Test passed	Voltage VRQLM less than or equal specification value (≤ 3,0 V)
Test failed (examples)	Voltage VRQLM greater than specification value (> 3,0 V)
Results	VRQLM (VSM = 20 V): <value> VRQLM (VSM = 30 V): <value>

411

412

413 **5.2.6   High-level input threshold voltage at Master C/Q port**

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

415 **Table 14 – High-level input threshold voltage at Master C/Q port**

416

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0006
Name	TCM_PHYL_INTF_VTHHM
Purpose (short)	Test of static input high-level threshold at C/Q
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.2, Table 4
Configuration / setup	The digital input signal for C/Q input is monitored
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Measurement of the threshold voltage for high-level at the C/Q terminal.
Precondition	Master set to SIO mode – digital input
Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master

TEST CASE	CONDITIONS / PERFORMANCE
	b) Sweep voltage VIM at C/Q from 5 V to 15 V c) Monitor digital input signal from C/Q d) Measure VIM for transition of digital input signal 'low'→'high' e) Repeat test with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	The input signal transition shall be 'low'→'high'
Test passed	Voltage VIM within specification value of VTHHM (10,5 to 13,0 V)
Test failed (examples)	Voltage VIM outside specification value of VTHHM (10,5 to 13,0 V)
Results	VIM@VTHHM (VSM = 20 V): <value> VIM@VTHHM (VSM = 30 V): <value>

417

418

5.2.7   Low-level input threshold voltage at Master C/Q port

419

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

421   **Table 15 – Low-level input threshold voltage at Master C/Q port**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0007
Name	TCM_PHYL_INTF_VTHLM
Purpose (short)	Test of static input low-level threshold at C/Q
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.2, Table 4
Configuration / setup	The digital input signal for C/Q input is monitored
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Measurement of the threshold voltage for low-level at the C/Q terminal.
Precondition	Master set to SIO mode – digital input
Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master b) Sweep voltage VIM at C/Q from 15 V to 5 V c) Monitor digital input signal from C/Q d) Measure VIM for transition of digital input signal 'high'→'low' e) Repeat test with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	The input signal transition shall be 'high'→'low'
Test passed	Voltage VIM within specification value of VTHLM (8,0 to 11,5 V)
Test failed (examples)	Voltage VIM outside specification value of VTHLM (8,0 to 11,5 V)
Results	VIM@VTHLM (VSM = 20 V): <value> VIM@VTHLM (VSM = 30 V): <value>

422

423

424

5.2.8   Input hysteresis voltage at Master C/Q port

425

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

427   **Table 16 – Input hysteresis voltage at Master C/Q port**

428

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0008
Name	TCM_PHYL_INTF_VHYSM
Purpose (short)	Calculation of input hysteresis at C/Q
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.2, Table 4
Configuration / setup	Comparison of values from SDCI_TC_0006 and SDCI_TC_0007
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Calculation of the hysteresis voltage at the C/Q terminal.
Precondition	Test T_PHY_MST_VTHHM passed Test T_PHY_MST_VTHLM passed
Procedure	-
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	VHYSM = value(T_PHY_MST_VTHHM) - value(T_PHY_MST_VTHLM)
Test passed	Voltage VHYSM is ≥ 0 V
Test failed (examples)	Voltage VHYSM is < 0 V
Results	VHYSM (VSM = 20 V): <value> VHYSM (VSM = 30 V): <value>

429

430

431   **5.2.9   High-side peak current capability at Master C/Q port**

432   Table 17 defines the test conditions for this test case.

433   **Table 17 – High-side peak current capability at Master C/Q port**

434

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0009
Name	TCM_PHYL_INTF_IQPKHM
Purpose (short)	Test of high-side peak current driver capability
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.3, Table 5
Configuration / setup	The output level at the Master C/Q output is measured.
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Peak current driver capability of the Master port high-side driver (wake-up request). Measurement of the voltage between negative supply L- and C/Q output. The driver shall drive a defined resistive load to a voltage level greater than the input high threshold level.
Precondition	Master set to SIO mode
Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master b) Apply an equivalent resistive load Rload between C/Q and L-: Rload = VTHHDmax / IQPKMmin;

TEST CASE	CONDITIONS / PERFORMANCE
	Rload = 13 V / 0,5 A = 26 Ohm (51 Ohm shunted by 51 Ohm) c) Set Master to IO-Link-Mode (generate WURQ) d) Measure voltage VIM between negative supply L- and C/Q at TWU_{min} = 75 µs after voltage has exceeded the 13 V threshold d) Check whether VIM is greater than the maximum limit of VTHHD (> 13 V) e) Repeat test with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The output level shall be within specified limits.
Test passed	Voltage VIM greater than or equal specification value of VTHHDmax (≥ 13,0 V)
Test failed (examples)	Voltage VIM less than specification value of VTHHDmax (< 13,0 V)
Results	VIM (VSM = 20 V): <value> VIM (VSM = 30 V): <value>

5.2.10 Low-side peak current capability at Master C/Q port

Table 18 defines the test conditions for this test case.

Table 18 – Low-side peak current capability at Master C/Q port

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0010
Name	TCM_PHYL_INTF_IQPKLM
Purpose (short)	Test of low-side peak current driver capability
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.3, Table 5
Configuration / setup	The output level at the Master C/Q output is measured.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Peak current driver capability of the Master port low-side driver (wake-up request). Measurement of the voltage between negative supply L- and C/Q output. The driver shall drive a defined resistive load to a voltage level less than the input low threshold level.
Precondition	Master set to SIO mode

Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master
	b) Apply an equivalent resistive load Rload between C/Q and L+:
	  Rload = (VSM-VTHLDmin) / IQPKMmin;
	  VSM = 20 V: Rload = 12 V / 0,5 A = 24 Ohm (47 Ohm shunted by 51 Ohm)
	  VSM = 30 V: Rload = 22V / 0,5 A = 44 Ohm (82 Ohm shunted by 100 Ohm)
	c) Set Master to IO-Link-Mode (generate WURQ)
	d) Measure voltage VIM between negative supply L- and C/Q at TWU_{min} = 75 µs after voltage has dropped below the 8 V threshold
	d) Check whether VIM is less than the minimum limit of VTHLD (< 8 V)
	e) Repeat test with maximum supply voltage (VSM = 30 V)

Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The output level shall be within specified limits.
Test passed	Voltage VIM less than or equal specification value of VTHLD$_{min}$ (≤ 8,0 V)

TEST CASE RESULTS	CHECK / REACTION
Test failed (examples)	Voltage VIM greater than specification value of $VTHLD_{min}$ (> 8,0 V)
Results	VIM (VSM = 20 V): <value> VIM (VSM = 30 V): <value>

442

5.3   Static parameters of the Device interface

5.3.1   Power supply current consumption of the Device

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

446   **Table 19 – Power supply current consumption of the Device**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0011
Name	TCD_PHYL_INTF_ISD
Purpose (short)	Test of static power supply current consumption
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.3, Table 6
Configuration / setup	The supply current at the Device C/Q L+ terminal is measured.
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Static worst case current consumption of the Device (only applicable to Devices without auxiliary power supply).
Precondition	Device is set to Device specific mode with maximum current consumption. Device is set to SDCI Mode (cyclic operation with MinCycleTime)
Procedure	a) Apply minimum supply voltage (VSD = 18 V) to the Device b) Set Device to SIO mode c) Measure current at L+ terminal ISDSIOmax d) Check whether ISDSIOmax is lower than the limit of 200 mA e) Set Device to SDCI mode (OPERATE mode with MinCycleTime) f) Measure current at L+ terminal ISDIOLmax g) Check whether ISDIOLmax is lower than the limit of 200 mA h) Repeat test with maximum supply voltage (VSD = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	The current shall not exceed the limits specified in [9] for the Master
Test passed	Current ISDSIOmax and ISDIOLmax ≤ specified value (200 mA)
Test failed (examples)	Current ISDSIOmax and ISDIOLmax ≥ specified value (200mA)
Results	ISDSIOmax (VSD = 18 V): <value> ISDIOLmax (VSD = 30 V): <value>

447 / 448

449

5.3.2   Power-on behavior of the Device

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

452   **Table 20 – Power-on behavior of the Device**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0012

453

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Name	TCD_PHYL_INTF_ISIRD
Purpose (short)	Test of power-on current consumption and behavior
Equipment under test (EUT)	Device and Legacy-Device (see B.3)
Test case version	1.0
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.3, Table 6 and 5.4.1, Table 10
Configuration / setup	The Device is powered by a supply defined by the Master parameter ISIRM.

454

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Device behaviour at power-on is verified with worst-case power supply according to Master specification ISIRM (only applicable to Devices without auxiliary power supply).
Precondition	Device is powered off and attached to a current supply, which simulates the minimum requirements for a Master port.
Procedure	a) Turn on power supply (VSD = 18 V) with attached Device b) Monitor current at L+ terminal ISDmax c) Check whether ISDmax(50 ms) is lower than the limit of 200 mA after 50 ms d) Check whether Device is functional according to the Device's specific default power-on operation after 300 ms e) Repeat test with maximum supply voltage (VSD = 30 V)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The Device shall start-up into its default power-on operation.
Test passed	Current ISDmax (50 ms) is ≤ specified value for ISM (200 mA) and Device is in power-on default operation
Test failed (examples)	Current ISDmax(50ms) is > specified value for ISM (200 mA) or Device is not in power-on default operation (see B.3)
Results	ISDmax(50 ms) (VSD = 18 V): <value> Power-On default operation (VSD = 18 V): <pass/fail> ISDmax(50 ms) (VSD = 30 V): <value> Power-On default operation (VSD = 30 V): <pass/fail>

455

456 **5.3.3   High-side residual voltage at Device C/Q port**

457   Table 21 defines the test conditions for this test case. This test case is only applicable for De-
458   vices with SIO mode or Devices where the output driver can be stimulated as if in SIO mode
459   (e.g. via ASICs).

460   **Table 21 – High-side residual voltage at Device C/Q port**

461

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0013
Name	TCD_PHYL_INTF_VRESHIGH
Purpose (short)	Test of static high-side driver capability
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.4, Table 7
Configuration / setup	The output level at the Device C/Q output is measured.

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Driver capability of the Device high-side driver (only applicable for Devices with SIO-Mode). Measurement of the voltage drop between positive supply L+ and C/Q output.
Precondition	Device is set to SIO mode; C/Q output is high.
Procedure	a) Apply minimum supply voltage (VSD = 18 V) to Device b) Apply minimum DC driver load (current sink 50 mA) to C/Q c) Measure voltage VRQHD between positive supply L+ and C/Q d) Check whether VRQHD is lower than the limit of 3 V e) Repeat test with maximum supply voltage (VSD = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	The output level shall be within specified limits.
Test passed	Voltage VRQHD ≤ specified value (3,0 V)
Test failed (examples)	Voltage VRQHD > specified value (3,0 V)
Results	VRQHD (VSD = 18 V): <value> VRQHD (VSD = 30 V): <value>

462

463

5.3.4   Low-side residual voltage at Device C/Q port

464

465 Table 22 defines the test conditions for this test case. This test case is only applicable for De-
466 vices with SIO mode or Devices where the output driver can be stimulated as if in SIO mode
467 (e.g. via ASICs).

468 **Table 22 – Low-side residual voltage at Device C/Q port**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0014
Name	TCD_PHYL_INTF_VRESLOW
Purpose (short)	Test of static low-side driver capability
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.4, Table 7
Configuration / setup	The output level at the Device C/Q output is measured.
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Driver capability of the Device low-side driver (only applicable for Devices with SIO-Mode and/or with push-pull output). Measurement of the voltage drop between C/Q output and negative supply L-.
Precondition	Device set to SIO-Mode; C/Q output is low.
Procedure	a) Apply minimum supply voltage (VSD = 18 V) to Device b) Apply minimum DC driver load (current source 50 mA) to C/Q c) Measure voltage VRQLD between negative supply L- and C/Q d) Check whether VRQLD is lower than the limit of 3 V e) Repeat test with maximum supply voltage (VSD = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	The output level shall be within specified limits.
Test passed	Voltage VRQLD ≤ specified value (3,0 V)

469

470

TEST CASE RESULTS	CHECK / REACTION
Test failed (examples)	Voltage VRQLD > specified value (3,0 V)
Results	VRQLD (VSD = 18 V): <value> VRQLD (VSD = 30 V): <value>

471

5.3.5 Pull-down or residual current at C/Q port

473 Table 23 defines the test conditions for this test case.

474 **Table 23 – Pull-down or residual current at C/Q port**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0015
Name	TCD_PHYL_INTF_IQQD
Purpose (short)	Test of static residual current
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.4, Table 7
Configuration / setup	Current measurements at C/Q terminal in receive mode or the output driver being disabled.
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The current flowing into C/Q is measured with the C/Q output being in receive mode or the output driver being disabled.
Precondition	Device C/Q port is set to a receive mode or inactive mode
Procedure	a) Apply minimum supply voltage (VSD = 18 V) to Device b) Apply test voltage to C/Q of input threshold high voltage (VTHHD = 13 V) c) Measure current flowing at C/Q port IQQD d) Check whether IQQD is lower than the limit of 15 mA e) Repeat test with maximum supply voltage (VSD = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	The residual current shall be within specified limits.
Test passed	Current IQQD ≤ specified value (15 mA)
Test failed (examples)	Current IQQD > specified value (15 mA)
Results	IQQD (VSD = 18 V): <value> IQQD (VSD = 30 V): <value>

477

5.3.6 High-level input threshold voltage at Device C/Q port

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

480 **Table 24 – High-level input threshold voltage at Device C/Q port**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0016
Name	TCD_PHYL_INTF_VTHHD
Purpose (short)	Test of statical input high-level threshold at C/Q
Equipment under test (EUT)	Device and Legacy-Device

481

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Test case version	1.0
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.2, Table 5
Configuration / setup	-
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Measurement of the threshold voltage for high-level at the C/Q terminal. The digital input signal for C/Q input is monitored. The test input signal / indicator transition shall be 'low'→'high'. This test is only applicable for Devices with physical layer test mode.
Precondition	Device set to PL test mode – digital input
Procedure	a) Apply minimum supply voltage (VSD = 18 V) to Device b) Sweep voltage VID at C/Q from 5 V to 15 V c) Monitor test input signal / indicator derived from input signal at C/Q d) Measure VID for transition of test signal 'low'→'high' e) Repeat test with maximum supply voltage (VSD = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	-
Test passed	Voltage VID within specification value of VTHHD (10,5 to 13,0 V)
Test failed (examples)	Voltage VID outside specification value of VTHHD (10,5 to 13,0 V)
Results	VID@VTHHD (VSD = 18 V): <value>, <pass/fail> VID@VTHHD (VSD = 30 V): <value>, <pass/fail>

482

483

484   **5.3.7   Low-level input threshold voltage at Device C/Q port**

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

486   **Table 25 – Low-level input threshold voltage at Device C/Q port**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0017
Name	TCD_PHYL_INTF_VTHLD
Purpose (short)	Test of statical input low-level threshold at C/Q
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.2, Table 5
Configuration / setup	-
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Measurement of the threshold voltage for low-level at the C/Q terminal. The test input signal / indicator for C/Q input is monitored. The input signal transition shall be 'high'→'low'. This test is only applicable for Devices with physical layer test mode.
Precondition	Device set to PL test mode – digital input
Procedure	a) Apply minimum supply voltage (VSD = 18 V) to Device b) Sweep voltage VID at C/Q from 15 V to 5 V c) Monitor test input signal / indicator derived from input signal at C/Q d) Measure VID for transition of digital input signal 'high'→'low' e) Repeat test with maximum supply voltage (VSD = 30 V)
Input parameter	-

487

488

TEST CASE	CONDITIONS / PERFORMANCE
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Voltage VID within specification value of VTHLD (8,0 to 11,5 V)
Test failed (examples)	Voltage VID outside specification value of VTHLD (8,0 to 11,5 V)
Results	VID@VTHLD (VSD = 18 V): <value> VID@VTHLD (VSD = 30 V): <value>

489

5.3.8   Input hysteresis voltage at Device C/Q port

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

492   **Table 26 – Input hysteresis voltage at Device C/Q port**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0018
Name	TCD_PHYL_INTF_VHYSD
Purpose (short)	Calculation of input hysteresis at C/Q
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.2, Table 5
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Calculation of the hysteresis voltage at the C/Q terminal via the values of TCD_PHYL_INTF_VTHHD and TCD_PHYL_INTF_VTHLD. This test is only applicable for Devices with physical layer test mode.
Precondition	a) Test TCD_PHYL_INTF_VTHHD (SDCI_TC_0016) passed b) Test TCD_PHYL_INTF_VTHLD (SDCI_TC_0017) passed
Procedure	-
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	VHYSD = value(TCD_PHYL_INTF_VTHHD) - value(TCD_PHYL_INTF_VTHLD)
Test passed	Voltage VHYSD is greater than or equal 0 V
Test failed (examples)	Voltage VHYSD is less than 0 V
Results	VHYSD (VSD = 18 V): <value> VHYSD (VSD = 30 V): <value>

495

5.3.9   High-side DC driver limit at Device C/Q port

497   Table 27 defines the test conditions for this test case. This test case is only applicable for De-
498   vices with SIO mode or Devices where the output driver can be stimulated as if in SIO mode
499   (e.g. via ASICs).

500   **Table 27 – High-side DC driver limit at Device C/Q port**

501

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0019
Name	TCD_PHYL_INTF_IQHD
Purpose (short)	Test of statical high-side driver capability limit
Equipment under test (EUT)	Device and Legacy-Device with SIO mode
Test case version	1.0
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.4, Table 7
Configuration / setup	-

502

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Driver capability limit of the Device high-side driver. Measurement of the current flowing out of the C/Q output. The output current shall not statically flow. This test is only applicable for Devices with SIO-Mode.
Precondition	a) Device set to SIO mode b) C/Q output is high
Procedure	a) Apply minimum supply voltage (VSD = 18 V) to Device b) Apply maximum DC driver load (current sink > 500 mA) to C/Q c) Measure current IQHD at C/Q output d) Check if IQHD is exceeding the specified limit e) Repeat test with maximum supply voltage (VSD = 30 V)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Current IQHD is less than or equal the driver limit (DC current ≤ 500mA)
Test failed (examples)	Current IQHD is greater than driver limit (DC current > 501 mA)
Results	IQHD (VSD = 18 V): <passed/failed> IQHD (VSD = 30 V): <passed/failed>

503

504   5.3.10   Low-side DC driver limit at Device C/Q port

505   Table 28 defines the test conditions for this test case. This test case is only applicable for De-
506   vices with SIO mode or Devices where the output driver can be stimulated as if in SIO mode
507   (e.g. via ASICs).

508   **Table 28 – Low-side DC driver limit at Device C/Q port**

509

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0020
Name	TCD_PHYL_INTF_IQLD
Purpose (short)	Test of statical low-side driver capability limit
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Physical Layer; test to pass (positive testing)
Specification (clause)	[9], see 5.3.2.4, Table 7
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Driver capability limit of the Device low-side driver. The output current at the Device

TEST CASE	CONDITIONS / PERFORMANCE
	C/Q port is measured. The specified output current limit shall not be exceeded. This test is only applicable for Devices with SIO-Mode.
Precondition	a) Device set to SIO mode b) C/Q output is low
Procedure	a) Apply minimum supply voltage (VSD = 18 V) to Device b) Apply maximum DC driver load (current source > 500 mA) to C/Q c) Measure current IQLD at C/Q output d) Check if IQLD is exceeding the specified limit e) Repeat test with maximum supply voltage (VSD = 30 V)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Current IQLD is less than or equal to the driver limit (DC current ≤ 500 mA)
Test failed (examples)	Current IQLD is greater than the driver limit (DC current > 500mA)
Results	IQLD (VSD = 18 V): <passed/failed> IQLD (VSD = 30 V): <passed/failed>

510

511

5.4 Wake-Up generation of the Master interface

512

5.4.1 Wake-Up current pulse high

513

514 Table 29 defines the test conditions for this test case.

515 **Table 29 – Wake-Up current pulse high**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0021
Name	TCM_PHYL_INTF_IQWUH
Purpose (short)	Driver capability of the wake-up pulse – high-side driver
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.3, Table 8
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Master shall drive the resistive load above the threshold high level of a receiver. Measure pulse voltage at Master C/Q port with Master configured for SDCI. The pulse voltage is measured with a resistive load applied between C/Q and L-.
Precondition	Master configured to SDCI mode
Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master b) Apply resistive load Rload between C/Q and L-: Rload = $VTHHM_{max}$ / $IQPKHM_{min}$ ≈ 26 Ohm (51 Ohm shunted by 51 Ohm) c) Trigger on wake-up request d) Measure voltage at C/Q port during wake-up request d) Check if VIM is exceeding $VTHHM_{max}$ e) Repeat test with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-

516

517

TEST CASE RESULTS	CHECK / REACTION
Test passed	Level at C/Q during wake-up request greater than or equal $VTHHM_{max}$
Test failed (examples)	Level at C/Q during wake-up request less than $VTHHM_{max}$
Results	VIM@WURQ (VSM = 18 V): <value> VIM@WURQ (VSM = 30 V): <value>

518

5.4.2   Wake-Up pulse duration high

520   Table 30 defines the test conditions for this test case.

521   **Table 30 – Wake-Up pulse duration high**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0022
Name	TCM_PHYL_INTF_TWUH
Purpose (short)	Wake-Up pulse duration (high pulse)
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.3 Table 8
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Master shall drive the resistive load below the threshold low level of a receiver. Measure the wake-up pulse duration at Master C/Q port with the Master configured to SDCI. The pulse time is measured with a resistive load applied between C/Q and L-. The pulse time is measured at the extreme position of the thresholds.
Precondition	Master configured to SDCI mode

Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master
	b) Apply resistive load Rload between C/Q and L-:
	    Rload = $VTHHM_{max}$ / $IQPKHM_{min}$ ≈ 26 Ohm (51 Ohm shunted by 51 Ohm)
	c) Trigger on wake-up request
	d) Measure pulse duration TWUH of wake-up request at C/Q port
	    - $TWUH_{min}$: start @ VIM=$VTHHM_{max}$, stop @ VIM=$VTHLM_{max}$
	    - $TWUH_{max}$: start @ VIM=$VTHHM_{min}$, stop @ VIM=$VTHLM_{min}$
	d) Check if $TWUH_{min/max}$ is within specified limits
	e) Repeat test with maximum supply voltage (VSM = 30 V)

Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Pulse duration of wake-up request within specified value range (≥ 75 µs, ≤ 85 µs)
Test failed (examples)	Pulse duration of wake-up request outside specified value range (< 75 µs, > 85 µs)
Results	TWUH@WURQ (VSM = 20 V): <value min/max> TWUH@WURQ (VSM = 30 V): <value min/max>

524

5.4.3   Wake-Up current pulse low

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

527

Table 31 – Wake-Up current pulse low

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0023
Name	TCM_PHYL_INTF_IQWUL
Purpose (short)	Drive capability of the wake-up pulse – low-side driver
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.3 Table 8
Configuration / setup	-
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The Master shall drive the resistive load below the threshold low level of a receiver. Measure pulse voltage at Master C/Q port with Master configured to SDCI. The pulse voltage is measured with a resistive load applied between C/Q and L+.
Precondition	Master configured to SDCI mode

Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master
	b) Apply resistive load Rload between C/Q and L+:
	    Rload = (VSM - $VTHLM_{min}$) / $IQPKLM_{min}$ ≈ *24 Ohm (47 Ohm shunted by 51 Ohm)*
	c) Trigger on wake-up request
	d) Measure voltage at C/Q port during wake-up request
	d) Check if VIM is below $VTHLM_{min}$
	e) Repeat test with maximum supply voltage (VSM = 30 V) to Master:
	    Rload ≈ *44 Ohm (82 Ohm shunted by 100 Ohm)*

Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	-
Test passed	Level at C/Q during wake-up request less than or equal $VTHLM_{min}$
Test failed (examples)	Level at C/Q during wake-up request greater than $VTHLM_{min}$
Results	VIM@WURQ (VSM = 20 V): <value> VIM@WURQ (VSM = 30 V): <value>

528

529

530

531 **5.4.4   Wake-Up pulse duration low**

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

533   **Table 32 – Wake-Up pulse duration low**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0024
Name	TCM_PHYL_INTF_TWUL
Purpose (short)	Wake-Up pulse duration (low pulse)
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.3, Table 8
Configuration / setup	-

534

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Master shall drive the resistive load below the threshold low level of a receiver. Measure the wake-up pulse duration at the Master C/Q port with the Master configured to SDCI. The pulse time is measured with a resistive load applied between C/Q and L+. The pulse time is measured at extreme position of the thresholds.
Precondition	Master configured to SDCI mode
Procedure	a) Apply minimum supply voltage (VSM = 20 V) to Master b) Apply resistive load Rload between C/Q and L+: Rload = (VSM-VTHLM$_{min}$) / IQPKLM$_{min}$ ≈ 24 Ohm (47 Ohm shunted by 51 Ohm) c) Trigger on wake-up request d) Measure pulse duration TWUL of wake-up request at C/Q port - TWUL$_{min}$: start @ VIM=VTHLM$_{min}$, stop @ VIM=VTHHM$_{min}$ - TWUL$_{max}$: start @ VIM=VTHLM$_{max}$, stop @ VIM=VTHHM$_{max}$ d) Check if TWUL$_{min/max}$ is within specified limits e) Repeat test with maximum supply voltage (VSM = 30 V), Rload ≈ 44 Ohm (82 Ohm shunted by 100 Ohm)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Pulse duration of wake-up request within specified value range (≥ 75 µs, ≤ 85 µs)
Test failed (examples)	Pulse duration of wake-up request outside specified value range (< 75 µs, > 85 µs)
Results	TWUL@WURQ (VSM = 20 V): <value min/max> TWUL@WURQ (VSM = 30 V): <value min/max>

535

536

5.5 Wake-Up detection of the Device interface

5.5.1 Wake-Up pulse detection high

Table 33 defines the test conditions for this test case.

Table 33 – Wake-Up pulse detection high

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0025
Name	TCD_PHYL_INTF_TWUH
Purpose (short)	Wake-Up pulse detection capability (high pulse)
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.3, Table 8
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	A wake-up pulse is applied at the Device C/Q port with timing at specified limits. The wake-up request is indicated via a test signal / indicator. The Device reaction is evaluated. This test is only applicable for Devices with physical layer test mode.
Precondition	Device in SIO-mode or after power-on (no communication). C/Q level is brought to low-signal.
Procedure	a) Apply minimum supply voltage (VSD = 18 V) to Master b) Apply current pulse with IQWU = IQPKH$_{min}$ (current source) and of TWU$_{min}$ (75 µs) to C/Q. c) Monitor test signal / indicator at Device d) Check if test signal / indicator indicate a wake-up request e) Repeat test with TWU$_{max}$ (85 µs)

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TEST CASE	CONDITIONS / PERFORMANCE
	f) Repeat test ($TWU_{min/max}$) with maximum supply voltage (VSD = 30 V)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Test signal / indicator indicate a received wake-up request
Test failed (examples)	Test signal / indicator do not indicate a received wake-up request
Results	WURQ (VSD = 18 V): <passed/failed> WURQ (VSD = 30 V): <passed/failed>

543

5.5.2 Wake-Up pulse detection low

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

546 **Table 34 – Wake-Up pulse detection low**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0026
Name	TCD_PHYL_INTF_TWUL
Purpose (short)	Wake-Up pulse detection capability (low pulse)
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.3, Table 8
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	A wake-up pulse is applied at the Device C/Q port with timing at specified limits. The wake-up request is inidicated via a test signal / indicator. The Device reaction is evaluated. This test is only applicable for Devices with SIO-mode and with physical layer test mode.
Precondition	Device in SIO-mode or after power-on (no communication). C/Q level is brought to high-signal.
Procedure	a) Apply minimum supply voltage (VSD = 18 V) to Master b) Apply current pulse with IQWU = $IQPKL_{min}$ (current sink) and of TWU_{min} (75 µs) to C/Q. c) Monitor test signal / indicator at Device d) Check if test signal / indicator indicate a wake-up request e) Repeat test with TWU_{max} (85 µs) f) Repeat test ($TWU_{min/max}$) with maximum supply voltage (VSD = 30 V)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Test signal / indicator indicate a received wake-up request
Test failed (examples)	Test signal / indicator do not indicate a received wake-up request
Results	WURQ (VSD = 18 V): <passed/failed> WURQ (VSD = 30 V): <passed/failed>

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550   **5.5.3   Wake-Up receive enable delay (C/Q high)**

551   Table 35 defines the test conditions for this test case.

552   **Table 35 – Wake-Up receive enable delay (C/Q high)**

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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	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.3, Table 8
Configuration / setup	-

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} < $VTHL_{min}$, *R = 390 Ohm*) b) Apply supply voltage (VSD = 24 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	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Delay time TREN within specified value range (≤ 500 µs)
Test failed (examples)	Delay time TREN outside specified value range (> 500 µs)
Results	TREN @ C/Q=high: <value>

555

556   **5.5.4   Wake-Up receive enable delay (C/Q low)**

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

558   **Table 36 – Wake-Up receive enable delay (C/Q low)**

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	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.3, Table 8

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Configuration / setup	-
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} >VTHH$_{max}$, *R = 470 Ohm*) b) Apply supply voltage (VSD = 24 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$_{max}$ is within specified limits (500 µs)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	-
Test passed	Delay time TREN within specification (<=500us)
Test failed (examples)	Delay time TREN outside specification (>500us)
Results	TREN @ C/Q=low: <value>

561

5.5.5 SDCI readiness delay

563 Table 37defines the test conditions for this test case.

564 **Table 37 – SDCI readiness delay**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0029
Name	TCD_PHYL_INTF_TRDL
Purpose (short)	Test SDCI Receive Enable Delay after Power-On
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 5.4.1, Table 9
Configuration / setup	-
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The Device shall be able to be set to the SDCI mode after the SDCI readiness delay. Measure SDCI readiness delay of the Device after a power-on situation.
Precondition	Master and Device system
Procedure	a) Apply supply voltage (VSD = 24 V) to Device b) Apply a wake-up sequence with a delay of TRDL$_{max}$ after VSD has reached VSD_{min} c) Check if the SDCI mode was entered within the first wake-up sequence
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	SDCI mode was entered
Test failed (examples)	SDCI mode was not entered
Results	SDCI mode @ TRDL: <passed/failed>

567

5.6   Dynamic parameters of the Master and Device interface

5.6.1   Bit eye-diagram with maximum load (Master)

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

571   **Table 38 – Bit eye-diagram with maximum load (Master)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0030
Name	TCM_PHYL_INTF_BITEYEMAXLOAD
Purpose (short)	Eye-diagram of 'low' and 'high' bits
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master physical layer test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.2, Figure 18
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The waveform shall meet the requirements of the eye diagram under maximum line load conditions. Test waveform for bits at the C/Q terminal on the receiver side with a maximum permissible line load applied.
Precondition	Master and Device system
Procedure	a) Attach line simulation (l = 20 m) with maximum load values (C_{max} = 3 nF, R_{max} = 6 Ohm (loop)) b) Attach test Device with COM2 capability and CQD = 10 nF c) Apply minimum supply voltage (VSM = 20 V) d) Set Master to SDCI mode e) Check bit waveform on the receiver side f) Repeat with maximum supply voltage (VSM = 30 V) g) Repeat steps c) to f) with a test Device with COM3 capability and CQD = 1 nF
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Bit waveforms meet requirements of the eye-diagram
Test failed (examples)	Bit waveforms do not meet requirements of the eye-diagram
Results	Bit eye-diagram @ maximum load (VSM = 20 V): <passed/failed> Bit eye-diagram @ maximum load (VSM = 30 V): <passed/failed>

574

5.6.2   Bit eye-diagram with maximum load (Device)

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

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Table 39 – Bit eye-diagram with maximum load (Device)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0294
Name	TCD_PHYL_INTF_BITEYEMAXLOAD
Purpose (short)	Eye-diagram of 'low' and 'high' bits
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device physical layer test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.2, Figure 18
Configuration / setup	-

578

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The waveform shall meet the requirements of the eye diagram under maximum line load conditions. Test waveform for bits at the C/Q terminal on the receiver side with a maximum permissible line load applied.
Precondition	Master and Device system
Procedure	a) Attach line simulation (l = 20 m) with maximum load values (C_{max} = 3 nF, R_{max} = 6 Ohm (loop)) b) Attache test Master with CQD = 1 nF c) Apply minimum supply voltage (VSM = 20 V) c) Set Master to SDCI mode d) Check bit waveform on the receiver side e) Repeat with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-

579

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Bit waveforms meet requirements of the eye-diagram
Test failed (examples)	Bit waveforms do not meet requirements of the eye-diagram
Results	Bit eye-diagram @ maximum load (VSM = 20 V): <passed/failed> Bit eye-diagram @ maximum load (VSM = 30 V): <passed/failed>

580

5.6.3 Bit eye-diagram with minimum load (Master)

581

582 Table 40 defines the test conditions for this test case.

583 **Table 40 – Bit eye-diagram with minimum load (Master)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0031
Name	TCM_PHYL_INTF_BITEYEMINLOAD
Purpose (short)	Eye-diagram of 'low' and 'high' bits
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master physical layer test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.2, Figure 18
Configuration / setup	-

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The waveform shall meet the requirements of the eye-diagram under minimum line load conditions. Test waveform for bits at the C/Q terminal on the receiver side with

TEST CASE	CONDITIONS / PERFORMANCE
	an applied minimum line load.
Precondition	Master and Device system
Procedure	a) Attach line simulation (l = 0,5 m) with minimum load values (C_{max} < 50 pF, R_{max} = 100 mOhm (loop)) b) Attach test Device with CQD < 500 pF c) Apply minimum supply voltage (VSM = 20 V) d) Set Master to SDCI mode e) Check bit waveforms on the receiver side f) Repeat with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Bit waveforms meet requirements of the eye-diagram
Test failed (examples)	Bit waveforms do not meet requirements of the eye-diagram
Results	Bit eye-diagram @ minimum load (VSM = 20 V): <passed/failed> Bit eye-diagram @ minimum load (VSM = 30 V): <passed/failed>

586

5.6.4   Bit eye-diagram with minimum load (Device)

588   Table 40 defines the test conditions for this test case.

589   **Table 41 – Bit eye-diagram with minimum load (Device)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0295
Name	TCD_PHYL_INTF_BITEYEMINLOAD
Purpose (short)	Eye-diagram of 'low' and 'high' bits
Equipment under test (EUT)	Device and Legacy Device
Test case version	1.0
Category / type	Device physical layer test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.2, Figure 18
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The waveform shall meet the requirements of the eye-diagram under minimum line load conditions. Test waveform for bits at the C/Q terminal on the receiver side with an applied minimum line load.
Precondition	Master and Device system
Procedure	a) Attach line simulation (l = 0,5 m) with minimum load values (C_{max} < 50 pF, R_{max} = 100 mOhm (loop)) b) Attach test Master with CQD < 500 pF c) Apply minimum supply voltage (VSM = 20 V) d) Set Master to SDCI mode e) Check bit waveforms on the receiver side f) Repeat with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Bit waveforms meet requirements of the eye-diagram

TEST CASE RESULTS	CHECK / REACTION
Test failed (examples)	Bit waveforms do not meet requirements of the eye-diagram
Results	Bit eye-diagram @ minimum load (VSM = 20 V): <passed/failed> Bit eye-diagram @ minimum load (VSM = 30 V): <passed/failed>

592

5.6.5 UART frame eye-diagram with maximum load (Master)

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

595   **Table 42 – UART frame eye-diagram with maximum load (Master)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0032
Name	TCM_PHYL_INTF_UARTEYEMAXLOAD
Purpose (short)	Eye-diagram of the UART frame
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master physical layer test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.2, Figure 19
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The waveform shall meet the requirements of the eye-diagram under maximum line load conditions. Test waveform for UART frame at the C/Q terminal on the receiver side with an applied maximum permissible line load.
Precondition	Master and Device system
Procedure	a) Attach line simulation (l = 20 m) with maximum load values (C_{max} = 3 nF, R_{max} = 6 Ohm (loop)) b) Attach test Device with COM2 capability and CQD = 10 nF c) Apply minimum supply voltage (VSM = 20 V) d) Set Master to SDCI mode e) Check UART frame waveform on the receiver side f) Repeat with maximum supply voltage (VSM = 30 V) g) Repeat steps c) to f) with a test Device with COM3 capability and CQD = 1 nF
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	-
Test passed	Bit waveforms meet requirements of the eye-diagram
Test failed (examples)	Bit waveforms do not meet requirements of the eye-diagram
Results	UART frame eye-diagram @ maximum load (VSM = 20 V): <passed/failed> UART frame eye-diagram @ maximum load (VSM = 30 V): <passed/failed>

598

5.6.6 UART frame eye-diagram with maximum load (Device)

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

601   **Table 43 – UART frame eye-diagram with maximum load (device)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0296
Name	TCD_PHYL_INTF_UARTEYEMAXLOAD

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Purpose (short)	Eye-diagram of the UART frame
Equipment under test (EUT)	Device and Legacy Device
Test case version	1.0
Category / type	Device physical layer test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.2, Figure 19
Configuration / setup	-
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The waveform shall meet the requirements of the eye-diagram under maximum line load conditions. Test waveform for UART frame at the C/Q terminal on the receiver side with an applied maximum permissible line load.
Precondition	Master and Device system
Procedure	a) Attach line simulation (l = 20 m) with maximum load values (C_{max} = 3 nF, R_{max} = 6 Ohm (loop)) b) Attach test Master with CQD = 1 nF c) Apply minimum supply voltage (VSM = 20 V) d) Set Master to SDCI mode e) Check UART frame waveform on the receiver side f) Repeat with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	-
Test passed	Bit waveforms meet requirements of the eye-diagram
Test failed (examples)	Bit waveforms do not meet requirements of the eye-diagram
Results	UART frame eye-diagram @ maximum load (VSM = 20 V): <passed/failed> UART frame eye-diagram @ maximum load (VSM = 30 V): <passed/failed>

5.6.7   UART frame eye-diagram with minimum load (Master)

Table 44 defines the test conditions for this test case.

Table 44 – UART frame eye-diagram with minimum load (Master)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0033
Name	TCM_PHYL_INTF_UARTEYEMINLOAD
Purpose (short)	Eye-diagram of UART frame
Equipment under test (EUT)	Master and Legacy Master
Test case version	1.0
Category / type	Master physical layer test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.2, Figure 19
Configuration / setup	-
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The waveform shall meet the requirements of the eye-diagram under minimum line load conditions. Test waveform for UART frame at the C/Q terminal on the receiver side with an applied minimum line load.
Precondition	Master and Device system
Procedure	a) Attach line simulation (l = 0,5 m) with minimum load values (C_{max} < 50 pF, R_{max} = 100 mOhm (loop))

TEST CASE	CONDITIONS / PERFORMANCE
	b) Attach test Device with CQD < 500 pF c) Apply minimum supply voltage (VSM = 20 V) d) Set Master to SDCI mode e) Check UART frame waveform on the receiver side f) Repeat with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	-
Test passed	Bit waveforms meet requirements of the eye-diagram
Test failed (examples)	Bit waveforms do not meet requirements of the eye-diagram
Results	UART frame eye-diagram @ minimum load (VSM = 20 V): <passed/failed> UART frame eye-diagram @ minimum load (VSM = 30 V): <passed/failed>

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5.6.8 UART frame eye-diagram with minimum load (Device)

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

613 **Table 45 – UART frame eye-diagram with minimum load (Device)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0297
Name	TCD_PHYL_INTF_UARTEYEMINLOAD
Purpose (short)	Eye-diagram of UART frame
Equipment under test (EUT)	Device and Legacy Device
Test case version	1.0
Category / type	Device physical layer test; test to pass (positive testing)
Specification (clause)	[9], see 5.3.3.2, Figure 19
Configuration / setup	-
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The waveform shall meet the requirements of the eye-diagram under minimum line load conditions. Test waveform for UART frame at the C/Q terminal on the receiver side with an applied minimum line load.
Precondition	Master and Device system
Procedure	a) Attach line simulation (l = 0,5 m) with minimum load values (C_{max} < 50 pF, R_{max} = 100 mOhm (loop)) b) Attach test Master with CQD < 500 pF c) Apply minimum supply voltage (VSM = 20 V) d) Set Master to SDCI mode e) Check UART frame waveform on the receiver side f) Repeat with maximum supply voltage (VSM = 30 V)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	-
Test passed	Bit waveforms meet requirements of the eye-diagram
Test failed (examples)	Bit waveforms do not meet requirements of the eye-diagram
Results	UART frame eye-diagram @ minimum load (VSM = 20 V): <passed/failed> UART frame eye-diagram @ minimum load (VSM = 30 V): <passed/failed>

616

617   **5.7   Test report template for PL tests**

618   Table 46 shows the template for the test report of the Physical Layer tests.

619   **Table 46 – Template for the test report of the Physical Layer tests**

TEST CASE ID	TEST results	Passed Y/N	Statement/ Exception
SDCI_TC_0001	ISM capability (VSM = 20 V): <pass/fail> ISM capability (VSM = 30 V): <pass/fail>		
SDCI_TC_0002	ISM capability (VSM = 20 V): <pass/fail> ISM capability (VSM = 30 V): <pass/fail>		
SDCI_TC_0003	ILLM (VIM = 5 V, VSM = 20 V): <value> ILLM (VIM = 15 V, VSM = 20 V): <value> ILLM (VIM = VSM = 20 V): <value> ILLM (VSM = 30 V): <value> ILLM (VIM = 15 V, VSM = 30 V): <value> ILLM (VIM = VSM = 30 V): <value>		
SDCI_TC_0004	VRQHM (VSM = 20 V): <value> VRQHM (VSM = 30 V): <value>		
SDCI_TC_0005	VRQLM (VSM = 20 V): <value> VRQLM (VSM = 30 V): <value>		
SDCI_TC_0006	VIM@VTHHM (VSM = 20 V): <value> VIM@VTHHM (VSM = 30 V): <value>		
SDCI_TC_0007	VIM@VTHLM (VSM = 20 V): <value> VIM@VTHLM (VSM = 30 V): <value>		
SDCI_TC_0008	VHYSM (VSM = 20 V): <value> VHYSM (VSM = 30 V): <value>		
SDCI_TC_0009	VIM (VSM = 20 V): <value> VIM (VSM = 30 V): <value>		
SDCI_TC_0010	VIM (VSM = 20 V): <value> VIM (VSM = 30 V): <value>		
SDCI_TC_0011	ISDSIOmax (VSD = 18 V): <value> ISDIOLmax (VSD = 30 V): <value>		
SDCI_TC_0012	ISDmax(50 ms) (VSD = 18 V): <value> Power-On default operation (VSD = 18 V): <pass/fail> ISDmax(50 ms) (VSD = 30 V): <value> Power-On default operation (VSD = 30 V): <pass/fail>		
SDCI_TC_0013	VRQHD (VSD = 18 V): <value> VRQHD (VSD = 30 V): <value>		
SDCI_TC_0014	VRQLD (VSD = 18 V): <value> VRQLD (VSD = 30 V): <value>		
SDCI_TC_0015	IQQD (VSD = 18 V): <value> IQQD (VSD = 30 V): <value>		
SDCI_TC_0016	VID@VTHHD (VSD = 18V): <value> VID@VTHHD (VSD = 30V): <value>		
SDCI_TC_0017	VID@VTHLD (VSD = 18V): <value> VID@VTHLD (VSD = 30V): <value>		
SDCI_TC_0018	VHYSD (VSD = 18V): <value> VHYSD (VSD = 30V): <value>		
SDCI_TC_0019	IQHD (VSD = 18V): <passed/failed> IQHD (VSD = 30V): <passed/failed>		
SDCI_TC_0020	IQLD (VSD = 18V): <passed/failed> IQLD (VSD = 30V): <passed/failed>		
SDCI_TC_0021	VIM@WURQ (VSM = 18V): <value> VIM@WURQ (VSM = 30V): <value>		
SDCI_TC_0022	TWUH@WURQ (VSM = 20V): <value min/max> TWUH@WURQ (VSM = 30V): <value min/max>		

TEST CASE ID	TEST results	Passed Y/N	Statement/ Exception
SDCI_TC_0023	VIM@WURQ (VSM = 20V): <value> VIM@WURQ (VSM = 30V): <value>		
SDCI_TC_0024	TWUL@WURQ (VSM = 20V): <value min/max> TWUL@WURQ (VSM = 30V): <value min/max>		
SDCI_TC_0025	WURQ (VSD = 18V): <passed/failed> WURQ (VSD = 30V): <passed/failed>		
SDCI_TC_0026	WURQ (VSD = 18V): <passed/failed> WURQ (VSD = 30V): <passed/failed>		
SDCI_TC_0027	TREN@C/Q=high: <value>		
SDCI_TC_0028	TREN@C/Q=low: <value>		
SDCI_TC_0029	SDCI mode@TRDL: <passed/failed>		
SDCI_TC_0030	Bit eye-diagram max load (VSM=20V): <passed/failed> Bit eye-diagram max load (VSM=30V): <passed/failed>		
SDCI_TC_0294	Bit eye-diagram max load (VSM=20V): <passed/failed> Bit eye-diagram max load (VSM=30V): <passed/failed>		
SDCI_TC_0031	Bit eye-diagram min load (VSM=20V): <passed/failed> Bit eye-diagram min load (VSM=30V): <passed/failed>		
SDCI_TC_0295	Bit eye-diagram min load (VSM=20V): <passed/failed> Bit eye-diagram min load (VSM=30V): <passed/failed>		
SDCI_TC_0032	UART frame eye-dia. max load (VSM=20V): <passed/failed> UART frame eye-dia. max load (VSM=30V): <passed/failed>		
SDCI_TC_0296	UART frame eye-dia. max load (VSM=20V): <passed/failed> UART frame eye-dia. max load (VSM=30V): <passed/failed>		
SDCI_TC_0033	UART frame eye-dia. min load (VSM=20V): <passed/failed> UART frame eye-dia. min load (VSM=30V): <passed/failed>		
SDCI_TC_0297	UART frame eye-dia. min load (VSM=20V): <passed/failed> UART frame eye-dia. min load (VSM=30V): <passed/failed>		

620

6 Device protocol test cases

6.1 General

The protocol tests can be performed almost automatically with the help of a Device-Tester as defined in A.2.2. The test sequences are described in 4.4 together with a list of the relevant test cases for Legacy-Devices in Table 4, a list of the relevant test cases for Devices without ISDU support in Table 5, and a list of the relevant test cases for Devices with ISDU support in Table 6. Supplementary requirements for Legacy-Devices beyond the definitions in [13] are listed in Annex B.

6.2 STARTUP

6.2.1 STARTUP cycle time

Table 47 defines the test conditions for this test case.

Table 47 – STARTUP cycle time

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0034
Name	TCD_DLPC_STUP_CYCTIME
Purpose (short)	Test Startup cycle time

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 7.3.2.5, 9.3.3.2, and A.2.6
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Device shall work in state STARTUP with any cycle time greater equal 100 TBIT
Precondition	Wake-up and ComRequest are performed, Device is in SDCI mode
Procedure	The Master reads the communication parameter (Direct Parameter 02h to 06h) at different cycle times
Input parameter	Cycle times: a) 100 TBIT b) 10000 TBIT c) 10 s
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check the Device response
Test passed	The Device shall respond to any read request with valid (constant) data
Test failed (examples)	-
Results	Cycle Time variation in STARTUP: <pass/fail>

6.2.2   From STARTUP to OPERATE

Table 48 defines the test conditions for this test case.

Table 48 – From STARTUP to OPERATE

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0035
Name	TCD_DLPC_STUP_STUPOPER1
Purpose (short)	Test state transition STARTUP to OPERATE
Equipment under test (EUT)	Device and Legacy-Device, except Devices with zero length process data
Test case version	1.0
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)	The Device shall change from STARTUP to OPERATE when it receives a Master command 0x99. This transition is used by Legacy Masters.
Precondition	Wake-up and read the communication parameter (Direct Parameter 02h to 06h)
Procedure	a) Master sends MasterCycleTime b) Master sends OPERATE command c) Master sends ISDU idle command, using the F-sequence TYPE for OPERATE
Input parameter	MasterCycleTime a) MinCycleTime of the Device b) 0xBF (132,8 ms)
Post condition	

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check the Device response
Test passed	The Device responds to any request
Test failed (examples)	-
Results	Transition from STARTUP directly to OPERATE: <pass/fail>

641

6.2.3 Illegal STARTUP to OPERATE

643 Table 49 defines the test conditions for this test case.

644 **Table 49 – Illegal STARTUP to OPERATE**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0036
Name	TCD_DLPC_STUP_STUPOPER2
Purpose (short)	Test illegal state transition STARTUP to OPERATE
Equipment under test (EUT)	Device and Legacy-Device, except Devices with zero length process data
Test case version	1.0
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)	The Device shall not change from STARTUP to OPERATE unless it receives a Master command 0x98.
Precondition	Wake-up and read the communication parameter (Direct Parameter 02h to 06h)
Procedure	a) Master sends MasterCycleTime b) Master sends ISDU idle command, using the F-sequence TYPE for OPERATE
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check the Device response
Test passed	No Device response
Test failed (examples)	Any Device response
Results	Device does not leave STARTUP: <pass/fail>

647

6.2.4 From OPERATE to STARTUP via Master command

649 Table 50 defines the test conditions for this test case.

650 **Table 50 – From OPERATE to STARTUP via Master command**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0037
Name	TCD_DLPC_OPER_OPERSTUP1
Purpose (short)	Test correct state transition from OPERATE to STARTUP
Equipment under test (EUT)	Device and Legacy-Device, except Devices with zero length process data
Test case version	1.0

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
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 the correct state transition from OPERATE to STARTUP via Master command
Precondition	Device is in OPERATE state
Procedure	a) Master sends Master command 0x97 "DeviceStartup" b) Master sends ISDU idle command, using the F-sequence TYPE for OPERATE
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check the Device response
Test passed	-
Test failed (examples)	The Device responds to ISDU idle command
Results	Transition from STARTUP state to OPERATE state: <pass/fail>

6.2.5   From OPERATE to STARTUP via ISDU idle command

Table 51 defines the test conditions for this test case.

Table 51 – From OPERATE to STARTUP via ISDU idle command

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 zero length process data
Test case version	1.0
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 ISDU idle command, using F-sequence TYPE_0 b) Master sends ISDU idle command, using F-sequence TYPE_0 c) Master sends ISDU idle command, using the F-sequence TYPE for OPERATE
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check the Device response
Test passed	-
Test failed (examples)	The Device responds to ISDU idle command b), but not to a) and c).
Results	Illegal F-sequence in OPERATE state: <pass/fail>

660   **6.3   PREOPERATE**

661   **6.3.1   From STARTUP to PREOPERATE Read**

662   Table 52 defines the test conditions for this test case.

663   **Table 52 – From STARTUP to PREOPERATE Read**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0039
Name	TCD_DLPC_PROP_READDPP1
Purpose (short)	Set Device from STARTUP into PREOPERATE and read Direct Parameter page 1.
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device PREOPERATE, test to pass (positive testing)
Specification (clause)	[9], see 7.3.2.5, Figure 34, and Annex A.2, Table A.7
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Set Device from STARTUP into PREOPERATE via Master command 0x9A and read Direct Parameter page 1. Device activates on-request data, service and event handler and returns DL_Mode.ind (PREOPERATE). Device reply message to Master read message to be checked.
Precondition	a) Initialize an SDCI communication (WURQ) b) Communication initialization between Master and Device is successful (both in STARTUP state) c) Save F-sequenceCapability, PDIn and PDOut for later comparison
Procedure	a) Master sends PREOPERATE command 0x9A. b) Positive response from Device c) Master and Device changed to PREOPERATE state. d) Master read message -> Read DirectParameterPage 1
Input parameter	F-sequenceCapability, PDIn and PDOut
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the 0x9A command results in a positive response of the Device b) Calculate with saved settings on PDIn, PDOut, and F-sequenceCapability the expected F-sequenceTYPE c) Check whether Device response (read DirectParameterPage 1) used the expected F-sequenceTYPE (Device reply message to Master read message). d) Check whether the Device reply message has been received with the expected amount of on-request data octets. e) Check whether no process data has been transmitted.
Test passed	Device reply message has been received with the expected amount of on-request data octets.
Test failed (examples)	a) PREOPERATE command results in a negative response, or b) No or wrong response from the Device, or c) Unexpected F-sequenceTYPE used by the Device
Results	Read of Direct Parameter page 1 in PREOPERATE state: <pass/fail>

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667   **6.3.2   From STARTUP to PREOPERATE Read Param+Event**

668   Table 53 defines the test conditions for this test case.

669   **Table 53 – From STARTUP to PREOPERATE Read Param+Event**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0292
Name	TCD_DLPC_PROP_READDPPEP
Purpose (short)	Test Device support of 1_2, 1_V, or 2_V F-sequence types, Direct Parameter or Event page
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see Annex A.2
Configuration / setup	Device-Tester

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	If the Device supports F-sequence types 1_2, 1_V, or 2_V with more than 1 On-request Data octets, all octets shall be valid in case of read accesses to Direct Parameter or Event page.
Precondition	Device is in PREOPERATE state
Procedure	a) Device-Tester reads Direct Parameter page 1 (Index = 0x00, Subindex = 0x02) b) Device is prompted to generate an Event c) Device-Tester reads the Event buffer
Input parameter	a) Content of the Direct Parameter page 1 acquired from IODD b) Valid EventCodes from the Device
Post condition	-

671

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check the content of all transmitted octets against predefined parameters from IODD b) Check the content of all transmitted octets against the Event.
Test passed	All octets contain valid data
Test failed (examples)	Only the first octet is valid
Results	Read predefined parameters: \<pass/fail\> Read Event buffer: \<pass/fail\>

672

673   **6.3.3   From STARTUP to PREOPERATE Write**

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

675   **Table 54 – From STARTUP to PREOPERATE Write**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0040
Name	TCD_DLPC_PROP_WRITEDPP1
Purpose (short)	Set Device from STARTUP into PREOPERATE and write Direct Parameter page 1.
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device PREOPERATE, test to pass (positive testing)
Specification (clause)	[9], see 7.3.2.5, Figure 34, and Annex A.2, Table A.7
Configuration / setup	Device-Tester

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Set Device from STARTUP into PREOPERATE state via Master command 0x9A and read Direct Parameter page 1. The Master writes Direct Parameter page 1. Device reply message to Master read message to be checked. NOTE The number of octets to write depends on the used F-sequenceTYPE. The Direct Parameter page 1 will not be completely written, but a write request

TEST CASE	CONDITIONS / PERFORMANCE
	with a valid F-sequenceTYPE length will be accepted.
Precondition	a) Initialize an SDCI communication (WURQ) b) Communication initialization between Master and Device has been successful (both in STARTUP state) c) Save F-sequenceCapability, PDIn and PDOut for later comparison
Procedure	a) Master sends PREOPERATE command 0x9A. b) Positive response from Device c) Master and Device changed to PREOPERATE d) Read Direct Parameter page 1 (one F-sequence) e) Save the Device's response on-request data f) Master builds a write message with the saved on-request data ("mirror") g) Master writes Direct Parameter page 1 (one message) in correct length h) Receive Device response
Input parameter	F-sequenceCapability, PDIn and PDOut
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check whether the Master command 0x9A results in a positive response of the Device b) Calculate with saved settings on PDIn, PDOut, and F-sequenceCapability the expected F-sequenceTYPE c) Check whether the Device response (write Direct Parameter page 1) used the expected F-sequenceTYPE (Device reply message to Master write message) d) Check whether no process data has been transmitted
Test passed	Direct Parameter page 1 write command has been accepted
Test failed (examples)	a) PREOPERATE command results in a negative response b) No or wrong response from the Device c) Unexpected F-sequenceTYPE used by the Device
Results	Write of Direct Parameter page 1 in PREOPERATE state: <pass/fail>.

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6.3.4 From STARTUP to PREOPERATE short message

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

681 **Table 55 – From STARTUP to PREOPERATE short message**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0041
Name	TCD_DLPC_PROP_SHORTMESSAGE
Purpose (short)	Test behaviour to truncated F-sequence request.
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device PREOPERATE protocol test
Specification (clause)	[9], see 7.3.2.5, Figure 34, and Annex A.2, Table A.7
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Set Device into PREOPERATE. To emulate message disturbances, caused for example by electromagnetic interference, the Device-Tester sends one octet less than required. The Device shall not respond to this truncated F-sequence request and respond to the following request without error.
Precondition	Master and Device in PREOPERATE
Procedure	a) Master writes to parameter "VendorId" in Direct Parameter page 1 (address 0x07/0x08) with one octet less than the normal request length b) Master writes to parameter "VendorId" in Direct Parameter page 1 (address 0x07/0x08) after the shortest possible time (MinCycleTime, see Table A.9 and B.1.4)

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TEST CASE	CONDITIONS / PERFORMANCE
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check responses on the two requests
Test passed	a) No response on the first request b) Response on the second request
Test failed (examples)	a) Response on the first request b) No response to the second request
Results	First response: <pass/fail> Second response: <pass/fail>

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6.3.5   From STARTUP to PREOPERATE collision

686   Table 56 defines the test conditions for this test case.

687   **Table 56 – From STARTUP to PREOPERATE collision**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0042
Name	TCD_DLPC_PROP_WRITECOLL
Purpose (short)	Set Device from STARTUP into PREOPERATE and cause a collision while writing.
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device PREOPERATE, test to fail (negative testing)
Specification (clause)	[9], see 7.3.2.5, Figure 34, and Annex A.2, Table A.7
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Set Device from STARTUP into PREOPERATE state via Master command 0x9A and read Direct Parameter page 1. The Master writes Direct Parameter page 1 within one F-sequence and "parameter length overrun", i.e. one octet more than specified. Check whether there is a collision while sending the last (exceeding) octet. It is also a test purpose to send a correct F-sequence after the minimum cycle time of PREOPERATE and check the response.
Precondition	Establish an SDCI communication
Procedure	a) Master sends PREOPERATE command 0x9A. b) Positive response from Device c) Master and Device switched to PREOPERATE. d) Read Direct Parameter page 1 (one F-sequence) e) Master prepares a write message with the saved on-request data (one octet more than specified for the Master write message length). It is important, that the checksum after the specified F-sequence length is correct and the exceeding octet will be added after the checksum. f) Write Direct Parameter page 1 with extended length g) A collision shall be detected h) Master prepares a write message with the saved on-request data in correct length i) Master writes Direct Parameter page 1 (one F-sequence) in correct length and with the minimum cycle time of PREOPERATE j) Receive Device response
Input parameter	Read and saved on-request data (mirror)
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the 0x9A command results in a positive response of the Device b) Check whether a collision (write Direct Parameter page 1 with one octet more than specified) will be detected. c) Check whether the Device response (write Direct Parameter page 1 with correct length) results in a specified Device reply message
Test passed	Device works properly after the detected collision.
Test failed (examples)	a) PREOPERATE command results in a negative response b) No collision detection c) Unexpected F-sequence TYPE used by the Device d) No Device reply message upon the correct Master message
Results	Collision detection in PREOPERATE state: <pass/fail>

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6.3.6 From PREOPERATE to STARTUP via simulated reset

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692 Table 57 defines the test conditions for this test case.

693 **Table 57 – From PREOPERATE to STARTUP via simulated reset**

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
Test case version	1.0
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 F-sequenceCapability, PDIn, and PDOut 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	F-sequenceCapability, PDIn, and PDOut
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
Test failed (examples)	a) Wrong F-sequence TYPE from Device b) No or wrong response from Device
Results	Received "MinCycleTime" within TYPE_0 Device message: <pass/fail>

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697 **6.3.7   From PREOPERATE to PREOPERATE with F-sequence fault**

698 Table 58 defines the test conditions for this test case.

699 **Table 58 – From PREOPERATE to PREOPERATE with F-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 F-sequence type
Equipment under test (EUT)	Device
Test case version	1.0
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 F-sequence type while in PREOPERATE state. The Device shall switch to STARTUP when detecting an illegal F-sequence type. In case of equal F-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 F-sequence type b) Invoke second Read on parameter "MinCycleTime" with the PREOPERATE F-sequence type c) Invoke third Read on parameter "MinCycleTime" with the STARTUP F-sequence type
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check the responses to the three Reads with appropriate F-sequence types.
Test passed	a) PREOPERATE not equal to OPERATE F-sequence type: - First and second Read shall not be responded by the Device - Third Read shall provide correct data b) PREOPERATE equal to OPERATE F-sequence type: - All Read requests shall be responded by the Device
Test failed (examples)	-
Results	PREOPERATE not equal to OPERATE F-sequence type: \<pass/fail\> PREOPERATE equal to OPERATE F-sequence type: \<pass/fail\>

702

703 **6.4   OPERATE**

704 **6.4.1   From PREOPERATE to OPERATE Read**

705 Table 59 defines the test conditions for this test case.

706 **Table 59 – From PREOPERATE to OPERATE Read**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0045
Name	TCD_DLPC_OPER_READ
Purpose (short)	Turn Master and Device into OPERATE state via Master command 0x99
Equipment under test (EUT)	Device
Test case version	1.0

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Category / type	Device OPERATE, test to pass (positive testing)
Specification (clause)	[9], see 7.3.2.5, Figure 34, and Annex A.2, Table A.8
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Master command 0x99 will be sent by the Master and both (Device and Master) switch into OPERATE state.
Precondition	a) Establish an SDCI communication (WURQ) b) Communication between Master and Device successful (both in STARTUP) c) Save F-sequenceCapability, PDIn, and PDOut for later comparison d) Master sends PREOPERATE command 0x9A e) Master and Device in PREOPERATE state f) Read Direct Parameter page 1 and save it in a variable for further use
Procedure	a) Master sends OPERATE command 0x99 followed by 0x98. b) Positive response from Device c) Master and Device changed to OPERATE state. d) Read Direct Parameter page 1
Input parameter	F-sequenceCapability, PDIn, and PDOut
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the 0x99 command results in a positive response of the Device b) Calculate with saved settings PDIn, PDOut, and F-sequenceCapability the specified F-sequenceTYPE c) Check whether the Device response (read Direct Parameter page 1) used the expected F-sequenceTYPE (Device reply message to Master read message) d) Check whether the Direct Parameter page 1 was received completely (use variable from "input parameters" for comparison) e) Check whether process data was transmitted
Test passed	Direct Parameter page 1 received
Test failed (examples)	a) OPERATE command results in a negative response b) No or wrong response from the Device c) Device did not use the expected F-sequence TYPE
Results	Direct Parameter page 1 received in OPERATE state: <pass/fail>

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6.4.2 From PREOPERATE to OPERATE Write

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

712 **Table 60 – From PREOPERATE to OPERATE Write**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0046
Name	TCD_DLPC_OPER_WRITE
Purpose (short)	Set Device from PREOPERATE into OPERATE write
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device OPERATE, test to pass (positive testing)
Specification (clause)	[9], see 7.3.2.5, Figure 34, and Annex A.2, Table A.8
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The command 0x9A will be sent by the Master and both (Device and Master) change into the OPERATE state. Master writes Direct Parameter page 1. Device reply message to Master write message to be checked. NOTE The number of octets to write depends on the used F-sequenceTYPE. The

TEST CASE	CONDITIONS / PERFORMANCE
	Direct Parameter page 1 will not be completely written, but a write request with a valid F-sequenceTYPE length will be accepted.
Precondition	a) Save F-sequenceCapability, PDIn, and PDOut for later comparison b) Master and Device in PREOPERATE state
Procedure	a) Master sends OPERATE command 0x99 b) Positive response from Device c) Master and Device changed to OPERATE. d) Read Direct Parameter page 1 (one F-sequence) e) Save the on-request data of the Device's response ("mirror") f) Master prepares a write message with the saved on-request data g) Master writes Direct Parameter page 1 (one F-sequence) within correct length h) Receive Device response
Input parameter	F-sequenceCapability, PDIn, and PDOut
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the 0x99 command results in a positive response of the Device b) Calculate with saved PDIn, PDOut, and F-sequenceCapability settings the specified F-sequenceTYPE c) Check whether the Device response (write Direct Parameter page 1) used the expected F-sequenceTYPE (Device reply message to Master write message) d) Check whether process data has been transmitted
Test passed	Direct Parameter page 1 write command was accepted
Test failed (examples)	a) OPERATE command results in a negative response b) No or wrong response from the Device c) Device did not use the expected F-sequence TYPE
Results	Direct Parameter page 1 write command accepted in OPERATE state: <pass/fail>

(714 marked to the left of the above tables)

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6.4.3   From PREOPERATE to OPERATE negative Write

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

718   **Table 61 – From PREOPERATE to OPERATE negative Write**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0047
Name	TCD_DLPC_OPER_NEGWRITE
Purpose (short)	Set Device from PREOPERATE into OPERATE with a negative write response
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device OPERATE, test to fail (negative testing)
Specification (clause)	[9], see 7.3.2.5, Figure 34, and Annex A.2, Table A.8
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Set Device from STARTUP into OPERATE state via Master command 0x99. The Master writes Direct Parameter page 1 with one F-sequence and "parameter length underrun", .i.e. one ocet less than specified. Check whether the Device does not respond to this incomplete F-sequence. It is also a test purpose to send a correct F-sequence after the minimum cycle time of OPERATE and check the response.
Precondition	Master and Device in PREOPERATE state
Procedure	a) Master sends OPERATE command 0x99. b) Positive response from Device c) Master and Device changed to OPERATE. d) Read Direct Parameter page 1 (one F-sequence) e) Save the on-request data of the Device response f) Master builds a write message with the saved on-request data (one octet less than

(719 marked to the left of the above tables)

TEST CASE	CONDITIONS / PERFORMANCE
	specified for the Master write message). g) Master writes Direct Parameter page 1 (one F-sequence) within reduced length h) Device does not respond i) Master prepares a write message with the saved on-request data in correct length j) Master writes Direct Parameter page 1 (one F-sequence) in correct length after the minimum cycle time of OPERATE k) Receive Device response
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the 0x99 command results in a positive response of the Device b) Check whether Device response (write Direct Parameter page 1 with one octet less than expected) results in no response c) Check whether Device response (write Direct Parameter page 1 within correct length) results in an expected Device reply message
Test passed	Device works properly after using the incomplete F-sequence TYPE
Test failed (examples)	a) OPERATE command results in a negative response b) Device responds to message with incomplete F-sequence c) Device did not use the expected F-sequence TYPE d) No Device response to the complete F-sequence
Results	Direct Parameter page 1 write command only accepted with specified length in OPERATE state: <pass/fail>

6.4.4 From PREOPERATE to OPERATE collision

Table 62 defines the test conditions for this test case.

Table 62 – From PREOPERATE to OPERATE collision

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0048
Name	TCD_DLPC_OPER_WRITECOLL
Purpose (short)	Set Device from STARTUP into OPERATE and cause a collision while writing.
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device OPERATE, test to fail (negative testing)
Specification (clause)	[9], see 7.3.2.5, Figure 34, and Annex A.2, Table A.8
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Set Device from STARTUP into OPERATE state via Master command 0x99. The Master writes Direct Parameter page 1 within one F-sequence and "parameter length overrun", .i.e. one octet more than specified. Check whether there is a collision while sending the last (exceeding) octet. It is also a test purpose to send a correct F-sequence after the minimum cycle time of OPERATE and to check the response.
Precondition	Master and Device in PREOPERATE state
Procedure	a) Master sends OPERATE command 0x99. b) Positive response from Device c) Master and Device changed to OPERATE. d) Read Direct Parameter page 1 (one F-sequence) e) Master prepares a write message with the saved on-request data (one octet more than specified for the Master write message). It is important, that the checksum after the specified F-sequence length is correct and the exceeding octet will be added after the checksum. f) Write Direct Parameter page 1 in extended length g) A collision shall be detected. h) Master prepares a write message with the saved on-request data in correct length

TEST CASE	CONDITIONS / PERFORMANCE
	i) Master writes Direct Parameter page 1 (one F-sequence) in correct length after the minimum cycle time of the OPERATE state j) Receive Device response
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the 0x99 command results in a positive response of the Device b) Check whether a collision (write Direct Parameter page 1 with one octet more than specified) will be detected. c) Check whether the Device (write Direct Parameter page 1 with correct length) responds with an expected reply message
Test passed	Device works properly after the detected collision.
Test failed (examples)	a) OPERATE command results in a negative response b) No collision detected or wrong response from the Device c) Device does not use the expected F-sequenceTYPE d) No Device response to the complete (correct) F-sequence
Results	Collision detection in OPERATE state: <pass/fail>

727

6.4.5   From OPERATE to STARTUP via simulated reset

729   Table 63 defines the test conditions for this test case.

730   **Table 63 – From OPERATE to STARTUP via simulated reset**

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
Test case version	1.0
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 (de-activate 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 via TYPE_0 message

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TEST CASE RESULTS	CHECK / REACTION
Test failed (examples)	a) Device used wrong F-sequence TYPE b) No or wrong response from Device
Results	Received MinCycleTime parameter value within TYPE_0 message: <pass/fail>

6.4.6 From OPERATE to OPERATE with wrong F-sequence TYPE

Table 64 defines the test conditions for this test case.

Table 64 – From OPERATE to OPERATE with wrong F-sequence TYPE

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0051
Name	TCD_DLPC_OPER_WRONGFRAMETYPE
Purpose (short)	Device receives in OPERATE an unexpected F-sequenceTYPE (same category)
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device OPERATE, test to fail (negative 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 OPERATE state. The Master sends a message with another F-sequence TYPE then expected by the Device (same category TYPE_x, but not the expected TYPE). Device does not respond.
Precondition	Master and Device in OPERATE state
Procedure	a) Master calculates an unexpected F-sequenceTYPE (same category, but not the expected TYPE) via the saved F-sequenceCapability, PDIn, and PDOut. b) Master reads Direct Parameter page 1 with the unexpected F-sequence TYPE c) Device does not respond d) Master reads Direct Parameter page 1 correctly e) Device responds correctly
Input parameter	F-sequenceCapability, PDIn, and PDOut
Post condition	

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the faulty Master request does not result in a Device response b) Check whether the correct Master request results in a Device correct response
Test passed	No response received upon an unexpected F-sequenceTYPE
Test failed (examples)	a) Device responds to an unexpected F-sequenceTYPE b) Device does not respond to a valid read request c) Device does not respond in the expected F-sequenceTYPE
Results	Device stays in OPERATE after unexpected F-sequenceTYPE: <pass/fail>

6.5 ISDU (Indexed Service Data Unit)

6.5.1 Prearrangement measures and configuration

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

Therefore, the vendor shall provide the necessary Index information for ISDU write/read operations within the IODD of the Device:

747   • Config1: An 8 bit readable and writeable SDCI Index of the Device

748   • Config2: A 16 bit readable and writeable SDCI Index in case 16 bit Indices are supported
749   by the Device. If a particular 16 bit Index is not supported, a 16 bit Index shall be provided
750   which is not used by the Device. With this Index the test system will check the 16-bit ca-
751   pabilities (coping with of the 16 bit ISDU addressing scheme) of the Device. The ISDU re-
752   sponses shall be correct and shall contain the appropriate ErrorCodes.

753   • Config3: An 8 bit readable SDCI Index of the Device providing more than 12 octets data
754   for ISDU read operations with an "ExtLength" octet in an ISDU read response

755   • Config4 (List of Block Parameters): A list of Block Parameter Indices which are accessed
756   via block parameterization (ListOfBlockParameters() As UInt16())

757   • Config5 (AlternativeValueOfFirstBlockPar): The alternative value for the first Block Pa-
758   rameter defines a second valid and useful entry which can be used during the Block Pa-
759   rameter tests. The value is provided as Octet string and shall match the length of the vari-
760   able.

761   • Config6 (IllegalValueOfFirstBlockPar): The illegal value for the first Block Parameter de-
762   fines an entry which can be used during the Block Parameter tests for the test of Error-
763   Codes. The value is provided as Octet string and shall match the length of the variable.

764   • Config7 (IndexToGenerateEvent): This Index is an optional parameter which can be used
765   to stimulate up to two specific events within the Device. The events are associated with
766   pairs of values. One value is used to stimulate the "appeared" event; the second value is
767   used to stimulate the "disappeared" event. The data type of the parameter is UintegerT,
768   bitLength = 8 (byte).

769   **6.5.2   Availability of ISDU via F-sequence Capability**

770   Table 65 defines the test conditions for this test case.

771   **Table 65 – Availability of ISDU via F-sequence Capability**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0052
Name	TCD_DLPC_ISDU_AVAILFSEQCAP
Purpose (short)	Availability of ISDU via F-sequence Capability in Direct Parameter Page 1
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device ISDU, test to pass (positive testing)
Specification (clause)	[9], see Annex B.1.5, Table B.5
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master reads the Device's F-sequence Capability via Direct Parameter Page 1 and checks whether the ISDU data channel is supported.
Precondition	a) Establish an SDCI communication (WURQ) b) Establish communication into PREOPERATE or OPERATE respectively. For a Legacy-Device establish communication only into OPERATE.
Procedure	a) Read F-sequence Capability (Direct Parameter page 1, address 0x03) b) Check Bit 0 of the parameter F-sequenceCapability
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Received F-sequence Capability b) Bit 0 = 1 (ISDU communication channel is supported)
Test passed	Bit 0 = 1 (ISDU communication channel is supported)

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773

TEST CASE RESULTS	CHECK / REACTION
Test failed (examples)	a) No response from the Device b) Bit 0 = 0 (ISDU communication channel is NOT supported)
Results	Availability of the ISDU service is indicated correctly: <pass/fail>

774

6.5.3 "Idle/Busy" check

776   Table 66 defines the test conditions for this test case.

777   **Table 66 – "Idle/Busy" check**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0053
Name	TCD_DLIC_ISDU_IDLEBUSYCHECK
Purpose (short)	Device response "Busy" received upon an "Idle" request of the Master
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device ISDU, test to pass (positive testing)
Specification (clause)	[9], see 7.3.6.2, Table 50, and Annex A.5, Table A.12, Table A.14
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Check whether the Device response "Busy" was received after an "Idle" request of the Master. Response length is 1 octet.
Precondition	Master in PREOPERATE or OPERATE respectively. In case of a Legacy-Device in OPERATE only.
Procedure	Master sends "keep alive" message "Idle" (0x00)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Read 0x11 (FlowCtrl) b) ISDU response 0x00 ("No service")
Test passed	"No service" received from Device
Test failed (examples)	No response from the Device
Results	ISDU service is available: <pass/fail>

780

6.5.4 Read 8 bit Index

782   Table 67 defines the test conditions for this test case.

783   **Table 67 – Read 8 bit Index**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0054
Name	TCD_DLIC_ISDU_READINDEX8
Purpose (short)	Check Device response to an ISDU read request with 8 bit Index
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.0
Category / type	Device ISDU, test to pass (positive testing)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Specification (clause)	[9], see 7.3.6.4, Figure 48, and Annex A.2, Table A.10
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master sends ISDU read request for VendorName (0x10, mandatory). Device responds with expected VendorName.
Precondition	a) Master in PREOPERATE or OPERATE respectively b) Read "VendorName" parameter and write it to a variable for comparison/ evaluation

Procedure	a) Master: Sends ISDU Read request
	   Segment 1: 0x93 (Service: Read request – 0b1001 / Length:0b0011)
	   Segment 2: 0x10 (Address of "VendorName")
	   Segment 3: 0x83 (Checksum)
	b) Receive Read response "busy" (0x01) until Device is ready
	c) Check and save Read response ("VendorName")
	d) Save service, length, data and checksum in variables and save ISDU Read response frames count

Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check whether the ServiceCode of the positive ReadResponse = 0b1101 b) Compare Length variable with the actual received Frame count c) Data ("VendorName") with "VendorName" saved in precondition shall be identical d) Calculate checksum and compare with saved checksum
Test passed	a) "VendorName" received is complete as expected. b) Service, Length and Checksum are correct.
Test failed (examples)	No, negative or wrong response from the Device
Results	"VendorName" read correctly from Device: <pass/fail>

6.5.5   Read 8 bit Index with ExtLength

Table 68 defines the test conditions for this test case.

Table 68 – Read 8 bit Index with ExtLength

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0055
Name	TCD_DLIC_ISDU_READ8EXTLENGTH
Purpose (short)	Read request with 8 bit Index and read response with ExtLength
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.0
Category / type	Device ISDU, test to pass (positive testing)
Specification (clause)	[9], see 7.3.6.4, Annex A.5.6, and Annex B, Table B.9
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master sends ISDU read request using "Config3". Device responds according "Config3" (ISDU response with ExtLength octet possible).
Precondition	a) Device in PREOPERATE or OPERATE respectively b) Master in PREOPERATE or OPERATE respectively

Procedure	a) Master: Sends ISDU Read request
	   Segment 1: 0x93 (Service: Read request – 0b1001 / Length:0b0011)
	   Segment 2: 0xnn (Address according Config3)
	   Segment 3: 0xnn (actual Checksum)
	b) Receive Read response "busy" (0x01) until Device is ready

TEST CASE	CONDITIONS / PERFORMANCE
	c) Check and save Read response (according Config3) d) Save service, length, data and checksum in variables and save ISDU Read response frames count
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Service shall be positive Read response 0b1101. b) Length = 0b0001? c) Compare ExtLength variable with Frame count d) Read response contains no Process Data e) Calculate checksum and compare with saved checksum
Test passed	a) Response correct according Config3. b) Service, Length, ExtLength and Checksum are correct.
Test failed (examples)	No, negative or wrong response from the Device
Results	Config3 read correctly from Device: \<pass/fail\>

6.5.6   Write 8 bit Index

Table 69 defines the test conditions for this test case.

Table 69 – Write 8 bit Index

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	1.0
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
	  Segment 1: 0x93 (Service: Write request + possible Length from precondition)
	  Segment 2: 0xnn (Address according Config1)
	  Segment 3: 0x01 (data 1)
	  Segment …
	  Segment m: 0x01 (data n - possible Length received in precondition)
	  Segment n: Checksum
	b) Receive Write response "busy" (0x01) until Device is ready
	c) Receive Write response
	d) Read Config1

Input parameter	Config1
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	Positive write response; Config1 contents as expected.
Test failed (examples)	a) Negative write response from Device b) Octets not written
Results	"Config1" changed after Write request: <pass/fail>.

798

799   6.5.7   Read 8 bit Index reserved

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

801   **Table 70 – Read 8 bit Index reserved**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0057
Name	TCD_DLIC_ISDU_READ8RESERVED
Purpose (short)	Check Device response "Index not available" upon Read to 8 bit reserved Index
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.0
Category / type	Device ISDU, test o fail (negative testing)
Specification (clause)	[9], see 7.3.6, and Annex C, Table C.1 and C.2
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master sends ISDU read request for Index = 0xFF (reserved) and receives "Index not available" (ErrorCode = 0x80, AdditionalCode =0x11)
Precondition	a) Device in PREOPERATE or OPERATE respectively b) Master in PREOPERATE or OPERATE respectively

Procedure	a) Master: Sends ISDU Read request
	  Segment 1: 0x93 (Service: Read request: 0b1001 / Length:0b0011)
	  Segment 2: 0xFF (reserved Index)
	  Segment 3: 0x6C (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 0x11 "Index not available".
Test passed	All comparisons and checks valid
Test failed (examples)	Positive response from Device or wrong ErrorCode or AdditionalCode
Results	Negative read response received upon reserved 8 bit Index: <pass/fail>.

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805   6.5.8   Read 8 bit Index with unavailable Subindex

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

807 **Table 71 – Read 8 bit Index with unavailable Subindex**

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0058
Name	TCD_DLIC_ISDU_READ8NOSUBINDEX
Purpose (short)	Check 8 bit read response when Subindex not available
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.0
Category / type	Device protocol test - 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 VendorName (Index = 0x10, mandatory, StringT) and a Subindex = 0x02. This results in a negative read response, "Subindex not available" (ErrorCode = 0x80 / AdditionalCode = 0x12)
Precondition	a) Device in PREOPERATE or OPERATE respectively b) Master in PREOPERATE or OPERATE respectively

Procedure	a) Master: Sends ISDU Read request
	    Segment 1: 0xA4 (Service: Read request: 0b1010 / Length:0b0100)
	    Segment 2: 0x10 (VendorName, mandatory, StringT)
	    Segment 3: 0x02 (Subindex)
	    Segment 4: 0xB6 (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	-

809

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".
Test passed	All comparisons and checks valid
Test failed (examples)	Positive response from Device or wrong ErrorCode or AdditionalCode
Results	Negative read response received upon unavailable Subindex: <pass/fail>.

810

811 **6.5.9 Read 16 bit Index**

812 Table 72 defines the test conditions for this test case.

813 **Table 72 – Read 16 bit Index**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0059
Name	TCD_DLIC_ISDU_READ16
Purpose (short)	Check Read response with 16 bit Index using Config2.
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.0
Category / type	Device ISDU, test to pass (positive testing)
Specification (clause)	[9], see 7.3.6.4, Figure 48, and Annex A.2, Table A.10
Configuration / setup	Device-Tester

814

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master sends ISDU read request using Config2. Device responds according Config2.
Precondition	a) Master in PREOPERATE or OPERATE respectively b) Read Config2 contents and write it to the Config2 variable for comparison / test evaluation

Procedure	a) Master: Sends ISDU Read request
	    Segment 1: 0x93 (Service: Read request: 0b1001 / Length:0b0011)
	    Segment 2: 0xnn (Index in Config2, part1)
	    Segment 3: 0xnn (Index in Config2, part2)
	    Segment 4: 0xzz (Checksum)
	b) Receive Read response "busy" (0x01) until Device is ready
	c) Check and save Read response
	d) Save service, length, data and checksum in variables and save ISDU Read response

Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response
Test passed	a) Config2 received is complete as expected or response Index not available. b) Service, Length and Checksum are correct.
Test failed (examples)	Any other negative response or no response
Results	Config2 read correctly from Device: <pass/fail>

6.5.10   Write 16 bit Index

Table 73 defines the test conditions for this test case.

Table 73 – Write 16 bit Index

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0060
Name	TCD_DLIC_ISDU_WRITE16
Purpose (short)	Check whether a 16 bit Write request is possible
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.0
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 16 bit ISDU Write request using Config2. Check whether the Write request was successful.
Precondition	a) Device in PREOPERATE or OPERATE respectively b) Master in PREOPERATE or OPERATE respectively c) Read Config2 and write it to the Config2 variable for comparison and length
Procedure	a) Master: Sends 16 bit ISDU Write request using Config2. b) Receive response "busy" (0x01) until Device is ready c) Receive Write response d) Read Config2
Input parameter	Config2 according
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response

TEST CASE RESULTS	CHECK / REACTION
Test passed	a) Positive Write response; Config2 contents as expected. b) Response "Index not available"
Test failed (examples)	a) Negative write response from Device b) Octets of Config2 not written
Results	"Config2" changed after Write request: <pass/fail>.

822

6.5.11 Read 16 bit Index reserved

824 Table 74 defines the test conditions for this test case.

825 **Table 74 – Read 16 bit Index reserved**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0061
Name	TCD_DLIC_ISDU_READ16RESERVED
Purpose (short)	Check Device response "Index not available" upon Read to 16 bit reserved Index
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.0
Category / type	Device ISDU, negative testing for Devices with 16 bit indices
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 Index = 0x7F32 (reserved) and receives a negative response with "Index not available" (ErrorCode = 0x80, AdditionalCode =0x11).
Precondition	a) Device in PREOPERATE or OPERATE respectively b) Master in PREOPERATE or OPERATE respectively

Procedure	a) Master: Sends ISDU Read request
	  Segment 1: 0xB4 (Service: Read request 16 bit: 0b1011 / Length: 0b0100)
	  Segment 2: 0x7F (reserved Index, part 1)
	  Segment 3: 0x32 (reserved Index, part 2)
	  Segment 4: 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 0x11 "Index not available".
Test passed	All comparisons and checks are valid
Test failed (examples)	Positive response from Device or wrong ErrorCode or AdditionalCode
Results	Negative read response received upon reserved 16 bit Index: <pass/fail>.

828

6.5.12 Read 16 bit Index with unavailable Subindex

830 Table 75 defines the test conditions for this test case.

831   **Table 75 – Read 16 bit Index with unavailable Subindex**

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	1.0
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

832

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, "Subindex not available" (ErrorCode = 0x80 / AdditionalCode = 0x12).
Precondition	a) Device in PREOPERATE or OPERATE respectively b) Master in PREOPERATE or OPERATE respectively

Procedure	a) Master: Sends ISDU Read request
	   Segment 1: 0xA4 (Service: Read request: 0b1010 / Length:0b0100)
	   Segment 2: 0xnn (Index in Config2, part1)
	   Segment 3: 0xnn (Index in Config2, part2)
	   Segment 4: 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	-

833

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".
Test passed	All comparisons and checks valid
Test failed (examples)	Positive response from Device or wrong ErrorCode or AdditionalCode
Results	Negative read response received upon unavailable Subindex: <pass/fail>.

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835   **6.5.13   Write 8 bit Index with data length overrun**

836   Table 76 defines the test conditions for this test case.

837   **Table 76 – Write 8 bit Index with data length overrun**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0063
Name	TCD_DLIC_ISDU_WRITE8LENOVERRUN
Purpose (short)	Check response of 8 bit Write request with 70 octets when 64 are permitted
Equipment under test (EUT)	Device
Test case version	1.0
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

838

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master sends Write request with 70 octets for Config1 (maximum of 64 octets). Write Request with ExtLength. Check whether the Write request was denied.
Precondition	a) Device in PREOPERATE state b) Master in PREOPERATE state c) Read Config1 and write it to the Config1 variable for comparison

Procedure	a) Master: Sends Write request
	   Segment 1: 0x11 (Service: Write request: 0b0001 / Length:0b0001)
	   Segment 2: 0x4A (ExtLength = 74)
	   Segment 3: 0xnn (Index in Config1)
	   Segment 4: 0x01 (data 1)
	   ……….
	   Segment 73: 0x01 (data 70)
	   Segment 74: 0xzz (Checksum)
	b) Receive Write response "busy" (0x01) until Device is ready
	c) Receive Write response and check whether it contains a negative read response with ErrorCode and AdditionalCode
	d) Read Config1 and compare it with the Config1 variable (saved while in PREOPERATE state)

Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the Write request results in a negative response b) Check whether ErrorCode = 0x80 and AdditionalCode = 0x33 "Parameter length overrun" c) Compare Config1 contents: stored and read back data shall be identical
Test passed	Negative write response, Config1 contents as expected.
Test failed (examples)	a) Positive Write response from Device b) Octets have been written
Results	Negative read response received upon length overrun: <pass/fail>.

6.5.14 Write 8 bit Index with wrong Length value

Table 76 defines the test conditions for this test case.

Table 77 – Write 8 bit Index with wrong Length value

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0064
Name	TCD_DLIC_ISDU_WRITE8WRONGLEN
Purpose (short)	Check response of 8 bit Write request with one octet less then expected
Equipment under test (EUT)	Device
Test case version	1.0
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 Write request with one octet less than the m expected octets for Config1. Check whether the Write request was denied.
Precondition	a) Device in PREOPERATE state b) Master in PREOPERATE state c) Read Config1 and write it to the Config1 variable for comparison
Procedure	a) Master prepares a Write message with the saved on-request data (one octet less than the m expected octets from Config1). b) Master: Sends Write request *Segment 1:* 0x11 (Service: Write request: 0b0001 / Length:0b0001)

TEST CASE	CONDITIONS / PERFORMANCE
	Segment 2: 0xnn (Index in Config1) *Segment 3:* 0x01 (data 1) ………. *Segment n-1:* 0x01 (data m-1) *Segment n:* 0xzz (Checksum) c) Receive response "busy" (0x01) until Device is ready d) Receive Write response e) Read Config1 and compare it with the Config1 variable (saved while in PREOPERATE state)
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Optional: Check whether the Write request results in a response "busy" b) Check negative response whether ErrorCode = 0x80 and AdditionalCode = 0x34 "Parameter length underrun" c) Compare Config1 contents: stored and read back data shall be identical
Test passed	Negative write response, Config1 contents as expected.
Test failed (examples)	a) Positive Write response from Device b) Octets have been written
Results	Negative read response received upon length underrun: <pass/fail>.

846

6.5.15   Read 8 bit Index with wrong Checksum value

848   Table 76 defines the test conditions for this test case.

849   **Table 78 – Read 8 bit Index with wrong Checksum value**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0065
Name	TCD_DLIC_ISDU_WRITE8WRONGCHECKSUM
Purpose (short)	Check Device response "Device application Error" – on read
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.0
Category / type	Device ISDU, test to fail (negative testing)
Specification (clause)	[9], see 7.3.6, Annex A.5, Table A.12, and Table A.14
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master sends 8 bit Read request with a wrong Checksum value. The Read request for the VendorName (0x10) shall be used. The correct Checksum value is 0x8B, the value in use is 0xFF. A negative Read response is expected.
Precondition	a) Device in PREOPERATE state or OPERATE respectively b) Master in PREOPERATE state or OPERATE respectively

Procedure	a) Master: Sends ISDU Read request
	    Segment 1: 0x93 (Service: Read request: 0b1001 / Length:0b0011)
	    Segment 2: 0x10 (VendorName, mandatory, StringT)
	    Segment 3: 0xFF (Checksum)
	b) Receive response "busy" (0x01) until Device is ready
	c) Receive Read response

Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check whether the Read response returns "no service"
Test passed	Checks are valid

TEST CASE RESULTS	CHECK / REACTION
Test failed (examples)	Positive response from Device or ErrorCode with AdditionalCode
Results	Read response "no service" received upon wrong Checksum value: <pass/fail>.

852

6.5.16   Write 8 bit Index on read only Index

854   Table 79 defines the test conditions for this test case.

855   **Table 79 – Write 8 bit Index on read only Index**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0066
Name	TCD_DLIC_ISDU_WRITE8ROINDEX
Purpose (short)	Check response of 8 bit Write request on read only Index
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only)
Test case version	1.0
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 8 bit Write request on read only index "VendorName". A negative Write response is expected with ErrorCode = 0x80 and AdditionalCode = 0x23.
Precondition	a) Device in PREOPERATE or OPERATE respectively b) Master in PREOPERATE or OPERATE respectively

Procedure	a) Master: Sends ISDU Write request
	  Segment 1: 0x17 (Service: Write request: 0b0001/Length: 0b0111)
	  Segment 2: 0x10 ("VendorName")
	  Segment 3: 0x01 (data 1)
	  Segment 4: 0x02 (data 2)
	  Segment 5: 0x03 (data 3)
	  Segment 6: 0x04 (data 4)
	  Segment 7: 0xzz (Checksum)
	b) Receive response "busy" (0x01) until Device is ready
	c) Receive negative Write response with ErrorCode and AdditionalCode.

Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether the Write response is negative b) Compare ErrorCode with 0x80 c) Compare AdditionalCode with 0x23 "Access denied"
Test passed	All comparisons and checks are valid
Test failed (examples)	Positive response from Device or wrong ErrorCode
Results	Negative Write response received upon read only Index: <pass/fail>.

858

6.5.17   Read 8 bit Index with request abort

860   Table 80 defines the test conditions for this test case.

861   **Table 80 – Read 8 bit Index with request abort**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0067

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Name	TCD_DLIC_ISDU_ABORTREADREQ
Purpose (short)	Check response of 8 bit Read request with abort
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only, see B.4)
Test case version	1.0
Category / type	Device ISDU, test to pass (positive testing)
Specification (clause)	[9], see 7.3.6.4, Figure 48 (T9), and Annex A.2, Table A.10
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master sends and aborts an 8 bit Read request for "VendorName" (0x10 – mandatory). Device switches to Idle mode.
Precondition	Master in PREOPERATE or OPERATE respectively

Procedure	a) Master: Sends 8 bit ISDU Read request
	  Segment 1: 0x93 (Service: Read request: 0b1001/Length: 0b0011)
	  Segment 2: 0x10 ("VendorName"; FlowCTRL = ABORT = 0x1F)
	b) Receive response "busy" (0x01) until Device is ready
	c) Receive Read response

Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Device sends no reception of the 8 bit Read request b) Read response of the Device is 0x00 = "No Service"
Test passed	"No Service" received (see B.4)
Test failed (examples)	Wrong Device response to the incomplete ISDU
Results	Device works properly after the aborted Read request: <pass/fail>.

6.5.18   Read 8 bit Index with response abort

Table 81 defines the test conditions for this test case.

Table 81 – Read 8 bit Index with response abort

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0068
Name	TCD_DLIC_ISDU_ABORTREADRESP
Purpose (short)	Check reaction of 8 bit Read response with abort
Equipment under test (EUT)	Device and Legacy-Device (the latter one in OPERATE only, see B.4)
Test case version	1.0 Device protocol test - ISDU, test to pass (negative testing)
Category / type	Device ISDU, test to pass (positive testing)
Specification (clause)	[9], see 7.3.6.4, Figure 48 (T10), and Annex A.2, Table A.10
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master sends Read request for VendorName (0x10 – mandatory) and receives from the Device the expected "VendorName". Master aborts reading the complete "VendorName".
Precondition	Master in PREOPERATE or OPERATE respectively

Procedure	a) Master: Sends ISDU Read request
	  Segment 1: 0x93 (Service: Read request: 0b1001/Length: 0b0011)
	  Segment 2: 0x10 ("VendorName")

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TEST CASE	CONDITIONS / PERFORMANCE
	Segment 3: 0x83 (Checksum) b) Master receives response "busy" (0x01) until Device is ready c) Master receives the first frame of the Read response ("VendorName") d) Master sends FrameCtrl = ABORT (Table 50) e) Master starts reading with "Idle" (0x00) f) Master receives Read response 0x00 = "No service"
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Device tries to send the complete "VendorName" as ISDU Read response. b) Read response after Master ABORT is 0x00 = "No Service"
Test passed	"No Service" received (see B.4)
Test failed (examples)	Wrong Device reply message to the incomplete Read response
Results	Device works properly after the aborted Read response: <pass/fail>.

870

871   6.6   Events

872   6.6.1   General

873   Any of the Device applications can generate predefined "status" information when SDCI op-
874   erations fail, or "technology specific" information (diagnosis) as a result from technology spe-
875   cific diagnostic methods. This information can be communicated via SDCI Event to upper
876   level systems of different capability. Thus the following tests can only verify the conformity to
877   the SDCI standard [9] and the legacy specification [13] in terms of Event handling mecha-
878   nisms.

879   The cause for an Event of a Device is determined vendor specific. Thus the test cases will not
880   require specific Events to occur, but any Event. It is the Device designer's and tester's re-
881   sponsibility to provide a possibility to stimulate at least one kind of Event for test purposes.
882   This stimulation, for example, can be an auxilliary mechanism on a Device prototype for the
883   purpose of testing that will be removed in series production. Devices, for example, which
884   monitor their power supply level, can raise an Event whenever the power supply is above a
885   certain limit.

886   6.6.2   Single Event while in OPERATE state

887   Table 82 defines the test conditions for this test case.

888   **Table 82 – Single Event while in OPERATE state**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0069
Name	TCD_DLIC_EVNT_OPERSINGLEEVENT
Purpose (short)	Test of single Event processing while in OPERATE state.
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Event test, test to pass (positive testing)
Specification (clause)	[9], see 7.3.8.2
Configuration / setup	Device-Tester shall service event flag as specified. User shall invoke Event via stimulation of Device (e.g. short circuit, over voltage).

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if event flag and event buffer is serviced as specified: - Event Flag is raised once an event occurred

TEST CASE	CONDITIONS / PERFORMANCE
	- StatusCode Type 2 is set respectively - Event page is frozen while event is pending - Event is cleared as specified - Event Type & Code match
Precondition	a) Device is in OPERATE state. b) No events pending - Event Flag not set. c) Events A and B defined by manufacturer
Procedure	a) Device-Tester to read StatusCode. Save value in tester variable "SCa". b) Invoke an event A (Vendor to define how this can be achieved). c) Device-Tester to read StatusCode. Save value in tester variable "SCc". d) Invoke an event B (Vendor to define how this can be achieved). e) Device-Tester to read StatusCode. Save value in tester variable "SCe". f) Device-Tester to read EventQualifier. g) Device-Tester to read EventCode. h) Device-Tester to write Status Code with 0xFF.
Input parameter	Event A and B
Post condition	-

TEST CASE RESULTS	CHECK / REACTION

Evaluation	a) Result of procedure step b): Event Flag is set
	b) Result of procedure step c): Content of "SCa" and "SCc" are different;
	   "SCc" indicates the event.
	c) Result of procedure step e): "SCc" and "SCe" contain the same value;
	   - Event Type & Code are as specified
	   - Check if Eventcode text matches the event described in user manual.
	d) Result of procedure step h): Event Flag is reset

Test passed	Evaluation steps a) through d) ok.
Test failed (examples)	a) No Event Flag set b) Content of "SCa" and "SCc" are not different c) No event indicated in evaluation step b) d) Event Type & Code are not as specified e) Eventcode does not match description in user manual f) Event Flag is not reset.
Results	a) Event Flag set: \<pass/fail> b) Content of "SCa" and "SCc" are different: \<pass/fail> c) Content of "SCa": \<pass/fail> d) Event Type & Code: \<pass/fail> e) Eventcode matches user manual: \<pass/fail> f) Event Flag is reset: \<pass/fail>

891

6.6.3   Single Event while in PREOPERATE state

893   Table 83 defines the test conditions for this test case.

894   **Table 83 – Single Event while in PREOPERATE**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0070
Name	TCD_DLIC_EVNT_PROPSINGLEEVENT
Purpose (short)	Test of single Event processing while in PREOPERATE state.
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Event test, test to pass (positive testing)
Specification (clause)	[9], see 7.3.8.2
Configuration / setup	Device-Tester shall service event flag as specified. User shall invoke Event via stimulation of Device (e.g. short circuit, over voltage).

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if event flag and event buffer is serviced as specified:

TEST CASE	CONDITIONS / PERFORMANCE
	- Event flag is raised once event has occurred - StatusCode Type 2 is set respectively - Event page is frozen while event is pending - Event is cleared as specified
Precondition	a) Device is in PREOPERATE state. b) No events pending - Event Flag not set. c) Events A and B defined by manufacturer
Procedure	a) Device-Tester to read StatusCode. Save value in tester variable "SCa". b) Invoke an event A (Vendor to define how this can be achieved). c) Device-Tester to read StatusCode. Save value in tester variable "SCc". d) Invoke an event B (Vendor to define how this can be achieved). e) Device-Tester to read StatusCode. Save value in tester variable "SCe". f) Device-Tester to read EventQualifier. g) Device-Tester to read EventCode. h) Device-Tester to write Status Code with 0xFF.
Input parameter	Event A and B
Post condition	-

TEST CASE RESULTS	CHECK / REACTION

Evaluation	a) Result of procedure step b): Event Flag is set
	b) Result of procedure step c): Content of "SCa" and "SCc" are different;
	  "SCc" indicates the event.
	c) Result of procedure step e): "SCc" and "SCe" contain the same value;
	  - Event Type & Code are as specified
	  - Check if Eventcode text matches the event described in user manual.
	d) Result of procedure step h): Event Flag is reset

Test passed	Evaluation steps a) through d) ok.
Test failed (examples)	a) No Event Flag set b) Content of "SCa" and "SCc" are not different c) No event indicated in evaluation step b) d) Event Type & Code are not as specified e) Eventcode does not match description in user manual f) Event Flag is not reset.
Results	a) Event Flag set: \<pass/fail> b) Content of "SCa" and "SCc" are different: \<pass/fail> c) Content of "SCa": \<pass/fail> d) Event Type & Code: \<pass/fail> e) Eventcode matches user manual: \<pass/fail> f) Event Flag is reset: \<pass/fail>

6.6.4 Event clearance in OPERATE state

Table 84 defines the test conditions for this test case.

Table 84 – Event clearance in OPERATE state

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0071
Name	TCD_DLIC_EVNT_OPEREVENTCLEAR
Purpose (short)	Test of Event clearance while in OPERATE state.
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Event test, test to pass (positive testing)
Specification (clause)	[9], see 7.3.8.2
Configuration / setup	Device-Tester shall service Event Flag as specified. User shall invoke Event via stimulation of Device (e.g. short circuit, over voltage).

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if event flag is serviced as specified, i.e. Event is cleared with any value writ-

TEST CASE	CONDITIONS / PERFORMANCE
	ten back into the StatusCode (Line 1505 & 1513, V1.09)
Precondition	a) Device is in OPERATE. b) No events pending - Event Flag not set. c) Event A defined by manufacturer
Procedure	a) Stimulation of Event A. b) Device-Tester to write StatusCode "0x00". c) Stimulation of Event A. d) Device-Tester to write StatusCode "0xAA". e) Stimulation of Event A. f) Device-Tester to read StatusCode. Save value in tester variable "SCf". g) Device-Tester to write StatusCode with value of tester variable "SCf".
Input parameter	Event A
Post condition	-

902

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Result of procedure step b): Event Flag is reset b) Result of procedure step d): Event Flag is reset c) Result of procedure step g): Event Flag is reset
Test passed	Evaluation steps a) through c) ok.
Test failed (examples)	Event Flag not reset in any of the evaluation steps.
Results	a) Event Flag in procedure step b: <pass/fail> b) Event Flag in procedure step d: <pass/fail> c) Event Flag in procedure step g: <pass/fail>

903

904 6.6.5   Event handling while communication interruption

905   Table 85 defines the test conditions for this test case.

906   **Table 85 – Event handling while communication interruption**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0072
Name	TCD_DLIC_EVNT_OPERCOMMINTERRUPT
Purpose (short)	Test of Event handling while communication is interrupted.
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Event test, test to pass (positive testing)
Specification (clause)	[9], see 10.9.2
Configuration / setup	Device-Tester shall service Event Flag as specified. User shall invoke Event via stimulation of Device (e.g. short circuit, over voltage).

907

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if Event is handled as specified once communication is cancelled or interrupted.
Precondition	a) Device is in OPERATE state. b) No Events pending - Event Flag not set. c) Stimulation of Event A defined by manufacturer
Procedure	a) Stimulation of Event A (error). Example: primary voltage supply over-run. This cause for the Event A shall not be cleared, thus the error appeared but did not yet disappear. b) Device-Tester to read StatusCode. Save value in tester variable "SCb". c) Device-Tester to read the indicated EventQualifier ("Event appears"). Save value in tester variable "SCc". d) Device-Tester to read the indicated EventCode. Save value in tester variable "SCd". e) Device-Tester to stop communication with Device f) Pause of 15 sec g) Device-Tester to wake-up Device to OPERATE state

TEST CASE	CONDITIONS / PERFORMANCE
	h) Read out and acknowledge events until expected event occurred
Input parameter	Error Event A
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Result of procedure step g): Event Flag is set because the error cause from step a) was not cleared before communication was lost. The timeout for the Device-Tester shall be 2 min. b) Result of procedure step h): Value read corresponds to tester variable "SCb", "SCc", and "SCd".
Test passed	Evaluation steps a) through d) ok.
Test failed (examples)	No correspondence between any of the values read and its tester variables.
Results	a) Event Flag in procedure step g: <pass/fail> b) Read value in step h: <pass/fail> c) Read value in step i: <pass/fail> d) Read value in step j: <pass/fail>

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909

6.6.6 Event handling while power supply interruption

910

911 Table 86 defines the test conditions for this test case.

912 **Table 86 – Event handling while power supply interruption**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0073
Name	TCD_DLIC_EVNT_OPERPOWERINTERRUPT
Purpose (short)	Test of Event handling while power supply is interrupted.
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Event test, test to pass (positive testing)
Specification (clause)	[9], see 7.3.8.2
Configuration / setup	Device-Tester shall service Event Flag as specified. User shall invoke Event via stimulation of Device (e.g. short circuit, over voltage).

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if Event modes are handled as specified when power supply of the Device is interrupted.
Precondition	a) Device is in OPERATE. b) No events pending - Event Flag not set. c) Stimulation of Event A defined by manufacturer
Procedure	a) Stimulation of Event A (error). Example: primary voltage supply over-run. This cause for the Event A shall not be cleared, thus the error appeared but did not yet disappear. b) Device-Tester to read StatusCode. Save value in tester variable "SCb". c) Device-Tester to read the indicated EventQualifier ("Event appears"). Save value in tester variable "SCc". d) Device-Tester to read the indicated EventCode. Save value in tester variable "SCd". e) Power-down of the Device (disconnect from Device-Tester) f) Pause of 15 sec g) Re-connect Device h) Device-Tester to wake-up Device to OPERATE state i) Read out and acknowledge events until expected event occurred
Input parameter	Event A
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Result of procedure step h): Event Flag is set because the error cause from step a) was not cleared before communication was lost. The Event Flag shall not be set immediately after the state change to OPERATE. The timeout for the Device-Tester shall be 2 min. b) Result of procedure step i): Value read corresponds to tester variable "SCb", "SCc", "SCd".
Test passed	Evaluation steps a) through d) ok.
Test failed (examples)	No correspondence between any of the values read and its tester variables. Warning is acceptable.
Results	a) Event Flag in procedure step h: <pass/fail> b) Read value in step i: <pass/fail> c) Read value in step j: <pass/fail> d) Read value in step k: <pass/fail>

915

6.6.7   Event appears/disappears

917   Table 87 defines the test conditions for this test case.

918   **Table 87 – Event appears/disappears**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0074
Name	TCD_DLIC_EVNT_OPERAPPEARDISAPPEAR
Purpose (short)	Test of Event handling with Errors appearing and disappearing.
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Event test, test to pass (positive testing)
Specification (clause)	[9], see 7.3.8.2
Configuration / setup	Device-Tester shall service Event Flag as specified. User shall invoke Event via stimulation of Device (e.g. short circuit, over voltage).

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if Event modes are handled as specified in Figure 11. (Line 2810, V1.09)
Precondition	a) Device is in OPERATE state. b) No events pending - Event Flag not set. c) Stimulation of Event A defined by manufacturer
Procedure	a) Stimulation of Error A. Error shall stay applied to the Device. b) Device-Tester to read StatusCode c) Device-Tester to read EventQualifier. Save value in tester variable "SCc". d) Device-Tester to read EventCode. Save value in tester variable "SCd". e) Device-Tester to write StatusCode "0xFF". f) User to release Error from Device. g) Device-Tester to read StatusCode. h) Device-Tester to read EventQualifier. Save value in tester variable "SCh". i) Device-Tester to read EventCode. Save value in tester variable "SCi". j) Device-Tester to write StatusCode "0xFF".
Input parameter	Error A
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Result of procedure step a): Event Flag is set b) Result of procedure step c): Value read shows mode = "Event appeared" c) Result of procedure step e): Event Flag is reset d) Result of procedure step f): Event Flag is set e) Result of procedure step h): Value read shows mode = "Event disappeared" f) Result of procedure step i): Value of "SCi" = value of "SCd" (EventCodes). g) Result of procedure step j): Event Flag is reset
Test passed	Evaluation steps a) through g) ok.

TEST CASE RESULTS	CHECK / REACTION	
Test failed (examples)	a) Event Flags are not set correctly b) Event modes are indicated incorrectly c) EventCodes are different	
Results	a) Event Flag in procedure step a: b) Value in procedure step c: c) Event Flag in procedure step e: d) Event Flag in procedure step f: e) Value in procedure step h: f) EventCodes in procedure step i: g) Event Flag in procedure step j:	\<pass/fail> \<pass/fail> \<pass/fail> \<pass/fail> \<pass/fail> \<pass/fail> \<pass/fail>

921

922 Figure 11 shows the relationship of an Error and the Event Flag and its appearance and dis-
923 appearance.
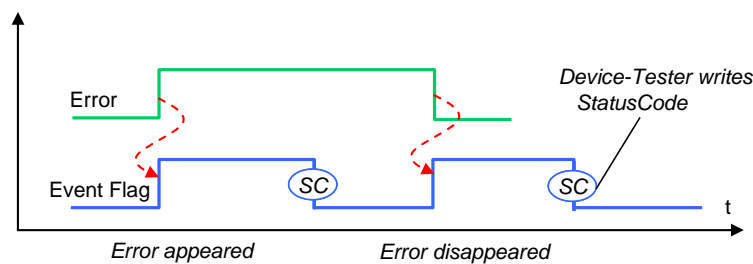
924

925 **Figure 11 – Relationship of an Error and the Event Flag**

926 **6.6.8   Multi Event handling**

927 Table 88 defines the test conditions for this test case.

928 **Table 88 – Multi Event handling**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0075
Name	TCD_DLIC_EVNT_OPERMULTEVENT
Purpose (short)	Test of Event handling with multiple Errors/Events.
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Event test, test to pass (positive testing)
Specification (clause)	[9], see 7.3.8.2
Configuration / setup	Device-Tester shall service Event Flag as specified. User shall invoke Events via stimulation of Device (e.g. short circuit, over voltage).

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check if Event modes are handled as specified in Figure 12. See (Line 2810, V1.09)
Precondition	a) Device is in OPERATE state. b) No events pending - Event Flag not set. c) Stimulation of Event A and B defined by manufacturer
Procedure	a) Stimulation of Error A. Error shall stay applied to Device. b) Device-Tester to read StatusCode c) Device-Tester to read EventQualifier. Save value in tester variable "SCc". d) Device-Tester to read EventCode. Save value in tester variable "SCd". e) Device-Tester to write Status Code "0xFF". f) Stimulation of Error B. Error shall stay applied to Device. h) Device-Tester to read StatusCode g) Stop simulation of Error A i) Device-Tester to read EventQualifier. Save value in tester variable "SCi". j) Device-Tester to read EventCode. Save value in tester variable "SCj".

929

TEST CASE	CONDITIONS / PERFORMANCE
	k) Device-Tester to write Status Code "0xFF". l) Device-Tester to read StatusCode m) Stop simulation of Error B n) Device-Tester to read EventQualifier. Save value in tester variable "SCm". o) Device-Tester to read EventCode. Save value in tester variable "SCn". p) Device-Tester to write StatusCode "0xFF". q) Device-Tester to read StatusCode r) Device-Tester to read EventQualifier. Save value in tester variable "SCq". s) Device-Tester to read EventCode. Save value in tester variable "SCr". t) Device-Tester to write StatusCode "0xFF".
Input parameter	Error/Event A and B
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Result of procedure step c): Value read shows mode = "Event A appeared" b) Result of procedure step i): Value read shows mode = "Event B appeared" c) Result of procedure step n): Value read shows mode = "Event A disappeared" d) Result of procedure step r): Value read shows mode = "Event B disappeared"
Test passed	Evaluation steps a) through d) ok.
Test failed (examples)	a) Event Flags are not set correctly b) Event modes are indicated incorrectly c) EventCodes are different
Results	a) Value in procedure step c): <pass/fail> b) Value in procedure step i): <pass/fail> f) Value in procedure step n): <pass/fail> g) Value in procedure step r): <pass/fail>

Figure 12 shows the correlation of two Errors and the Event Flag and its appearance and disappearance.
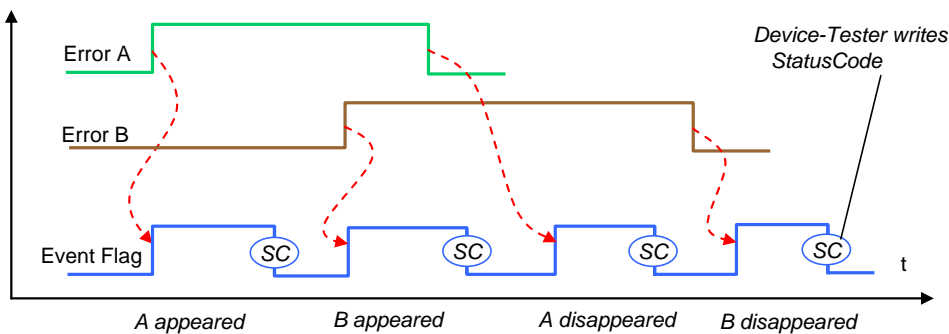
Figure 12 – Correlation of two Errors and the Event Flag

6.6.9   Short time Events

Table 89 defines the test conditions for this test case.

Table 89 – Short time Events

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0076
Name	TCD_DLIC_EVNT_OPERSHORTEVENT
Purpose (short)	Test of the Event handling of short time errors.
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Event test, test to pass (positive testing)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Specification (clause)	[9], see 7.3.8.2
Configuration / setup	Device-Tester shall service Event flag as specified. Person in charge of the test to stimulate an Event (e.g. short circuit, over voltage).

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of the Event handling of short time errors according Figure 13. "Short time error" means that the cause of the error is no more existent, when the acknowledgement from the Master occurred (Write access to StatusCode (SC)). The Device shall send "Error disappeared" in this case after the acknowledgement.
Precondition	a) Device is in OPERATE state. b) No Events pending - Event Flag not set. c) Stimulation of short time Event A defined by manufacturer
Procedure	a) Stimulation of a short time error A. Duration of the error as short as possible. b) Person in charge of the test shall confirm the end of the error cause to the Device-Tester (Figure 13). c) Device-Tester to write StatusCode "0xFF". d) Device-Tester to start timer (measurement) when Event Flag is set. e) Device-Tester to write StatusCode "0xFF" once 100 ms time elapsed and Event Flag still is set.
Input parameter	Short time Error A
Post condition	-

TEST CASE RESULTS	CHECK / REACTION

Evaluation	a) Result of procedure step a): Event Flag is set
	b) Result of procedure step c):
	  - Event Flag still is set and then reset or
	  - Event Flag remains set
	c) Result of procedure step e): Event Flag still is set and then reset

Test passed	Evaluation steps a) through c) ok.
Test failed (examples)	Event Flags are not set correctly
Results	Event has been latched: <pass/fail>

Figure 13 shows the timings of a short time error and the Event flag.
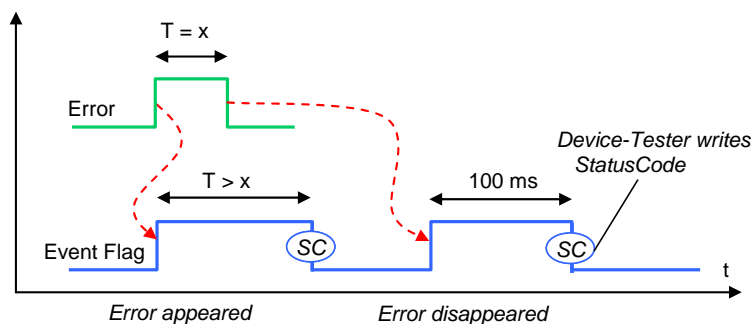
Figure 13 – Timings of a short time error and the Event flag

6.7 Data Storage (DS)

6.7.1 General

6.7.1.1 Checks on Data Storage Index

Checks on different states/values shall be performed according to the notes in the "Evaluation" and "Results" field of the test cases:

951 • State_Property
952   - value of 'State of Data Storage'
953   - value of 'DS_UPLOAD_FLAG'

954 • Data_Storage_Size
955   - shall be larger or equal to actual memory size for the current 'Index_List' and current
956   object values, as described in "Struture of the stored DS data objects"
957   - check after Upload

958 • Parameter_checksum
959   - After modification of parameters listed for data storage this value shall be changed
960   - Check after parameter modification

961 These states are specified in [9], 10.4.2 (Data Storage state machine), and B.2.3 (Data Stor-
962 age Index).

963 "Parameter set 1" and "Parameter set 2" are used as placeholders for two parameter sets that
964 fulfil the following conditions:

965 • "Parameter set 1" and "Parameter set 2" contain parameters listed for data storage

966 • "Parameter set 1" and "Parameter set 2" are different in parameters listed for data storage

967 • "Parameter set 1" and the parameter set of the Device after factory reset are different

968 **6.7.1.2   Generation of "DS_UPLOAD_REQ"**

969 It would be possible to test the generation of "DS_UPLOAD_REQ" in separate testcases. But
970 these tests are already executed within the test cases for Upload and Download.

971 **6.7.1.3   Different Upload test cases**

972 Upload is tested in different states of the Device.

973 **6.7.1.4   Different Download test cases**

974 Download is only checked with "DS_UPLOAD_REQ" flag = false.

975 **6.7.2   Upload without DS_UPLOAD_FLAG notification**

976 Table 90 defines the test conditions for this test case.

977   **Table 90 – Upload without DS_UPLOAD_FLAG notification**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0077
Name	TCD_APPS_DSUP_NOFLAG
Purpose (short)	Test of explicit upload without DS_UPLOAD_FLAG notification
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.4.2, Table B.11, Figure 95
Configuration / setup	-
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test covers upload of data storage contents (parameter set) without DS_UPLOAD_FLAG notification
Precondition	a) Device in PREOPERATE or OPERATE mode b) Device DS activated c) DS_UPLOAD_FLAG is not set

978

TEST CASE	CONDITIONS / PERFORMANCE
	d) Device parameterized (manufacturer to define parameter set)
Procedure	Execute upload completely as defined in Master DS state machine: a) Switch Master DS from deactivated to activated state. b) Stimulate upload using DS_Commands "DS_UploadStart" and "DS_UploadEnd"
Input parameter	Parameter set (manufacturer to define parameter set)
Post condition	-

979

TEST CASE RESULTS	CHECK / REACTION

Evaluation	Check whether parameter set is read without errors through Data Storage Index.
	Upon each of the following actions:
	  a) After call of the DS_UploadStart command
	  b) After reading/uploading the parameters
	  c) After call of the DS_UploadEnd command
	check the following:
	  d) State of Data Storage is correct
	  e) DS_UPLOAD_FLAG is not set
	  f) Parameter_checksum does not change

Test passed	If all three checks during the three actions described in evaluation are positive
Test failed (examples)	If one check during the actions described in Evaluation is negative
Results	a) Result of evaluation action a) and check d): <state> <pass/fail> b) Result of evaluation action a) and check e): <flag> <pass/fail> c) Result of evaluation action a) and check f): <checksum> <pass/fail> d) Result of evaluation action b) and check d): <state> <pass/fail> e) Result of evaluation action b) and check e): <flag> <pass/fail> f) Result of evaluation action b) and check f): <checksum> <pass/fail> g) Result of evaluation action c) and check d): <state> <pass/fail> h) Result of evaluation action c) and check e): <flag> <pass/fail> i) Result of evaluation action c) and check f): <checksum> <pass/fail>

980

981 6.7.3 Upload via ParamDownloadStore

982 Table 91 defines the test conditions for this test case.

983 **Table 91 – Upload via ParamDownloadStore**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0078
Name	TCD_APPS_DSUP_VIADOWNLOADSTORE
Purpose (short)	Test of explicit upload via SystemCommand "ParamDownloadStore"
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.4.2, Tables B.8, B.11, D.2, Figure 95
Configuration / setup	-

984

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers parameterization (parameter set 2) of a Device and upload of this set into the Master DS per SystemCommand "ParamDownloadStore". Manufacturer is responsible for the definition of two possible "parameter sets".
Precondition	a) Device in PREOPERATE or OPERATE mode b) Device DS activated c) Parameter set 1 stored within Device (manufacturer to define parameter set 1) d) DS_UPLOAD_FLAG is not set d) Test preparation e.g. using DS_Command "DS_UploadStart", upload of parameter set 1" using the Index List (upload), followed by a "DS_UploadEnd"
Procedure	a) Call DS_Command "ParamDownloadStart" b) Write different parameter set 2 into the Device (manufacturer to define parameter

TEST CASE	CONDITIONS / PERFORMANCE
	set 2) c) Call DS_Command "ParamDownloadStore" (causes the event DS_UPLOAD_REQ) d) Wait for event DS_UPLOAD_REQ e) Execute Upload (Data Storage) completely as defined in the Master state machine (switch Master DS from deactivated to activated)
Input parameter	Parameter set 1 and parameter set 2 (defined by manufacturer)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check whether parameter set 2 is read without errors through Parameter_checksum. Upon each of the following actions: a) After call of the DS_UploadStart command b) After reading/uploading the parameters c) After call of the DS_UploadEnd command check the following: d) State of Data Storage is correct e) DS_UPLOAD_FLAG is not set f) Parameter_checksum has changed to that of parameter set 2
Test passed	If all three checks during the three actions described in evaluation are positive.
Test failed (examples)	If one check during the actions described in Evaluation is negative.
Results	a) Result of evaluation action a) and check d): \<state\> \<pass/fail\> b) Result of evaluation action a) and check e): \<flag\> \<pass/fail\> c) Result of evaluation action a) and check f): \<checksum\> \<pass/fail\> d) Result of evaluation action b) and check d): \<state\> \<pass/fail\> e) Result of evaluation action b) and check e): \<flag\> \<pass/fail\> f) Result of evaluation action b) and check f): \<checksum\> \<pass/fail\> g) Result of evaluation action c) and check d): \<state\> \<pass/fail\> h) Result of evaluation action c) and check e): \<flag\> \<pass/fail\> i) Result of evaluation action c) and check f): \<checksum\> \<pass/fail\>

6.7.4   Upload via ParamDownloadStore without write calls

Table 92 defines the test conditions for this test case.

Table 92 – Upload via ParamDownloadStore without write calls

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0079
Name	TCD_APPS_DSUP_VIADOWNLOADSTORENOWRITE
Purpose (short)	Test of explicit upload via "ParamDownloadStore" without write calls
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.4.2, Table B.11, Table D.2, Figure 95
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers parameterization (parameter set 2) of a Device and upload of this set into the Master DS per SystemCommand "ParamDownloadStore". Manufacturer is responsible for the definition of two possible "parameter sets".
Precondition	a) Device in PREOPERATE or OPERATE mode b) Device DS activated c) Parameter set 1 stored within Device (manufacturer to define parameter set 1) d) DS_UPLOAD_FLAG is not set d) Test preparation e.g. using DS_Command "DS_UploadStart", upload of parameter set 1" using the Index List (upload), followed by a "DS_UploadEnd"
Procedure	a) Write different parameter set 2 into the Device (manufacturer to define parameter set 2) b) Wait 1 s for event DS_UPLOAD_REQ

TEST CASE	CONDITIONS / PERFORMANCE
	c) Call SystemCommand "ParamDownloadStart" via ISDU (w/o writing parameters) d) Initiate upload via SystemCommand "ParamDownloadStore" e) Wait for event DS_UPLOAD_REQ e) Execute upload (Data Storage) completely as defined in the Master state machine (switch Master DS from deactivated to activated)
Input parameter	Parameter set 1 and 2 (manufacturer to define possible parameter sets)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION

Evaluation	a) Check whether parameter set 2 is written without errors
	b) Check whether Event DS_UPLOAD_REQ was not raised after changing parameters (parameter set 2)
	c) Check whether Event DS_UPLOAD_REQ was raised by the Device after SystemCommand "ParamDownloadStore"
	d) Check whether parameter set 2 is read without errors through Parameter_checksum
	Upon each of the following actions:
	  e) After call of the DS_UploadStart command
	  f) After reading/uploading the parameters
	  g) After call of the DS_UploadEnd command
	check via Data Storage Index the following:
	  h) State of Data Storage is correct
	  i) DS_UPLOAD_FLAG is not set
	  j) Parameter_checksum has changed only after 'Write parameter set 2'

Test passed	If all three checks during the three actions described in evaluation are positive.
Test failed (examples)	If one check during the actions described in Evaluation is negative.
Results	a) Result of evaluation action a): <checksum> <pass/fail> b) Result of evaluation action b): <flag> <pass/fail> c) Result of evaluation action c): <flag> <pass/fail> d) Result of evaluation action d): <checksum> <pass/fail> e) Result of evaluation action e) and check h): <state> <pass/fail> f) Result of evaluation action e) and check i): <flag> <pass/fail> g) Result of evaluation action e) and check j): <checksum> <pass/fail> h) Result of evaluation action f) and check h): <state> <pass/fail> i) Result of evaluation action f) and check i): <flag> <pass/fail> j) Result of evaluation action f) and check j): <checksum> <pass/fail> k) Result of evaluation action g) and check h): <state> <pass/fail> l) Result of evaluation action g) and check i): <flag> <pass/fail> m) Result of evaluation action g) and check j): <checksum> <pass/fail>

6.7.5 Upload via local parameter modification

Table 93 defines the test conditions for this test case.

Table 93 – Upload via local parameter modification

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0080
Name	TCD_APPS_DSUP_VIALOCALCHANGE
Purpose (short)	Test of implicit upload after local parameter modification
Equipment under test (EUT)	Device (only if local parameterization such as teach-in or panel is supported)
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.4.2, Table B.11, Table D.2, Figure 95
Configuration / setup	-

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers local parameter changes of a Device and implicit upload of the parameter set into the Master DS. Manufacturer is responsible for the definition of two possible "parameter sets".

997

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

TEST CASE RESULTS	CHECK / REACTION

Evaluation	a) Check whether Event DS_UPLOAD_REQ was raised automatically by the Device
	   after local parameter modification
	b) Check whether parameter set 2 is read without errors through
	   Parameter_checksum
	Upon each of the following actions:
	  c) After call of the DS_UploadStart command
	  d) After reading/uploading the parameters
	  e) After call of the DS_UploadEnd command
	check via Data Storage Index the following:
	  f) State of Data Storage is correct
	  g) DS_UPLOAD_FLAG is not set
	  h) Parameter_checksum has changed only after 'local change of parameter values'

Test passed	If all three checks during the three actions described in evaluation are positive.
Test failed (examples)	If one check during the actions described in Evaluation is negative.
Results	a) Result of evaluation action a): \<flag\> \<pass/fail\> b) Result of evaluation action b): \<checksum\> \<pass/fail\> c) Result of evaluation action c) and check f): \<state\> \<pass/fail\> d) Result of evaluation action c) and check g): \<flag\> \<pass/fail\> e) Result of evaluation action c) and check h): \<checksum\> \<pass/fail\> f) Result of evaluation action d) and check f): \<state\> \<pass/fail\> g) Result of evaluation action d) and check g): \<flag\> \<pass/fail\> h) Result of evaluation action d) and check h): \<checksum\> \<pass/fail\> i) Result of evaluation action e) and check f): \<state\> \<pass/fail\> j) Result of evaluation action e) and check g): \<flag\> \<pass/fail\> k) Result of evaluation action e) and check h): \<checksum\> \<pass/fail\>

998

6.7.6   Call ParamBreak in different states of Upload

1000   Table 94 defines the test conditions for this test case.

1001   **Table 94 – Call ParamBreak in different states of Upload**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0081
Name	TCD_APPS_DSUP_PARABREAKABORT
Purpose (short)	Test of Upload abort via SystemCommand "ParamBreak" in different states
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.4.2, Table B.11, Table D.2, Figure 95
Configuration / setup	

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test covers Upload aborts via SystemCommand "ParamBreak" in different states.

1002

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

Evaluation	a) Check whether Event DS_UPLOAD_REQ was raised automatically by the Device
	b) Check whether parameter set 2 is read without errors through Parameter_checksum
	Upon each of the following actions:
	  c) After call of each SystemCommand "ParamUploadStart" (3x)
	  d) After call of each SystemCommand "ParamBreak" (3x)
	check via Data Storage Index the following:
	  e) State of Data Storage is correct
	  f) DS_UPLOAD_FLAG is not set
	  g) Parameter_checksum has changed only after 'write parameter set 2'
	h) Check whether the Upload has been completed without errors

Test passed	If all three checks during the two actions described in evaluation are positive.
Test failed (examples)	If one check during the actions described in Evaluation is negative.
Results	a) Result of evaluation action a): <flag> <pass/fail> b) Result of evaluation action b): <checksum> <pass/fail> c) Result of evaluation action c) and check e): <state> <pass/fail> d) Result of evaluation action c) and check f): <flag> <pass/fail> e) Result of evaluation action c) and check g): <checksum> <pass/fail> g) Result of evaluation action d) and check e): <state> <pass/fail> h) Result of evaluation action d) and check f): <flag> <pass/fail> i) Result of evaluation action d) and check g): <checksum> <pass/fail> j) Result of evaluation action h): <pass/fail>

6.7.7 Download after modification of parameters

Table 95 defines the test conditions for this test case.

Table 95 – Download after modification of parameters

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0082
Name	TCD_APPS_DSDN_PARAMODIFICATION
Purpose (short)	Test Download after modification of parameters
Equipment under test (EUT)	Device
Test case version	1.0

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.4.2, Table B.11, Table D.2, Figure 95
Configuration / setup	-

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

TEST CASE RESULTS	CHECK / REACTION

Evaluation	a) Check whether Event DS_UPLOAD_REQ was not raised by the Device
	Upon each of the following actions:
	  b) After call of SystemCommand "ParamDownloadStart"
	  c) After call of SystemCommand "ParamDownloadEnd"
	  d) After execution of the complete Download
	check via Data Storage Index the following:
	  e) State of Data Storage is correct
	  f) DS_UPLOAD_FLAG is not set
	  g) Parameter_checksum has changed only after 'write parameter set 2'
	h) Check whether the Download has been completed without errors

Test passed	If all three checks during the three actions described in evaluation are positive.
Test failed (examples)	If one check during the actions described in Evaluation is negative.
Results	a) Result of evaluation action a): <flag> <pass/fail> b) Result of evaluation action b) and check e): <state> <pass/fail> c) Result of evaluation action b) and check f): <flag> <pass/fail> d) Result of evaluation action b) and check g): <checksum> <pass/fail> e) Result of evaluation action c) and check e): <state> <pass/fail> f) Result of evaluation action c) and check f): <flag> <pass/fail> g) Result of evaluation action c) and check g): <checksum> <pass/fail> h) Result of evaluation action d) and check e): <state> <pass/fail> i) Result of evaluation action d) and check f): <flag> <pass/fail> j) Result of evaluation action d) and check g): <checksum> <pass/fail> k) Result of evaluation action h): <pass/fail>

6.7.8   Download into the Device after reset

Table 96 defines the test conditions for this test case.

Table 96 – Download into the Device after reset

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0083
Name	TCD_APPS_DSDN_FACTORYRESET
Purpose (short)	Test of Download into the Device after reset to factory settings
Equipment under test (EUT)	Device (only if reset to factory settings is supported)

1014

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.4.2, 10.6.4, Table B.11, Table D.2, Figure 95
Configuration / setup	-

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

1015

TEST CASE RESULTS	CHECK / REACTION

Evaluation	a) After "Restore factory settings" check whether Event DS_UPLOAD_REQ was not raised by the Device.
	Upon each of the following actions:
	  b) After "Restore factory settings"
	check via Data Storage Index the following:
	  c) State of Data Storage is correct
	  d) DS_UPLOAD_FLAG is not set
	  e) Parameter_checksum has changed
	f) Check whether the Download has been completed without errors

Test passed	If all three checks during the action described in evaluation are positive.
Test failed (examples)	If one check during the actions described in Evaluation is negative.
Results	a) Result of evaluation action a): <flag> <pass/fail> b) Result of evaluation action b) and check c): <state> <pass/fail> c) Result of evaluation action b) and check d): <flag> <pass/fail> d) Result of evaluation action b) and check e): <checksum> <pass/fail> e) Result of evaluation action f): <pass/fail>

1016

1017   6.7.9   Call ParamBreak in different states of Download

1018   Table 96 defines the test conditions for this test case.

1019   **Table 97 – Call ParamBreak in different states of Download**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0084
Name	TCD_APPS_DSDN_PARABREAKABORT
Purpose (short)	Test of Download abort via SystemCommand "ParamBreak" in different states
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.4.2, Table B.11, Table D.2, Figure 95
Configuration / setup	-

1020

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

Evaluation	Upon each of the following actions:
	  a) After call of each SystemCommand "ParamBreak" (3x)
	check via Data Storage Index the following:
	  b) State of Data Storage is correct
	  c) DS_UPLOAD_FLAG is not set
	  d) Parameter_checksum has changed
	e) Check whether the Download has been completed without errors

Test passed	If all checks during the actions described in evaluation are positive.
Test failed (examples)	If one check during the actions described in Evaluation is negative.
Results	a) Result of evaluation action a) and check b): \<state\> \<pass/fail\> b) Result of evaluation action a) and check c): \<flag\> \<pass/fail\> c) Result of evaluation action a) and check d): \<checksum\> \<pass/fail\> d) Result of evaluation action e): \<pass/fail\>

1021

1022

6.8   Operation with a legacy Master ("Master 1.0")

6.8.1   General

Designers of Devices according to [9] ("Device 1.1") should be aware of the possibility that such a Device in the field can be connected to a Master ("Master 1.0") designed according to a previous specification [13]. Therefore, the conformity class requirements and the associated test cases are specified within the following clauses. It should be noted that the IODD of such a Device plays an important role in establishing the right behavior in respect to Process Data exchange and cycle times (interleave mode). The compatibility rules for IODDs are defined in [3].

6.8.2   Conformity classes

6.8.2.1   Master conformity

The "Masters 1.0" in the field are supposed to be conform with [13]. By design according to [9], the "Masters 1.1" shall be compatible to any legacy "Device 1.0". Therefore, no special compatibility rules are required for Masters and no conformity classes.

6.8.2.2   "Device 1.1" without backward compatibility

The Device requires features that only a Master provides, which is designed according to [9] or a later version. Thus, usually it can deny SDCI communication with a "Master 1.0". Exam-

1040   ple is a Device with large Process Data (PD). If this Device would be used with a "Master 1.0"
1041   and an F-sequence TYPE_1, the Process Data cycle could last much longer than with a "Mas-
1042   ter 1.1". The manufacturer or vendor of a Device shall document the behavior of the Device in
1043   case it will be connected to a "Master 1.0" (see B.5 also).

1044   **6.8.2.3   "Device 1.1" compatible with a "Master 1.0"**

1045   There exist two main possibilities to design a "Device 1.1" compatible to a "Master 1.0".

1046   • The "Device 1.1" can be adjusted to a behavior according to [13] through setting of a spe-
1047   cific parameter using ISDU services ("Device 1.0"). In this case no new test cases are re-
1048   quired due to an SDCI communication compatible to [13].

1049   • The "Device 1.1" will automatically detect connection to a "Master 1.0" and switch to an
1050   SDCI communication compatible to [13]. For this case, the restrictions for the "Master 1.0"
1051   and the "Device 1.1" are defined in the following.

1052   The compatibility restrictions or constraints for a "Master 1.0" being able to support automatic
1053   SDCI communication version detection are:

1054   • As defined in the state machines of [9], the "Device 1.1" will send the protocol version 1.1
1055   (or a later one) via parameter 0x04 (RevisionID) to the "Master 1.0" during the startup
1056   phase. The "Master 1.0" shall ignore this version number. If the "Master 1.0" insists in pro-
1057   tocol version 1.0, the "Device 1.1" cannot be used with this Master.

1058   • During reading of the parameters 0x02 to 0x06 (Direct Parameter page 1) in the STARTUP
1059   phase, the "Device 1.1" cannot detect the Master version. For this reason, some of the re-
1060   served bits in the parameter 0x03 (F-sequence Capability) in [13] are set in the "De-
1061   vice 1.1". The "Master 1.0" shall ignore these bits. Otherwise, the "Device 1.1" cannot be
1062   used with this "Master 1.0".
1063

1064   **6.8.3   From STARTUP to OPERATE (V1.0)**

1065   Table 98 defines the test conditions for this test case.

1066   **Table 98 – From STARTUP to OPERATE (V1.0)**

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
Test case version	1.0
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 F-sequence type and exchanges Process Data

1067

TEST CASE	CONDITIONS / PERFORMANCE
	f) Master initiates an ISDU Read or Write to test the Device capability
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 F-sequence type after OPERATE c) Check if the ISDU Read or Write is responded
Test passed	a) If Device exchanges Process Data after STARTUP b) If ISDU is working
Test failed (examples)	a) MasterCommand 0x99 (OPERATE) results in a negative response or b) Device does not use the target F-sequence type c) Device does not respond to ISDU Read or Write
Results	Exchange of PD: \<yes/no> \<pass/fail> ISDU is working: \<yes/no> \<pass/fail>

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6.8.4   From STARTUP to OPERATE – interleave (V1.0)

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1071   Table 99 defines the test conditions for this test case.

1072   **Table 99 – From STARTUP to OPERATE - interleave (V1.0)**

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
Test case version	1.0
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 F-sequence types for large Process Data transfers (more than 2 octets). In Version V1.0, SDCI communication uses the TYPE_1_x F-sequences with interleaving of Process Data and ISDU data. 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 F-sequence TYPE_1_1/2 and exchanges Process Data f) Master initiates a ISDU Read or Write to ensure an answer of 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 F-sequence type after OPERATE c) Check if the ISDU Read or Write is responded
Test passed	a) If Device exchanges Process Data in interleave mode after STARTUP b) If ISDU is working

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1074

TEST CASE RESULTS	CHECK / REACTION
Test failed (examples)	a) MasterCommand 0x99 (OPERATE) results in a negative response or b) Device does not use the target F-sequence type c) Device does not respond to ISDU Read or Write
Results	Exchange of PD in interleave mode: <yes/no>　　　　<pass/fail> ISDU is working: <yes/no>　　　　<pass/fail>

1075

6.8.5　Events – PDInvalid / PDValid (V1.0)

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1077　Table 100 defines the test conditions for this test case.

1078　**Table 100 – Events – PDInvalid / PDValid (V1.0)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0087
Name	TCD_DLIC_COMP_PDINVALIDEVENT
Purpose (short)	Send Event for PDVALID/INVALID
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[13],
Configuration / setup	Device-Tester

1079

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Send Event for PDVALID/INVALID. This test to ensure that a Device can indicate the validity of the Process Data inputs GOOD or BAD via an Event in a V1.0 SDCI communication (In V1.0, the Master does not interpret the bit in the Process Data).
Precondition	The communication is established
Procedure	a) Stimulate an error in the Device, which leads to a Process Data failure b) The Device shall send this status change via an Event
Input parameter	-
Post condition	-

1080

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check if the Device sent an Event with PDValid/Invalid to the Master .
Test passed	Device-Tester received an Event for the validity change of Process Data (GOOD and BAD).
Test failed (examples)	Device did not send an Event.
Results	Device sent "GOOD/BAD" Event: <yes/no>　　　　<pass/fail>

1081

6.9　Direct Parameter page 1

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6.9.1　MasterCycleTime

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1084　Table 101 defines the test conditions for this test case.

1085　**Table 101 – MasterCycleTime**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0089
Name	TCD_DLPC_STDP_MASTERCYCLETIME
Purpose (short)	Test for correct value of MasterCycleTime

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.3
Configuration / setup	Device-Tester , Line-Monitor (optionally)
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test the correct value of MasterCycleTime. The value shall match the value provided by the Master (Maximum is 134 ms, see B.6).
Precondition	Device is in SIO mode
Procedure	a) Set Device to SDCI communication mode b) Monitor MasterCycleTime written to the Device at startup c) Read via the Master the MasterCycleTime on Direct Parameter page 1 (address 0x01) d) Compare value of MasterCycleTime with written value at startup
Input parameter	-
Post condition	-

1087

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check valid MasterCycleTime (Maximum is 134 ms)
Test passed	Value of MasterCycleTime is equal to value written at startup.
Test failed (examples)	Value of MasterCycleTime is not equal to value written at startup.
Results	MasterCycleTime: <value> <passed/failed>

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1089   **6.9.2   MinCycleTime**

1090   Table 102 defines the test conditions for this test case.

1091   **Table 102 – MinCycleTime**

1092

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0090
Name	TCD_DLPC_STDP_MINCYCLETIME
Purpose (short)	Test for correct setting of MinCycleTime
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.4, Figure B.2, Table B.3
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test the MinCycleTime. The value shall match the Device specific default settings as defined in IODD or shall be valid (Maximum is 134 ms, see B.7).
Precondition	Device is in SDCI communication mode (Scan mode).
Procedure	a) Read via Device-Tester the MinCycleTime on Direct Parameter page 1 (Index 0, Subindex 3 redirected to 0x02) b) Check value of MinCycleTime parameter c) Check if Time Base contains a valid value
Input parameter	-
Post condition	-

1093

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check value of MinCycleTime (Maximum is 134 ms, see B.7) and Time Base.
Test passed	MinCycleTime is equal to 0x00 or MinCycleTime is equal to specified value and Time Base is less than 3.
Test failed (examples)	MinCycleTime is not equal to 0x00 and MinCycleTime is not equal to specified value and Time Base is equal to value 3.
Results	MinCycleTime: <value> <passed/failed> Time Base: <value> <passed/failed>

1094

6.9.3 F-sequenceCapability

1095

1096 Table 103 defines the test conditions for this test case.

1097 **Table 103 – F-sequenceCapability**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0091
Name	TCD_DLPC_STDP_FSEQCAPABILITY
Purpose (short)	Test for correct F-sequence type entries
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.5, Figure B.3
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the parameter F-SequenceCapability. The values shall match the Device specific default settings as defined in the IODD.
Precondition	Device is in SDCI communication mode (Scan mode).
Procedure	a) Read with the Device-Tester the F-SequenceCapability on Direct Parameter page 1 (Index 0, Subindex 4 redirected to 0x03) b) Check if ISDU value matches specified value (Bit 0) c) Check if OPERATE F-sequence type matches specified value (Bit 1-3) d) Check if PREOPERATE F-sequence type matches specified value (Bit 4,5) e) Check if Bit 6,7 match the default value
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check validity of F-SequenceCapability bit combinations
Test passed	a) ISDU bit matches specified value b) OPERATE F-sequence type matches specified value c) PREOPERATE F-sequence type matches specified value d) Bit 6,7 are equal to value "0"
Test failed (examples)	Any of the bit combinations do not match specified values or bit 6,7 are not "0"
Results	F-SequenceCapability: <value> <passed/failed>

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6.9.4 RevisionID

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1102 Table 104 defines the test conditions for this test case.

1103   **Table 104 – RevisionID**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0092
Name	TCD_DLPC_STDP_REVISIONID
Purpose (short)	Test for correct default protocol revision
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.6, Figure B.4
Configuration / setup	Device-Tester

1104

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the protocol revision. The value shall match the Revision defined by the vendor as the default value.
Precondition	Device is in SDCI communication mode (Scan mode).
Procedure	a) Read via the Device-Tester the RevisionID on Direct Parameter page1 (Index 0, Subindex 5 redirected to 0x04) b) Check if RevisionID matches the vendor assigned default value
Input parameter	-
Post condition	-

1105

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check validity of the parameter RevisionID
Test passed	Revision ID matches the vendor assigned default value
Test failed (examples)	Revision ID does not match the assigned default value
Results	RevisionID: <value> <passed/failed>

1106

1107   6.9.5   ProcessDataIn

1108   Table 105 defines the test conditions for this test case.

1109   **Table 105 – ProcessDataIn**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0093
Name	TCD_DLPC_STDP_PDIN
Purpose (short)	Test for correct default ProcessDataInput value
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.7, Figure B.5
Configuration / setup	Device-Tester

1110

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the values of ProcessDataInput. The value shall match the specified default value according to the IODD.
Precondition	Device is in SDCI communication mode (Scan mode).
Procedure	a) Read via the Device-Tester the parameter ProcessDataIn on Direct Parameter page 1 (Index 0, Subindex 6 redirected to 0x05) b) Check if Process Data length matches the specified values (Bit 0-4,7) c) Check if SIO bit matches the specified value (Bit 6)

TEST CASE	CONDITIONS / PERFORMANCE
	d) Check if Bit 5 has default value
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check validity of the parameter ProcessDataInput.
Test passed	a) Process Data length and SIO bit match specified values and b) Process Data length unit is a valid value and c) Bit 5 is "0".
Test failed (examples)	a) Process Data length or SIO bit do not match specified values or b) Process Data length unit is not a valid value or c) Bit 5 is not "0".
Results	ProcessDataIn: <value> <passed/failed>

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1112

6.9.6   ProcessDataOut

Table 106 defines the test conditions for this test case.

Table 106 – ProcessDataOut

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0094
Name	TCD_DLPC_STDP_PDOUT
Purpose (short)	Test for correct default ProcessDataOutput value
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.8, Figure B.5
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the values of Process Data Output. The value shall match the specified default value according to the IODD.
Precondition	Device is in SDCI communication mode (Scan mode).
Procedure	a) Read via the Device-Tester the parameter ProcessDataOut on Direct Parameter page 1 (Index 0, Subindex 7 redirected to 0x06) b) Check if Process Data length matches the specified value (Bit 0-4,7) c) Check if Bits 5,6 have default value
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check validity of the parameter ProcessDataOutput.
Test passed	a) Process Data length match specified values and b) Process Data length unit is a valid value and c) Bit 5 and 6 are "0".
Test failed (examples)	a) Process Data length do not match specified values or b) Process Data length unit is not a valid value or c) Bit 5 or 6 are not "0".
Results	ProcessDataOut: <value> <passed/failed>

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1119   **6.9.7   VendorID**

1120   Table 107 defines the test conditions for this test case.

1121   **Table 107 – VendorID**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0095
Name	TCD_DLPC_STDP_VENDORID
Purpose (short)	Test for correct VendorID
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.9
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test the VendorID. The value shall match the unique ID assigned to the vendor.
Precondition	Device is in SDCI communication mode (Scan mode).
Procedure	a) Read via the Device-Tester VendorID1 and VendorID2 on Direct Parameter page 1 (Index 0, Subindex 8 and Subindex 9 redirected to 0x07, 0x08) b) Check if it matches the assigned value
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check validity of the parameter VendorID.
Test passed	VendorID matches the assigned value
Test failed (examples)	VendorID does not match the assigned value
Results	VendorID: <value> <passed/failed>

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1125   **6.9.8   DeviceID**

1126   Table 108 defines the test conditions for this test case.

1127   **Table 108 – DeviceID**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0096
Name	TCD_DLPC_STDP_DEVICEID
Purpose (short)	Test for correct default DeviceID
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.10
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test the DeviceID. The value shall match the ID assigned by the vendor for the specific Device function as the default value.

TEST CASE	CONDITIONS / PERFORMANCE
Precondition	Device is in SDCI communication mode (Scan mode).

Procedure	a) Read via the Device-Tester DeviceID1, DeviceID2 and
	   DeviceID3 on Direct Parameter page 1 (Index 0 Subindex 10, Subindex 11,
	   Subindex 12 redirected to 0x09, 0x0A, 0x0B)
	b) Check if DeviceID matches the vendor assigned value according to the IODD

Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check validity of the parameter DeviceID.
Test passed	DeviceID matches the vendor assigned default value and IODD DeviceID
Test failed (examples)	DeviceID is 0x00, 0x00, 0x00 or does not match the assigned value
Results	DeviceID: <value> <passed/failed>

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6.9.9   FunctionID

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Table 109 defines the test conditions for this test case.

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Table 109 – FunctionID

1133

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0097
Name	TCD_DLPC_STDP_FUNCTIONID
Purpose (short)	Test for correct FunctionID
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.11
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test the FunctionID. The FunctionID is not used and shall contain the default value.
Precondition	Device is in SDCI communication mode (Scan mode).

Procedure	a) Read via the Device-Tester FunctionID1 and FunctioID2 on
	   Direct Parameter page 1 (Index 0 Subindex 13, Subindex 14 redirected to 0x0C,
	   0x0D)
	b) Check if FunctionID matches the default value

Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check validity of the parameter FunctionID.
Test passed	FunctionID is 0x00, 0x00
Test failed (examples)	FunctionID is not 0x00, 0x00
Results	FunctionID: <value> <passed/failed>

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6.9.10   Reserved parameter – Read

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Table 110 defines the test conditions for this test case.

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1139   **Table 110 – Reserved parameter - Read**

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0100
Name	TCD_DLPC_STDP_READRESPAR
Purpose (short)	Test reserved Direct Parameter read result
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.1
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the read result of a read access to a reserved Direct Parameter.
Precondition	Device is in SDCI communication mode (Scan mode).
Procedure	a) Read via the Device-Tester reserved parameters on Direct Parameter page 1 (Address 0x0E) b) Check if result matches specification
Input parameter	-
Post condition	-

1141

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check validity of a Read access to reserved Direct Parameter.
Test passed	Read Result is 0x00
Test failed (examples)	Read Result is not 0x00
Results	Read Reserved Parameter: <value> <passed/failed>

1142

1143 **6.9.11   Reserved parameter – Write**

1144   Table 111 defines the test conditions for this test case.

1145   **Table 111 – Reserved parameter - Write**

1146

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0101
Name	TCD_DLPC_STDP_WRITERESPAR
Purpose (short)	Test reserved Direct Parameter write behavior
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device Direct Parameter; test to pass (positive testing)
Specification (clause)	[9], see B.1.1
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the Device behavior and read result after write access to a reserved Direct Parameter
Precondition	Device is in SDCI communication mode
Procedure	Write values 0x00 to 0xFF via the Device-Tester to reserved parameters on Direct Parameter page 1 (Address 0x0E)
Input parameter	-

1147

TEST CASE	CONDITIONS / PERFORMANCE
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check validity of a Write access to reserved Direct Parameter.
Test passed	If no communication errors occurred
Test failed (examples)	If communication errors or Events occurred
Results	Communication errors: <no/yes> <passed/failed>

1148

1149 **6.10 Predefined Device parameters**

1150 **6.10.1 General rules**

1151 Predefined parameters shall be tested in any case. The following rules apply:

1152 a) They shall be tested as specified within the test cases, if they are defined within the IODD

1153 b) The Device shall respond with "Index not available", if they are not defined within the
1154 IODD, which means they are not implemented.

1155 c) All optional test cases for Predefined Parameters shall be handled according to rule b)

1156

1157 **6.10.2 System command – reserved commands**

1158 Table 112 defines the test conditions for this test case.

1159 **Table 112 – System command – reserved commands**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0104
Name	TCD_DLIC_DEFP_SYSCMDRES
Purpose (short)	Test of SystemCommand reserved value implementation (via ISDU)
Equipment under test (EUT)	Device and Legacy-Device (see B.8)
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see B.2.2, and Annex C.2.1, Table C.1
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies the correct response values upon usage of reserved and unused SystemCommands.
Precondition	Device is in SDCI communication mode (Scan mode) and SystemCommand is implemented.
Procedure	Write subsequently all values to SystemCommand, which are marked as reserved or marked as unused.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check every response on Write access.
Test passed	Every Write request is followed by a negative response: FUNC_NOTAVAIL (0x8035). If the error response does not match this expectation, the Device tester shall raise a warning and display the response value. For Legacy-Devices see B.8.
Test failed (examples)	Wrong or no response.

1160

1161

TEST CASE RESULTS	CHECK / REACTION	
Results	Write response (reserved SC): <value>	<pass/fail>

1162

6.10.3 System command – implemented commands

1163

1164   Table 113 defines the test conditions for this test case.

1165   **Table 113 – System command – implemented commands**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE	
Identification (ID)	SDCI_TC_0105	
Name	TCD_DLIC_DEFP_SYSCMDIMP	
Purpose (short)	Test of SystemCommand implemented value behavior (via ISDU)	
Equipment under test (EUT)	Device and Legacy-Device (see B.9)	
Test case version	1.0	
Category / type	Device application test; test to pass (positive testing)	
Specification (clause)	[9], see Annex B.2.2	
Configuration / setup	Device-Tester	

1166

TEST CASE	CONDITIONS / PERFORMANCE	
Purpose (detailed)	The test verifies, that implemented SystemCommands are responded correctly.	
Precondition	Device is in SDCI communication mode (Scan mode) and SystemCommand is implemented.	
Procedure	Write subsequently all values to System Command, which are marked as implemented.	
Input parameter	-	
Post condition	-	

1167

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	Check every response on Write access.	
Test passed	Every Write request is followed by a positive response received within 5 s (ISDU). See B.9.	
Test failed (examples)	Wrong or no response.	
Results	Write response (implemented SC): <value> Response time: <value>	<pass/fail> <pass/fail>

1168

6.10.4 Data Storage Index – complete parameter

1169

1170   Table 114 defines the test conditions for this test case.

1171   **Table 114 – Data Storage Index – complete parameter**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0107
Name	TCD_DLIC_DEFP_DSINDEX
Purpose (short)	Test of parameter Data Storage Index (mandatory if DS is supported)
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.3, Table B.9

1172

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The test verifies the implementation of parameter Data Storage Index.
Precondition	Device is in SDCI communication mode (Scan mode) and Data Storage Index is implemented.
Procedure	Read parameter Data Storage Index (Index 0x03)
Input parameter	-
Post condition	-

1173

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check for response on Read access b) Check for parameter length c) Calculate <index entries> = (parameter length – 12)/3
Test passed	a) No negative response and b) Evaluation <index entries> has a positive integer value in the range ≥ 0 and ≤ 70
Test failed (examples)	a) Negative response, or b) Evaluation <index entries> outside the permitted range
Results	Data Storage Index, length: <index entries> <pass/fail>

1174

1175 **6.10.5   Data Storage Index – record items**

1176   Table 115 defines the test conditions for this test case.

1177   **Table 115 – DataStorageIndex – record items**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0108
Name	TCD_DLIC_DEFP_DSRECORD
Purpose (short)	Test of parameter Data Storage Index record items
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.3, Table B.9
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The test verifies the correct structure of parameter and record items of the Data Storage Index.
Precondition	Device is in SDCI communication mode (Scan mode) and Data Storage Index is implemented.
Procedure	Read subsequently Subindex 1 to 5 of Data Storage Index (Index 0x03)
Input parameter	-
Post condition	-

1179

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check for response on Read access b) Check for record item length c) Check value of record item

1178

TEST CASE RESULTS	CHECK / REACTION
Test passed	No negative response on record item Read access and a) Subindex 1 has a length of 1 octet and value is within range ≥ 0 to ≤ 5 b) Subindex 2 has a length of 1 octet and value of bit 0 and bit 3 - 6 is "0" c) Subindex 3 has a length of 4 octets and value is within range 0 to 2048 d) Subindex 4 has a length of 4 octets e) Subindex 5 has a length of ≥ 2 octets in increments of 3 (2,5,8,11,14, until 212)
Test failed (examples)	Record items are deviating in length or value range
Results	Data Storage Index, Subindex 1: <length, value> <pass/fail> Data Storage Index, Subindex 2: <length, value> <pass/fail> Data Storage Index, Subindex 3: <length, value> <pass/fail> Data Storage Index, Subindex 4: <length> <pass/fail> Data Storage Index, Subindex 5: <length> <pass/fail>

1180

1181   ### 6.10.6   Device Access Locks – valid

1182   Table 116 defines the test conditions for this test case.

1183   **Table 116 – Device Access Locks – valid**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0109
Name	TCD_DLIC_DEFP_ACCESSLOCKSVAL
Purpose (short)	Test of Device Access Locks with valid values
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.4, Table B.11
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies that all implemented values for Device Access Locks are stored and responded correctly.
Precondition	Device is in SDCI communication mode (Scan mode) and Device Access Locks are implemented
Procedure	a) Write value to Device Access Locks with "1" at every bit position marked as implemented and "0" at the remaining bits. b) Read value Device Access Locks c) Write value 0x0000 to Device Access Locks d) Read value Device Access Locks
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check for response on Read and Write access. b) Compare response value from step b) with written value from step a) c) Compare response value from step d) with written value from step c)
Test passed	a) No negative response on Read or Write access and b) Comparison of evaluation step a) and b) show matching values
Test failed (examples)	No matching values.
Results	Device Access Locks implemented: <written/read values> <pass/fail> Device Access Locks 0x0000: <written/read values> <pass/fail>

1186

1187   **6.10.7   Device Access Locks – invalid**

1188   Table 117 defines the test conditions for this test case.

1189   **Table 117 – Device Access Locks – invalid**

1190

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0110
Name	TCD_DLIC_DEFP_ACCESSLOCKSINVAL
Purpose (short)	Test of Device Access Locks with invalid values
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.4, Table B.11
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies that all reserved or unused values for Device Access Locks are responded correctly.
Precondition	Device is in SDCI communication mode (Scan mode) and Device Access Locks are implemented.
Procedure	a) Write to Device Access Locks subsequently the value "1" at a single bit position, which is marked as reserved and a value "0" at the remaining bit positions b) Read value Device Access Locks c) Repeat with next bit position
Input parameter	-
Post condition	-

1191

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response from step a) b) Check response value from step b)
Test passed	Each write request in step a) is reponded by a negative response PAR_VALOUTOFRNG (0x8030) and each result returned in step b) shows the value 0x0000
Test failed (examples)	a) No negative response b) Returned value in step b) is ≠ 0x0000
Results	Device Access Locks reserved: <written/read values> <pass/fail> Device Access Locks 0x0000: <written/read values> <pass/fail>

1192

1193   **6.10.8   Profile Characteristic**

1194   Table 118 defines the test conditions for this test case.

1195   **Table 118 – Profile Characteristic**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0111
Name	TCD_DLIC_DEFP_PROFILCHARAC
Purpose (short)	Test of parameter Profile Characteristics
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.5
Configuration / setup	Device-Tester

1196

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test for implementation of parameter Profile Characteristics
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Profile Characteristics marked as implemented
Procedure	Read parameter Profile Characteristics (Index 0x000D)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check response on read access
Test passed	No negative response
Test failed (examples)	No response
Results	Profile Characteristics: <response> <pass/fail>

1197

1198

1199   **6.10.9   PD Input Descriptor**

1200   Table 119 defines the test conditions for this test case.

1201   **Table 119 – PD Input Descriptor**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0112
Name	TCD_DLIC_DEFP_PDINDESC
Purpose (short)	Test of parameter PD Input Descriptor
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.5
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test for implementation of parameter PD Input Descriptor
Precondition	Device is in SDCI communication mode (Scan mode) and parameter PD Input Descriptor marked as implemented
Procedure	Read parameter PD Input Descriptor (Index 0x000E)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check response on Read access
Test passed	No negative response
Test failed (examples)	No response
Results	PD Input Descriptor: <response> <pass/fail>

1202

1203

1204

1205   **6.10.10 PD Output Descriptor**

1206   Table 120 defines the test conditions for this test case.

1207

Table 120 – PD Output Descriptor

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0113
Name	TCD_DLIC_DEFP_PDOUTDESC
Purpose (short)	Test of parameter PD Output Descriptor
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.5
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test for implementation of parameter PD Output Descriptor
Precondition	Device is in SDCI communication mode (Scan mode) and parameter PD Output Descriptor marked as implemented
Procedure	Read parameter PD Output Descriptor (Index 0x000F)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response on Read access
Test passed	No negative Response
Test failed (examples)	No response
Results	PD Output Descriptor: <response> <pass/fail>

1208

1209

1210

1211   **6.10.11 Vendor Name**

1212   Table 121 defines the test conditions for this test case.

1213

Table 121 – Vendor Name

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0114
Name	TCD_DLIC_DEFP_VENDORNAM
Purpose (short)	Test of parameter Vendor Name (mandatory with ISDU)
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.6
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter Vendor Name
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Vendor Name marked as implemented
Procedure	Read parameter Vendor Name (Index 0x0010)
Input parameter	-
Post condition	-

1214

1215

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	a) Check response on read access b) Check coding of parameter c) Check parameter length d) Check contents of parameter	
Test passed	a) No negative response and b) Parameter is coded in UTF8 and c) Parameter length is ≤ 64 octets and d) Contents matches registered vendor for VendorID (VID)	
Test failed (examples)	Any of the evaluation steps fails	
Results	Vendor Name response: <negative/positive> Vendor Name UTF8 coding: <yes/no> Vendor Name length: <value> Vendor Name registration: <ok/not ok>	<pass/fail> <pass/fail> <pass/fail> <pass/fail>

1216

6.10.12 Vendor Text

1217

1218   Table 122 defines the test conditions for this test case.

1219   **Table 122 – Vendor Text**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0115
Name	TCD_DLIC_DEFP_VENDORTEXT
Purpose (short)	Test of parameter Vendor Text
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.7
Configuration / setup	Device-Tester

1220

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter Vendor Text
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Vendor Text marked as implemented
Procedure	Read parameter Vendor Text (Index 0x0011)
Input parameter	-
Post condition	-

1221

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	a) Check response on Read access b) Check coding of parameter c) Check parameter length d) Check contents of parameter	
Test passed	a) No negative response and b) Parameter is coded in UTF8 and c) Parameter length is ≤ 64 octets and d) Contents matches vendor / Device specific information	
Test failed (examples)	Any of the evaluation steps fails	
Results	Vendor Text response: <negative/positive> Vendor Text UTF8 coding: <yes/no> Vendor Text length: <value> Vendor Text adequate: <ok/not ok>	<pass/fail> <pass/fail> <pass/fail> <pass/fail>

1222

1223 **6.10.13 Product Name**

1224 Table 123 defines the test conditions for this test case.

1225 **Table 123 – Product Name**

1226

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0116
Name	TCD_DLIC_DEFP_PRODUCTNAM
Purpose (short)	Test of parameter Product Name (mandatory with ISDU)
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.8
Configuration / setup	Device-Tester

1227

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter Product Name (ISDU support)
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Product Name marked as implemented
Procedure	Read parameter Product Name (Index 0x0012)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Read access b) Check coding of parameter c) Check parameter length d) Check contents of parameter
Test passed	a) No negative response and b) Parameter is coded in UTF8 and c) Parameter length is ≤ 64 octets and d) Contents matches vendor / Device specific information
Test failed (examples)	Any of the evaluation steps fails
Results	Product Name response: <negative/positive> <pass/fail> Product Name UTF8 coding: <yes/no> <pass/fail> Product Name length: <value> <pass/fail> Product Name adequate: <ok/not ok> <pass/fail>

1228

1229 **6.10.14 Product ID**

1230 Table 124 defines the test conditions for this test case.

1231 **Table 124 – Product ID**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0117
Name	TCD_DLIC_DEFP_PRODUCTID
Purpose (short)	Test of parameter Product ID
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)

1232

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Specification (clause)	[9], see Annex B.2.9
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test the correct contents and coding of parameter Product ID.
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Product ID marked as implemented
Procedure	Read parameter Product ID (Index 0x0013)
Input parameter	-
Post condition	-

1233

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Read access b) Check coding of parameter c) Check parameter length d) Check contents of parameter
Test passed	a) No negative response and b) Parameter is coded in UTF8 and c) Parameter length is ≤ 64 octets and d) Contents matches vendor / Device specific information
Test failed (examples)	Any of the evaluation steps fails
Results	Product ID response: <negative/positive> <pass/fail> Product ID UTF8 coding: <yes/no> <pass/fail> Product ID length: <value> <pass/fail> Product ID adequate: <ok/not ok> <pass/fail>

1234

6.10.15 Product Text

1236   Table 125 defines the test conditions for this test case.

1237   **Table 125 – Product Text**

1238

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0118
Name	TCD_DLIC_DEFP_PRODUCTTEXT
Purpose (short)	Test of parameter Product Text
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.10
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test the correct contents and coding of parameter Product Text
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Product Text marked as implemented
Procedure	Read parameter Product Text (Index 0x0014)
Input parameter	-
Post condition	-

1239

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Read access b) Check coding of parameter

TEST CASE RESULTS	CHECK / REACTION	
	c) Check parameter length d) Check contents of parameter	
Test passed	a) No negative response and b) Parameter is coded in UTF8 and c) Parameter length is ≤ 64 octets and d) Contents matches vendor / Device specific information	
Test failed (examples)	Any of the evaluation steps fails	
Results	Product Text response: <negative/positive>	<pass/fail>
	Product Text UTF8 coding: <yes/no>	<pass/fail>
	Product Text length: <value>	<pass/fail>
	Product Text adequate: <ok/not ok>	<pass/fail>

1240

6.10.16 Serial Number

1241

1242 Table 126 defines the test conditions for this test case.

1243 **Table 126 – SerialNumber**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE	
Identification (ID)	SDCI_TC_0119	
Name	TCD_DLIC_DEFP_SERNUM	
Purpose (short)	Test of parameter Serial Number	
Equipment under test (EUT)	Device and Legacy-Device	
Test case version	1.0	
Category / type	Device application test; test to pass (positive testing)	
Specification (clause)	[9], see Annex B.2.11	
Configuration / setup	Device-Tester	
TEST CASE	**CONDITIONS / PERFORMANCE**	
Purpose (detailed)	Test the correct contents and coding of parameter Serial Number	
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Serial Number marked as implemented	
Procedure	Read parameter Serial Number (Index 0x0015)	
Input parameter	-	
Post condition	-	
TEST CASE RESULTS	**CHECK / REACTION**	
Evaluation	a) Check response on Read access b) Check coding of parameter c) Check parameter length d) Check contents of parameter	
Test passed	a) No negative response and b) Parameter is coded in UTF8 and c) Parameter length is ≤ 16 octets and d) Contents matches vendor / Device specific information	
Test failed (examples)	Any of the evaluation steps fails	
Results	Serial Number response: <negative/positive>	<pass/fail>
	Serial Number UTF8 coding: <yes/no>	<pass/fail>
	Serial Number length: <value>	<pass/fail>
	Serial Number adequate: <ok/not ok>	<pass/fail>

1244

1245

1246

1247   **6.10.17 Hardware Revision**

1248   Table 127 defines the test conditions for this test case.

1249   **Table 127 – HardwareRevision**

1250

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0120
Name	TCD_DLIC_DEFP_HARDREV
Purpose (short)	Test of parameter Hardware Revision
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.12
Configuration / setup	Device-Tester

1251

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter Hardware Revison
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Hardware Revison marked as implemented
Procedure	Read parameter Hardware Revision (Index 0x0016)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Read access b) Check coding of parameter c) Check parameter length d) Check contents of parameter
Test passed	a) No negative response and b) Parameter is coded in UTF8 and c) Parameter length is ≤ 64 octets and d) Contents matches vendor / Device specific information
Test failed (examples)	Any of the evaluation steps fails
Results	Hardware Revison response: <negative/positive> <pass/fail> Hardware Revison UTF8 coding: <yes/no> <pass/fail> Hardware Revison length: <value> <pass/fail> Hardware Revison adequate: <ok/not ok> <pass/fail>

1252

1253   **6.10.18 Firmware Revision**

1254   Table 128 defines the test conditions for this test case.

1255   **Table 128 – Firmware Revision**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0121
Name	TCD_DLIC_DEFP_FIRMREV
Purpose (short)	Test of parameter Firmware Revision
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.13

1256

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter Firmware Revison
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Firmware Revison marked as implemented
Procedure	Read parameter Firmware Revision (Index 0x0017)
Input parameter	-
Post condition	-

1257

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Read access b) Check coding of parameter c) Check parameter length d) Check contents of parameter
Test passed	a) No negative response and b) Parameter is coded in UTF8 and c) Parameter length is ≤ 64 octets and d) Contents matches vendor / Device specific information
Test failed (examples)	Any of the evaluation steps fails
Results	Firmware Revison response: <negative/positive> <pass/fail> Firmware Revison UTF8 coding: <yes/no> <pass/fail> Firmware Revison length: <value> <pass/fail> Firmware Revison adequate: <ok/not ok> <pass/fail>

1258

1259 6.10.19 Application Specific Tag – valid

1260   Table 129 defines the test conditions for this test case.

1261   **Table 129 – Application Specific Tag – valid**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0122
Name	TCD_DLIC_DEFP_TAGVALID
Purpose (short)	Test of parameter Application Specific Tag – valid strings
Equipment under test (EUT)	Device and Legacy-Device (see B.10)
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.14
Configuration / setup	Device-Tester

1262

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct behavior for write and read access to parameter Application Specific Tag
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Application Specific Tag marked as implemented
Procedure	a) Write a random text string with length <specified fixed length> to parameter Application Specific Tag (Index 0x0018) b) Read parameter Application Specific Tag (Index 0x0018) c) Power cycle the Device (switch off and on) d) Read parameter Application Specific Tag (Index 0x0018)
Input parameter	Random text string with <specified fixed length>: manufacturer dependent (minimum 16 octets, maximum 32 octets). See B.10 for Legacy Devices.
Post condition	-

1263

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Read and Write access b) Compare contents and length of reading in step b) to written string in step a). c) Compare contents and length of reading in step b) and step d)
Test passed	a) No negative response and b) Comparisons in evaluation b) and c) are correct in string length (see and c) Comparisons in evaluation b) and c) are correct in contents.
Test failed (examples)	Negative response or comparison fails
Results	Application Specific Tag string length: <ok/not ok> <pass/fail> Application Specific Tag content: <ok/not ok> <pass/fail>

1264

6.10.20 Application Specific Tag – invalid

1265

1266   Table 130 defines the test conditions for this test case.

1267   **Table 130 – Application Specific Tag – invalid**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0123
Name	TCD_DLIC_DEFP_TAGINVALID
Purpose (short)	Test of parameter Application Specific Tag – invalid string length
Equipment under test (EUT)	Device and Legacy-Device (see B.10)
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.14
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test the correct behavior for Write and Read access with invalid string length to parameter Application Specific Tag.
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Application Specific Tag marked as implemented
Procedure	a) Read parameter Application Specific Tag (Index 0x0018) b) Write a random string with length <specified fixed length+1> to parameter Application Specific Tag (Index 0x0018) c) Read parameter Application Specific Tag (Index 0x0018)
Input parameter	Random text string with <specified fixed length>: manufacturer dependent (minimum 16 octets, maximum 32 octets). See B.10 for Legacy Devices.
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check response on Read access b) Check response on Write access c) Compare contents and length of reading in step c) and step a)
Test passed	a) No negative response on read access and b) Negative response VAL_LENOVRRUN (0x8033) upon Write access in step b) and c) Comparison in evaluation c) shows maching values.
Test failed (examples)	No response
Results	Application Specific Tag negative response: <yes/no> <pass/fail> Application Specific Tag content matches: <yes/no> <pass/fail>

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6.10.21 Error Count

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1272   Table 131 defines the test conditions for this test case.

1273 **Table 131 – Error Count**

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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
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.15
Configuration / setup	Device-Tester

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
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 stimulance of an error
Post condition	-

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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) 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>

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1277 **6.10.22 Devcie Status**

1278 Table 132 defines the test conditions for this test case.

1279 **Table 132 – DeviceStatus**

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0128
Name	TCD_DLIC_DEFP_DEVSTAT
Purpose (short)	Test of parameter Device Status
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.16
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter Device Status
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Device Status marked as implemented
Procedure	Read parameter Device Status (Index 0x0024)
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check response on Read access b) Check parameter length c) Check parameter value
Test passed	a) No negative response and b) Parameter length is 1 octet and c) Value is ≥ 0 and ≤4
Test failed (examples)	No response
Results	Device Status response: <negative/positive> <pass/fail> Device Status length: <value> <pass/fail> Device Status: <value> <pass/fail>

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6.10.23 Detailed Device Status – complete object

Table 133 defines the test conditions for this test case.

Table 133 – Detailed Device Status – complete object

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0129
Name	TCD_DLIC_DEFP_DETAILDEVSTAT
Purpose (short)	Test of complete parameter Detailed Device Status
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.17 and [12]
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test of the correct length of parameter Detailed Device Status
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Detailed Device Status marked as implemented
Procedure	Read parameter Detailed Device Status (Index 0x0025)
Input parameter	<record item count>
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check response on read access b) Check parameter length c) Calculate <record item count> = parameter length / 3
Test passed	a) No negative response and b) Parameter length is ≤ 64*3 octets and c) <record item count> is a positive integer value with 1 ≤ value ≥ 64
Test failed (examples)	No response
Results	Detailed Device Status response: <negative/positive> <pass/fail> Detailed Device Status length: <value> <pass/fail>

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TEST CASE RESULTS	CHECK / REACTION
	Detailed Device Status: <value> <pass/fail>

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6.10.24 Detailed Device Status – record items inactive

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1290   Table 134 defines the test conditions for this test case.

1291   **Table 134 – Detailed Device Status – record items inactive**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0130
Name	TCD_DLIC_DEFP_DETAILDEVSTATINACTIVE
Purpose (short)	Test of record items in parameter Detailed Device Status without active Events
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.17
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of the correct structure of record items in parameter Detailed Device Status and that the values are initialized.
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Detailed Device Status marked as implemented
Procedure	Read subsequently all record items from Subindex 1 to <record item count>
Input parameter	<record item count> from TC 0129 (TCD_DLIC_DEFP_DETAILDEVSTAT)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on each Read access to Subindex b) Check each record item length c) Check each record item value
Test passed	For each Subindex: a) No negative response and b) Each record item length is 3 octets and c) The value for each record item is equal to "0x000000"
Test failed (examples)	No response
Results	For the first failed or final Subindex: Detailed Device Status item inactive response: <negative/positive> <pass/fail> Detailed Device Status item inactive length: <value> <pass/fail> Detailed Device Status item inactive: <value> <pass/fail>

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6.10.25 Detailed Device Status – record items active

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1296   Table 135 defines the test conditions for this test case.

1297   **Table 135 – Detailed Device Status – record items active**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0131
Name	TCD_DLIC_DEFP_DETAILDEVSTATACTIVE
Purpose (short)	Test of record items in parameter Detailed Device Status with active event
Equipment under test (EUT)	Device

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.17
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of the correct entry of active events in parameter Detailed Device Status
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Detailed Device Status marked as implemented
Procedure	a) Read subsequently all record items from subindex 1 to <record item count> b) Stimulate one persistent Event in Device technology specific application (error or warning) c) Read subsequently all record items from Subindex 1 to <record item count> d) Power cycle the Device (switch off and on) e) Read subsequently all record items from Subindex 1 to <record item count>
Input parameter	<record item count> from TC 0129 (TCD_DLIC_DEFP_DETAILDEVSTAT)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on each Read access to Subindex b) Compare each record item in step a) with the same record item in step c) c) Check each record item value in step e)
Test passed	a) No negative response and b) Comparison shows exactly 1 different record item in evaluation b) and c) The different record item matches transferred Event in EventCode and EventQualifier and d) Each value from evaluation c) is equal to "0x000000"
Test failed (examples)	No response
Results	Detailed Device Status item active response: <negative/positive> <pass/fail> Detailed Device Status item active comparison: <number> <pass/fail> Detailed Device Status item active matches Event: <yes/no> <pass/fail> For the first failed or final Subindex: Detailed Device Status item active: <value> <pass/fail>

6.10.26 Process Data Input

Table 136 defines the test conditions for this test case.

Table 136 – Process Data Input

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0132
Name	TCD_DLIC_DEFP_PDIN
Purpose (short)	Test of parameter Process Data Input
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.18
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test the correct contents and coding of parameter Process Data Input
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Process Data Input marked as implemented

TEST CASE	CONDITIONS / PERFORMANCE
Procedure	Read parameter Process Data Input (Index 0x0028)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Read access b) Check parameter length c) Check parameter contents
Test passed	a) No negative response and b) Parameter length matches parameter Process Data In (Direct Parameter page1, address 0x05) and c) Not used bits are "0".
Test failed (examples)	No response
Results	Process Data Input response: <negative/positive> <pass/fail> Process Data Input length: <value> <pass/fail> Process Data Input not used bits = "0": <yes/no> <pass/fail>

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1307 6.10.27 Process Data Output

1308   Table 137 defines the test conditions for this test case.

1309   **Table 137 – Process Data Output**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0133
Name	TCD_DLIC_DEFP_PDOUT
Purpose (short)	Test of parameter Process Data Output
Equipment under test (EUT)	Device and Legacy-Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.19
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of the correct contents and coding of parameter Process Data Output
Precondition	Device is in SDCI communication mode (Scan mode) and parameter Process Data Output marked as implemented
Procedure	Read parameter Process Data Output (Index 0x0029)
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Read access b) Check parameter length c) Check parameter contents
Test passed	a) No negative response and b) Parameter length matches parameter Process Data In (Direct Parameter page1, address 0x06) and c) Not used bits are "0".
Test failed (examples)	No response
Results	Process Data Output response: <negative/positive> <pass/fail> Process Data Output length: <value> <pass/fail> Process Data Output not used bits = "0": <yes/no> <pass/fail>

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1312   **6.10.28 Offset Time – valid**

1313   Table 138 defines the test conditions for this test case.

1314   **Table 138 – Offset Time – valid**

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0134
Name	TCD_DLIC_DEFP_OFFTIMEVALID
Purpose (short)	Test of Offset Time with valid values
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.20, Table B.11
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies whether the value range for Offset Time is correct.
Precondition	Device is in SDCI communication mode (Scan mode) with maximum MasterCycleTime and parameter Offset Time marked as implemented.
Procedure	a) Write value to Offset Time with "0" for time base and for multiplier (Index 0x0030) b) Read value Offset Time c) Repeat step a) and step b) with multiplier = "63" d) Repeat step a) to step c) with time base = "1" and time base = "2"
Input parameter	-
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Read and Write access b) Compare response value of step b) with written value of step a)
Test passed	a) No negative response on Read or Write access and b) Comparison of evaluation b) shows matching values
Test failed (examples)	No response
Results	For each of the 3 settings: OffsetTime valid response: <negative/positive> <pass/fail> OffsetTime valid matching values: <yes/no> <pass/fail>

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1318   **6.10.29 Offset Time – invalid**

1319   Table 139 defines the test conditions for this test case.

1320   **Table 139 – Offset Time – invalid**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0135
Name	TCD_DLIC_DEFP_OFFTIMEINVALID
Purpose (short)	Test of Offset Time with invalid values
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.20, Table B.11, and Annex C.2.9
Configuration / setup	Device-Tester

1321

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The test verifies whether the reserved value range for Offset Time is correct.
Precondition	Device is in SDCI communication mode (Scan mode) with maximum MasterCycleTime and parameter Offset Time marked as implemented.
Procedure	a) Read value Offset Time (Index 0x0030) b) Write value to Offset Time with "3" for the time base and "0" for multiplier c) Read value Offset Time d) Repeat step a) to step c) with multiplier = "63"
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check for response on Read and Write access b) Compare response value from step c) with written value from step a)
Test passed	a) No negative response on Read access and b) Negative response PAR_VALOUTOFRNG (0x8030) on Write access and c) Comparison of evaluation b) shows matching values
Test failed (examples)	No response
Results	For each of the 2 settings: OffsetTime valid Read response: <negative/positive> <pass/fail> OffsetTime valid Write response: <ErrorType> <pass/fail> OffsetTime valid matching values: <yes/no> <pass/fail>

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6.10.30 Profile Parameter – Read access

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1325 Table 140 defines the test conditions for this test case.

1326 **Table 140 – Profile Parameter – Read access**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0136
Name	TCD_DLIC_DEFP_PROFILEPARREAD
Purpose (short)	Test of implemented Profile Parameter Read access (Device supports profile)
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.21
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test of Read access of parameters defined as Profile specific
Precondition	Device is in SDCI communication mode (Scan mode), parameter Profile marked as implemented, and Device supports profile.
Procedure	Read Profile parameters from index 0x0031 to 0x003F
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check each response on Read access
Test passed	a) No negative response on Profile parameters marked as implemented and b) Negative response IDX_NOTAVAIL (0x8011) on parameters not used within a specific profile or not implemented
Test failed (examples)	No response

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TEST CASE RESULTS	CHECK / REACTION
Results	For each Read access: Profile Parameter response: \<negative/positive\> \<pass/fail\> Profile Parameter not used/implemented response: \<ErrorType\> \<pass/fail\>

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6.10.31 Profile Parameter – Write access

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1331   Table 141 defines the test conditions for this test case.

1332   **Table 141 – Profile Parameter – Write access**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0137
Name	TCD_DLIC_DEFP_PROFILEPARWRITE
Purpose (short)	Test of implemented Profile Parameter Write access (Device supports profile)
Equipment under test (EUT)	Device
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2.21
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of Write access to parameters defined Profile specific
Precondition	Device is in SDCI communication mode (Scan mode), parameter Profile marked as implemented, and Device supports profile.
Procedure	a) Write Profile Parameters from index 0x0031 to 0x003F with \<values\>, if marked as implemented, and b) With value "0x0000", if marked as not implemented
Input parameter	\<values\>: randomly chosen valid values
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check each response on Write access
Test passed	a) No negative response on Profile Parameters marked as implemented and b) Negative response IDX_NOTAVAIL (0x8011) on parameters not used within a specific profile or not implemented
Test failed (examples)	No response
Results	For each Write access: Profile Parameter used response: \<negative/positive\> \<pass/fail\> Profile Parameter not used/implemented response: \<ErrorType\> \<pass/fail\>

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6.10.32 Write access – Read only

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1337   Table 142 defines the test conditions for this test case.

1338   **Table 142 – Write access – Read only**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0140
Name	TCD_DLIC_DEFP_WRITETOREADONLY
Purpose (short)	Test of Write access to Read only parameter
Equipment under test (EUT)	Device and Legacy-Device

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2 and Annex C.2.8
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test that Write access to a Read only standard parameter shows the correct response behavior
Precondition	Device is in SDCI communication mode, some standard parameters are read only.
Procedure	Write Request with <value> to all standard parameters which are marked Read Only with specified parameter length
Input parameter	<value>: any
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check for negative response
Test passed	Negative Response is IDX_NOT_WRITEABLE (0x8023)
Test failed (examples)	No response
Results	Upon all Write accesses to Read Only parameters: Parameter Read Only response: <ErrorType> <pass/fail>

1341

6.10.33 Write access – invalid short Length

Table 143 defines the test conditions for this test case.

Table 143 – Write access – invalid short Length

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0141
Name	TCD_DLIC_DEFP_WRITETOOSHORT
Purpose (short)	Test of Write access with invalid length (too short) to writable parameter
Equipment under test (EUT)	Device and Legacy-Device (see B.11)
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2 and Annex C.2.13
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test that Write access to a writable standard parameter with a too short parameter length shows the correct response behavior
Precondition	Device is in SDCI communication mode, standard parameter is writable, data type length is > 1 octet
Procedure	Write Request with a parameter length shorter than specified <value> to all standard parameters which are marked as writable
Input parameter	<value>: any
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check for negative response

TEST CASE RESULTS	CHECK / REACTION
Test passed	Negative Response is VAL_LENUNDRUN (0x8034). If the error response does not match this expectation, the Device tester shall raise a warning and display the response value. For Legacy-Devices see B.11.
Test failed (examples)	No response
Results	Upon all Write accesses with too short length to writable parameters: Parameter Write response: <ErrorType> <pass/fail>

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6.10.34 Write access – invalid long Length

1349   Table 144 defines the test conditions for this test case.

1350   **Table 144 – Write access – invalid long Length**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0142
Name	TCD_DLIC_DEFP_WRITETOOLONG
Purpose (short)	Test of Write access with invalid length (too long) to writable parameter
Equipment under test (EUT)	Device and Legacy-Device (see B.11)
Test case version	1.0
Category / type	Device application test; test to pass (positive testing)
Specification (clause)	[9], see Annex B.2, and Annex C.2.8
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test that Write access to a writable standard parameter with a too long parameter length shows the correct response behavior
Precondition	Device is in SDCI communication mode, standard parameter is writable
Procedure	Write Request with a parameter length longer than specified <value> to all standard parameters which are marked as writable
Input parameter	<value>: any
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check for negative response
Test passed	Negative response is VAL_LENOVRRUN (0x8033). If the error response does not match this expectation, the Device-Tester shall raise a warning and display the response value. For Legacy-Devices see B.11.
Test failed (examples)	No response
Results	Upon all Write accesses with too long length to writeable parameters: Parameter Write response: <ErrorType> <pass/fail>

1353

6.11   Block parameter

6.11.1   General

1356   The manufacturer/vendor of a Device shall provide information about a possible Block Pa-
1357   rameter set enabling the performance of the following tests. This Block Parameter set shall
1358   comply with the requirements of the test cases 6.11.2 through 6.11.6.

6.11.2   Block parameter – Download

1360   Table 145 defines the test conditions for this test case.

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Table 145 – Block parameter – Download

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0143
Name	TCD_DSBP_APPL_BPDOWNLOAD
Purpose (short)	Test of Block Parameter download
Equipment under test (EUT)	Device with option Block Parameter
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.3.5 and 10.6.14
Configuration / setup	Device-Tester

1362

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of Block Parameter download
Precondition	Device in PREOPERATE or OPERATE mode
Procedure	a) Write SystemCommand (0x0002): 0x03 (ParamDownloadStart) b) Write Block Parameters listed by the manufacturer c) Write SystemCommand (0x0002): 0x04 (ParamDownloadEnd)
Input parameter	The manufacturer shall specify a set of parameters that are combined to a Block
Post condition	-

1363

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Write "ParamDownloadStart" b) Check response while Writing Block parameters c) Check response on Write "ParamDownloadEnd"
Test passed	There is no negative response during any Write request
Test failed (examples)	No response
Results	Write "ParamDownloadStart" response: <negative/positive> <pass/fail> Write Block parameter response: <negative/positive> <pass/fail> Write "ParamDownloadEnd" response: <negative/positive> <pass/fail>

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1365 **6.11.3 Block parameter – Break by command**

1366 Table 146 defines the test conditions for this test case.

1367 **Table 146 – Block parameter – Break by command**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0144
Name	TCD_DSBP_APPL_BPBREAKCMD
Purpose (short)	Test break of Block Parameter transfer per command
Equipment under test (EUT)	Device with option Block Parameter
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.3.5 and 10.6.14
Configuration / setup	Device-Tester

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, that a Device discards any change of parameters when it receives a System-Command "ParamDownloadBreak"
Precondition	Device in PREOPERATE or OPERATE mode
Procedure	a) Read one Parameter listed by the vendor and buffer the <value1>

TEST CASE	CONDITIONS / PERFORMANCE
	b) Write SystemCommand "ParamDownloadStart" c) Write parameter listed by the vendor, \<value2\> ≠ \<value1\> of step a) d) Write SystemCommand "ParamDownloadBreak" e) Read Parameter written in step c) and verify with the value of step a) f) Write SystemCommand "ParamDownloadEnd" g) Read Parameter written in step c) and verify with the value of step a)
Input parameter	The vendor shall specify a set of parameters that are combined to a Block
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Write "ParamDownloadStart" b) Check response on Write "ParamDownloadBreak" c) Parameter value of step a) matches the parameter value of step e) d) Check response on Write "ParamDownloadEnd" e) Parameter value of step a) matches the parameter value of step g)
Test passed	a) There is no negative response during any Write request except in step f) b) Positive evaluations c) and e)
Test failed (examples)	No response or evaluations negative
Results	Write "ParamDownloadBreak" response: \<negative/positive\> \<pass/fail\> Evaluation c): \<negative/positive\> \<pass/fail\> Write "ParamDownloadEnd" response: \<ErrorType\> \<pass/fail\> Evaluation e): \<negative/positive\> \<pass/fail\>

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6.11.4   Block parameter – Break by reset

(1371)

Table 147 defines the test conditions for this test case.

(1372)

Table 147 – Block parameter – Break by reset

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0145
Name	TCD_DSBP_APPL_BPBREAKRESET
Purpose (short)	Test break of Block Parameter transfer per reset
Equipment under test (EUT)	Device with option Block Parameter
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.3.5 and 10.6.14
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, that a Device discards any change of parameters if a reset occurs during parametrization
Precondition	Device in PREOPERATE or OPERATE mode

Procedure	a) Read one Parameter listed by the vendor and store the \<value1\>
	b) Write SystemCommand "ParamDownloadStart"
	c) Write parameter listed by the vendor, \<value2\> ≠ \<value1\> of step a)
	d) Reset the Device either
	   - using power cycle off/on reset or
	   - using SystemCommand "DeviceReset" or
	   - using MasterCommand "Fallback"
	e) Set Device to PREOPERATE or OPERATE mode
	f) Read Parameter written in step c) and verify with the value of a)
	g) Write SystemCommand "ParamDownloadEnd"
	h) Read Parameter written in c) and verify with value of a)

Input parameter	The vendor shall specify a set of parameters combined to a block
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on Write "ParamDownloadStart" b) Check Device behavior after reset c) Parameter value of step a) matches the parameter value of step e) d) Check response on Write "ParamDownloadEnd" e) Parameter value of step a) matches the parameter value of step g)
Test passed	a) There is no negative response during any write request except in step g) b) Positive evaluations c) and e)
Test failed (examples)	No response or evaluations negative
Results	Write "ParamDownloadStart" response: <negative/positive> <pass/fail> Device reset: <ok/not ok> <pass/fail> Evaluation c): <negative/positive> <pass/fail> Write "ParamDownloadEnd" response: <ErrorType> <pass/fail> Evaluation e): <negative/positive> <pass/fail>

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6.11.5 Block parameter – Break by double download

1377

1378 Table 148 defines the test conditions for this test case.

1379 **Table 148 – Block parameter – Break by double download**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0147
Name	TCD_DSBP_APPL_BPBREAK2DOWNLOADS
Purpose (short)	Test break of Block Parameter transfer by double SystemCommand "Param-DownloadStart"
Equipment under test (EUT)	Device with option Block Parameter
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.3.5 and 10.6.14
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, that a Device discards any change of parameters if it occurs outside the Block Parameter transfer
Precondition	Device in PREOPERATE or OPERATE mode
Procedure	a) Read one parameter listed by the vendor and store the <value1> b) Write SystemCommand "ParamDownloadStart" c) Write parameter listed by the vendor, <value2> ≠ <value1> of step a) d) Write SystemCommand "ParamDownloadStart" e) Write all parameters listed by the vendor, except those used in a) f) Write SystemCommand "ParamDownloadEnd" g) Read parameters written in c) and verify with value of a)
Input parameter	The vendor shall specify a set of parameters that are combined to a block
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check response on first Write "ParamDownloadStart" b) Check response on second Write "ParamDownloadStart" c) Check Device behavior after writing different Block Parameter sequence d) Check response on Write "ParamDownloadEnd" e) Parameter value of step a) shall not match the parameter values of step g)
Test passed	a) There is no negative response during any write request b) Positive evaluation e)
Test failed (examples)	No response or evaluations negative

1380

1381

TEST CASE RESULTS	CHECK / REACTION	
Results	Write "ParamDownloadStart" first response: <negative/positive>	<pass/fail>
	Write "ParamDownloadStart" second response: <negative/positive>	<pass/fail>
	Device behavior on different Block: <ok/not ok>	<pass/fail>
	Write "ParamDownloadEnd" response: <negative/positive >	<pass/fail>
	Evaluation e): <negative/positive>	<pass/fail>

1382

6.11.6 Block parameter – local locking

1383

1384 Table 149 defines the test conditions for this test case.

1385 **Table 149 – Block parameter – local locking**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0148
Name	TCD_DSBP_APPL_BPBREAKLOCALLOCK
Purpose (short)	Test locking of local parametrization during Block Parameter transfer
Equipment under test (EUT)	Device with option Block Parameter and local parameterization capability (on-board)
Test case version	1.0
Category / type	Device protocol test; test to pass (positive testing)
Specification (clause)	[9], see 10.3.5 and 10.6.14
Configuration / setup	Device-Tester

1386

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test, that local access is locked during Block parametrization
Precondition	Device in PREOPERATE or OPERATE mode
Procedure	a) Read one parameter listed by the vendor and store the <value1> b) Read a parameter which can be changed by local parameterization (on-board) c) Write SystemCommand "ParamDownloadStart" d) Write parameter listed by the vendor, <value2> ≠ <value1> of step a) e) Try to change parameter of step b) via local parameterization (on-board) f) Write SystemCommand "ParamDownloadEnd" g) Read parameter written in d) and verify with value of a) h) Read parameter changed in e) and verify with value of b)
Input parameter	The vendor shall specify a set of parameters that are combined to a block
Post condition	-

1387

TEST CASE RESULTS	CHECK / REACTION	
Evaluation	a) Check response on Write "ParamDownloadStart" b) Check Device behavior when using local parameterization features c) Check response on Write "ParamDownloadEnd" d) Parameter value of step a) shall not match the parameter values of step g) e) Parameter value of step b) shall match the parameter values of step h)	
Test passed	a) There is no negative response during any write request b) Positive evaluation d) c) Positive evaluation e) d) Positive acknowledge on local parameterization (none or negative are acceptable)	
Test failed (examples)	No response or evaluations negative	
Results	Write "ParamDownloadStart" response: <negative/positive>	<pass/fail>
	Device behavior on local parameterization: <acknowledge>	<pass/fail>
	Write "ParamDownloadEnd" response: <negative/positive >	<pass/fail>
	Evaluation d): <negative/positive>	<pass/fail>
	Evaluation e): <negative/positive>	<pass/fail>

1388

1389 **6.12 Test report summary of the Device protocol tests**

1390 The template is defined by the Device-Tester. The test report shall present at least the results
1391 of the test cases for the Device protocol tests.

1392

1393 **7 IODD test**

1394 **7.1 General**

1395 The IODD test focuses on three major issues. The first issue is the test of a Device's IODD
1396 file with the help of a so-called IODD checker tool. This specification defines the parsers such
1397 an IODD checker tool shall use for IODD schema consistency checks. It defines also a set of
1398 business rules for the IODD check.

1399 The second issue is the test, whether the parameters defined in the IODD are accessible
1400 within the Device (parameter verification test).

1401 The third issue focuses on the IODD interpreter tool. This test shall ensure, that the "Port and
1402 Device Configuration Tool" of the Master is able to provide all the IODD definitions in the cor-
1403 rect manner.

1404 **7.2 Schema test via an IODD checker tool**

1405 The organization referenced in Annex D makes available an IODD checker tool ("Checker")
1406 for free download from its web server. It is mandatory for each and every IODD associated
1407 with a Device to pass the test with this Checker. The Device's manufacturer declaration shall
1408 state the successful result of the test.

1409 The requirements for the Checker consist of two main parts.

1410 Within the first part the Checker uses the following parsers to test the schema consistency of
1411 a particular IODD:

1412 • MSXML 4.0 Service Pack 3 (Microsoft XML Core Services),
1413 date published: 29-Sep-2009,
1414 http://www.microsoft.com/downloads/details.aspx?familyid=7F6C0CB4-7A5E-4790-A7CF-
1415 9E139E6819C0&displaylang=en

1416 • XmlReader class of Microsoft .NET Framework Version 2.0 with schema validation
1417 switched on, i.e. *Settings.ValidationType* set to *ValidationType.Schema*.
1418
1419 Microsoft .NET Framework Version 2.0 Redistributable Package,
1420 date published: 22-Jan-2006,
1421 http://www.microsoft.com/downloads/details.aspx?familyid=0856EACB-4362-4B0D-8EDD-
1422 AAB15C5E04F5&displaylang=en
1423
1424 Microsoft .NET Framework 2.0 Service Pack 2
1425 date published: 16-Jan-2009,
1426 http://www.microsoft.com/downloads/details.aspx?FamilyID=5b2c0358-915b-4eb5-9b1d-
1427 10e506da9d0f&displaylang=en

1428 • Xerces-C++ Version 3.1.1,
1429 http://xerces.apache.org/xerces-c/

1430 Within the second part the Checker uses the following business rule set in Table 150. An "x"
1431 in column "M" indicates relevance for the main IODD and in column "L" relevance for the lan-
1432 guage file. An "x" in column "W" indicates that this business rule check creates a warning,
1433 and an "x" in column "V" indicates validity of the check for legacy Devices (V1.0).

1434   **Table 150 – Checker business rule set for IODDs**

IODD_TC No	Rule name (TCDD_...)	Reference	Definition	M	L	W	V
0001	Encoding	[3], 5	Encoding shall be UTF-8	x	x		x
0002	NameSpace	[3], 5	http://www.w3.org/2001/XMLSchema-instance with the prefix "xsi" http://www.io-link.com/IODD/2010/10 with the prefix "iodd"	x	x		
0003	AdditionalName-Spaces	[3], 5	No additional name spaces shall be included	x	x		x
0004	SchemaLocation	[3], 5	http://www.io-link.com/IODD/2010/10	x	x		x
0005	SchemaMainIODD	[3], 5	IODD1.1.xsd	x			
0006	SchemaLanguage-File	[3], 5	IODD-Primitives1.1.xsd		x		
0007	FileNameConvention_IODD_Special Characters	[3], 5	Special characters are permitted in vendor name and device name part of filename: _, #, -	x	x		x
0008	FileNameConvention_IODD_VendorNamePart	[3], 5	All files of the set of files belonging to a specific IODD shall have the same <vendor name> part in their file names.	x	x		x
0009	FileNameConvention_MainIODD	[3], 5.1	<vendor name>-<device name>-<date of file creation>-IODD<schema version>.xml; IODD shall be done with upper case letters	x			x
0010	FileNameConvention_LanguageFile	[3], 5.2	<vendor name>-<device name>-<date of file creation>-IODD<schema version>-<language>.xml; IODD shall be done with upper case letter		x		x
0011	LanguagePart_-LanguageFile-Name_ISO	[3], 5.2	The "language" part follows ISO 639-1:2002.		x	x	x
0012	LanguagePart_-LanguageFile-Name_2Letters	[3], 5.2	The "language" part consists of two letters		x		x
0013	LanguagePart_-LanguageFile-Name_Unique	[3], 5.2	There shall be no additional language file for languages already covered in the main IODD file		x		x
0014	LanguagePart_-LanguageFile-Name_Inside	[3], 5.2	The language part of the language file name shall be the same as the definition inside the language file		x		x
0015	LanguageStandard-Definitions	[3], 5.2	If an IODD contains a language, which is not existing for IODD-StandardDefinitions or IODD-StandardUnitDefinitions, the checker will show a warning	x	x	x	
0016	VendorLogo	[3], 5.3	160 x 90 pixel, landscape format	x			x
0017	DeviceIcon	[3], 5.3	48 x 48 pixel	x			x
0018	DevicePicture	[3], 5.3	Min. 160 x 160 pixel, max. 320 x 320, square	x			x
0019	ConnectionSymbol	[3], 5.3	Min. 160 x 160 pixel, max. 320 x 320, square	x			
0020	ImageFilesExist	[3], 5.3	If the attributes are used, the referenced image files shall be present	x			x
0021	ImageFileName-Convention	[3], 5	All files of the set of files belonging to a specific IODD shall have the same <vendor name> part in their file names	x			x
0022	Date_IODD_-FileName	[3], 7.3.1	The date information in the IODD file name shall correspond to the releaseDate attribute in the DocumentInfo element	x			x
0023	Date_Language_-FileName	[3], 7.3.1	The date information in the language file name shall correspond to the releaseDate attribute in the DocumentInfo element, if the DocumentInfo element exists		x		x

IODD_TC No	Rule name (TCDD_...)	Reference	Definition	M	L	W	V
0024	ProfileHeader	[3], 7.3.2	It shall correspond exactly to the given values in the specification	x			x
0025	Stamp	[3], 7.3.4	If no errors are detected during the checking process, the crc attribute is set to a CRC value calculated across the file contents. Otherwise, the crc attribute is set to an invalid value.	x	x		x
0026	Comments_InOr-After_Stamp	[3], 7.3.4	Comments shall not be included in or after the Stamp element.	x	x		x
0027	ProductId	[3], 7.4.1	ProductID in IODD corresponds to the ISDU standard parameter. If ProductID is not implemented in the Device, multiple device variants are not allowed.	x			x
0028	ProductId_Length	[3], 7.4.1	The maximum length of ProductId shall not exceed 64 bytes UTF-8 coded.	x			x
0029	Declarations_Data-types	[3], 7.5.2	There shall be no unreferenced data type elements.	x			x
0030	DatatypeId	[3], 7.5.2	For data types in the DatatypeCollection, the attribute id shall be specified.	x			x
0031	NoDatatypeId	[3], 7.5.2	For Datatypes outside the DatatypeCollection, the attribute id shall not be specified	x			x
0032	StdVariableRef	[3], 7.5.4.1	Since direct parameters are mandatory, the variables V_DirectParameters_1 and V_DirectParameters_2 shall always be referenced. All standard ISDU variables marked with the attribute mandatory="true" in the IODD-StandardDefinitions shall be referenced, if the Device supports ISDU access.	x			x
0033	StdVariableRef_-Reserved_Ids	[3], 7.5.4.1 [9], B.2.1	The ids of optional variables in StdDefinitions1.1.xml shall not be used for user specific variables, even if they are not referenced in the IODD.	x			x
0034	StdVariableRef_-DefaultValue	[3], 7.5.4.1	@defaultValue shall not be specified for references to V_ProcessDataInput or V_Process-DataOutput	x			x
0035	FixedLength-Restriction	[3], 7.5.4.1	If referenced variable is of type OctetString or String, it shall be less or equal its fixedLength attribute. If referenced variable is of type Array, it shall be less or equal to its count attribute.	x			x
0036	V_Application-SpecificTag	[9], B.2.14	If fixedLengthRestriction is used, it shall be equal or greater than 16.	x			x
0037	StdSingleValueRef	[3], 7.5.4.1 [3], 8.1	Check if StdSingleValue exists as SingleValue in StdDefinitions1.1.xml.	x			x
0038	StdValueRangeRef	[3], 7.5.4.1 [3], 8.1	Check if StdValueRange exists as ValueRange in StdDefinitions1.1.xml.	x			x
0039	StdVariableRef_-SingleValue	[3], 7.5.4.1 [3], 8.1	Check against overlapping with StdSingleValue and StdValueRange (even if they are optional and not referenced), other SingleValue or ValueRange.	x			x
0040	StdVariableRef_-ValueRange	[3], 7.5.4.1 [3], 8.1	Check against overlapping with StdSingleValue and StdValueRange (even if they are optional and not referenced), other SingleValue or ValueRange.	x			x
0041	StdRecordItemRef	[3], 7.5.4.1	Check if referenced RecordItem exists in StdDefinitions1.1.xml.	x			x
0042	DirectParameter-Overlay_Subindex-AccessSupported	[3], 7.3.3.2 [9], B.1.1	Statement subindexAccessSupported="false" shall not be used. Index 1 can only be accessed octet by octet.	x			

IODD_TC No	Rule name (TCDD_...)	Reference	Definition	M	L	W	V
0043	DirectParameter-Overlay_Datatype	[3], 7.5.4.2	The data type shall be a record.	x			
0044	DirectParameter-Overlay_Usage	[3], 7.5.4.2	Recommendation: Use DirectParameterOverlay only for Devices not supporting ISDU access (checker shall generate a warning)	x		x	
0045	VariableIndex	[9] B.2.1	Preferred and extended Index for Device or vendor specific variables are 64 to 254 and 256 to 16383. Indices 2 to 63, 255, 16384 to 65535 shall not be used as Device or vendor specific variable.	x			x
0046	VariableIndex_-Profiles	[9] B.2.1	Indices 49 to 63 and 16384 to 20479 are reserved for profiles. Since the checker is not designed to perform profile specific checks, a warning is given and the vendor is responsible to use these Indices only according to profile definitions.	x		x	x
0047	RecordItemInfo	[3], 7.5.4.3	RecordItem shall exist.	x			x
0048	RecordItemInfo_-NoRecord	[3], 7.5.4.3	Only applicable if the variable is of type record.	x			x
0049	DefaultValue	[3], 7.5.4.1, 7.5.4.3	The default value shall match the given datatype.	x			x
0050	DefaultValue_String	[3], 7.5.4.1, 7.5.4.3	Check whether used letters are valid in respect to given encoding.	x			x
0051	ProcessData_-Condition	[3], 7.5.5	If ProcessData occur more than once, the individual ProcessData elements can be distinguished by to the Condition element.	x			x
0052	ProcessData_-BitLength	[3], 7.5.5	The attribute 'bitLength' shall represent the underlying ProcesssDataIn (-Out) datatype in a bit by bit manner. For record data types this bitLength shall equal the bitLength attribute of the record.	x			x
0053	ProcessData_Id	[3], 7.5.5	The attribute "id" shall be unique within the elements ProcessData, ProcessDataIn, and ProcessDataOut.	x			x
0054	ProcessData_-Condition_Variable	[3], 7.5.5	There shall only be exactly one variable used for the switching of process data. The referenced variable shall contain a default value. The process data length (of ProcessDataIn and ProcessDataOut respectively) shall be the same for all ProcessData.	x			x
0055	ProcessData_-Condition_Datatype	[3], 7.5.5	Conditions shall only be of datatype IntegerT, UIntegerT and BooleanT.	x			x
0056	StdErrorTypeRef	[3], 7.5.6	Check whether referenced ErrorType exists in StdDefinitions1.1.xml.	x			
0057	StdEventRef	[3], 7.5.7	Check whether referenced Event exists in StdDefinitions1.1.xml.	x			
0058	EventCode	[9], D.2	Vendor or device specific codes are: 0x1800-0x18FF and 0x8CA0-0x8DFF.	x			
0059	ProfileEventCode	[9], D.2	The codes reserved for profiles are: 0xB000-0xBFFF.	x		x	
0060	ProcessDataInfo	[3], 7.5.8.1	Check whether displayFormat and Datatype are matching.	x			
0061	MenuLevel	[3], 7.5.8.2	At most three menu levels below the role assignment are acceptable.	x			x
0062	NotUsedMenus	[3], 7.5.8.3	There shall be no unreferenced Menu elements	x			
0063	MenuName	[3], 7.5.8.3	In underlying menus, a menu name shall be given by the IODD.	x			x

IODD_TC No	Rule name (TCDD_...)	Reference	Definition	M	L	W	V
0064	Gradient_Offset	[3], 7.5.8.4	When applying gradient and/or offset to convert the Variable or RecordItem value into the displayed value, the value will be implicitly converted to a floating point value. Consequently, the only allowed displayFormat for such values shall be "Dec".	x			x
0065	RecordItem-Ref_Array	[3], 7.5.8.4	Single array members can't be referenced by RecordItemRef. If there is a need to access a single member, a record shall be defined instead of an array.	x			x
0066	UnitCode	[3], 7.5.8.4	Unit code to which the indicated variable refers. See IODD-StandardUnitDefinitions1.1.xml for valid unit codes.	x			x
0067	Menu_AccessRight Restriction	[3], 7.5.8.4	The accessright of the referenced element shall include the accessrights given by accessRightRestriction.	x			x
0068	ButtonValue	[3], 7.5.8.4	The value of the 'buttonValue' attribute shall be defined as a 'SingleValue' of the Variable/-RecordItem	x			x
0069	ButtonReference	[3], 7.5.8.4	A variable referenced as "Button" shall have accessRights "wo", shall only be displayed as a button, and shall not be used as a condition variable to switch menus or processdata.	x			x
0070	RecordItemRef	[3], 7.5.8.5	The variable referenced by variableId shall be of type record. If referenced as "Button", the referenced variable shall support subindex access. The subindex shall be defined in the referenced record.	x			x
0071	RecordItem-Ref_Button	[3], 7.5.8.5	If referenced as "Button", the referenced variable shall support subindex access.	x			x
0072	Button_NoDisplay-Format	[3], 7.5.8.5	If in menu subelement 'Button' exists for VariableRef or RecordItemRef, displayFormat shall not be defined.	x			
0073	MenuRef_Circular-References	[3], 7.5.8.6	Circular references shall be avoided.	x			x
0074	MenuCondition	[3], 7.5.8.6	Conditions shall only be of datatype IntegerT, UIntegerT, and BooleanT.	x			x
0075	MenuCondition_-ProcessData-Condition	[3], 7.5.8.6	If there is more than one ProcessData element selected by conditions, and the variable V_ProcessDataIn or V_ProcessDataOut is referenced in a menu, one of the following shall hold: a) The type of reference (VariableRef/-RecordItemRef) and the gradient, offset, unitCode and displayFormat match each of the ProcessData elements. b) The menu is conditioned in the same way as one of the ProcessData elements, and the type of reference (VariableRef / RecordItemRef) and the gradient, offset, unitCode and displayFormat match this particular ProcessData element ("conditioned in the same way" means that this menu or one of the parent menus has the same condition: same variable, same subindex, same value).	x			x
0076	MinCycleTime	[3], 7.6 [9], B.1.4	The minimum cycle time of the slave; specified in units of 1 μs. For example 2300 represents 2,3 ms. For the allowed values, refer to chapter 'Min Cycle Time' in [9].	x			x
0077	PrimaryLanguage	[3], 7.7.1	The primary language shall be English (the attribute xml:lang shall have the value "en").	x			x

IODD_TC No	Rule name (TCDD_...)	Reference	Definition	M	L	W	V
0078	TextRedefine	[3], 7.7.1	Language dependent text overriding a standard text. Only applicable for texts describing the octets of DirectParameter page 2. It shall be one of STD_TI_DeviceSpecific_1 to STD_TI_-DeviceSpecific_16.	x			
0079	NotUsedTexts	[3], 7.7.1	Shall be referenced by other elements via their textId attribute (there shall be no unreferenced Text elements)	x	x		x
0080	NotTranslatedTexts	[3], 7.7.1	Check whether texts are not translated.	x	x	x	x
0081	Unique_Device-VariantNameText	[3], 7.7.1	Texts referenced by DeviceVariantCollection/DeviceVariant/Name/textId shall be unique for each language.	x	x		
0082	Unique_Variable-NameText	[3], 7.7.1	Texts referenced by StandardVariables, DirectParameterOverlay or Variables shall be unique for each language.	x	x		
0083	Overlaping_Single-Value_ValueRange	[3], 7.5.3.1.1	SingleValues and ValueRanges shall not overlap	x			x
0084	Arrays	[9], E.3	UIntegerT and IntegerT with a length of ≥ 58 bit and < 64 bit are not permitted.	x			x
0085	Record_Subindices	[9], E.3	The Subindices within the IODD shall be listed in ascending order from 1 to n describing an octet sequence. Gaps within the list of Subindices are allowed.	x			x
0086	Alignment_Data-types	[9], E.3	The following data types shall always be aligned with octet boundaries: Float32T, StringT, OctetStringT, TimeT, and TimeSpanT.	x			x
0087	Alignment_-Integer58	[9], E.3	UIntegerT and IntegerT with a length of ≥ 58 bit shall always be aligned with one side of an octet boundary.	x			x
0088	Alignment_-Integer10	[9], E.3	It is highly recommended for UIntegerT and IntegerT with a length of ≥ 8 bit to align always with one side of an octet boundary.	x		x	x
0089	Alignment_-Integer6	[9], E.3	It is highly recommended for UIntegerT and IntegerT with a length of < 8 bit not to cross octet boundaries.	x		x	x
0090	RecordItems_-AccessRight-Restriction	[9], E.3	The accessright of the RecordItem shall include the accessrights of the variable.	x			x
0091	ProcessData_-AccessRight-Restriction	[9], E.3	The attribute "'accessRightRestriction" is only applicable for service parameter, not for process data.	x			x
0092	BitOffset	[9], E.3	RecordItem shall not overlap	x			x
0093	Connection_MinDef	[3], 7.6	Connection: L+, L- and C/Q shall be defined with OtherConnectionT/Wires.	x			
0094	MaxLength_-Variables	[9], 4.4	The length of a variable shall not exeed 238 octets.	x			x
0095	MaxLength_-ProcessData	[9], 4.4	The length of a ProcessDataIn/Out shall not exeed 32 octets.	x			X
0096	ExcludedFrom-DataStorage	[3], 7.5.4.1	This check shall only be used for variables with accessRights = "rw"	x			
0097	ModifiesOther-Variables	[3], 7.5.4.2	This check shall only be used for variables with accessRight = "rw" or "wo"	x			
0098	Dynamic	[3], 7.5.4.2	This check shall only be used for variables with accessRights = "rw" or "ro"	x			x

1436 **7.3 Parameter verification test**

1437 **7.3.1 IODD identification**

1438 Table 151 defines the test conditions for this test case.

1439 **Table 151 – IODD identification**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0149
Name	TCD_IODD_PARV_IDENT
Purpose (short)	Verification that Device under test is related to the associated IODD
Equipment under test (EUT)	Device and Legacy-Device and associated IODD
Test case version	1.0
Category / type	IODD parameter verification test; test to pass (positive testing)
Specification (clause)	[3] 5.2 and 5.2.1; [9] B.1.9, B.1.10 and B.2.9
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Verify that Device is related to the associated IODD. The Device-Tester reads dedicated IODD parameters from the Device. Therefore read the VendorID, DeviceID and ProductID and check if IODD describes this specific Device. For further tests only the read DeviceID and the ProductID shall match the IODD entries.
Precondition	Device is in SDCI communication mode
Procedure	Read VendorID, DeviceID, ProductID from Device
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check if IDs match the entries in the IODDs Device identity b) Check if ProductID is listed in the DeviceVariantCollection of the IODD
Test passed	All IDs from Device found in IODD
Test failed (examples)	Any of the ID from Device not found in IODD (not matching)
Results	VendorID: <value> <pass/fail> DeviceID: <value> <pass/fail> ProductID: <value> <pass/fail> ProductID listed in DeviceVariantCollection: <yes/no> <pass/fail>

1442

1443 **7.3.2 IODD communication profile verification**

1444 Table 152 defines the test conditions for this test case.

1445 **Table 152 – IODD communication profile verification**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0150
Name	TCD_IODD_PARV_COMPROFILE
Purpose (short)	Verification of Device network communication profile
Equipment under test (EUT)	Device and Legacy-Device and associated IODD
Test case version	1.0
Category / type	IODD parameter verification test; test to pass (positive testing)
Specification (clause)	[3] 5.4; [9] B.1.4, B.1.6, B.1.7 and B.1.8

1446

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Configuration / setup	Device-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The Device-Tester reads dedicated IODD parameters from the Device Test if the IODD network communication profile corresponds to the entries in the Direct Parameter page 1 of the Device. The properties MinCycleTime (address 0x02), RevisionID (address 0x04) and ProcessDataIn/SIO supported (address 0x05, bit 6) of the IODD commNetworkProfile are tested.
Precondition	Device is in SDCI communication mode, matching VendorID and ProductID
Procedure	Read Direct Parameter page 1 (Index 0)
Input parameter	-
Post condition	-

1447

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check if values (address 0x02, address 0x04, address 0x05, bit 6) correspond to entries in IODD commNetworkProfile (MinCycleTime, RevisionID, SIO supported)
Test passed	Values are matching
Test failed (examples)	Values are not matching
Results	MinCycleTime: \<value\> \<pass/fail\> RevisionID: \<value\> \<pass/fail\> SIO supported: \<yes/no\> \<pass/fail\>

1448

1449   ### 7.3.3   IODD parameter read verification

1450   Table 153 defines the test conditions for this test case.

1451   **Table 153 – IODD parameter read verification**

1452

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0151
Name	TCD_IODD_PARV_READVERIFY
Purpose (short)	Test access rights, structure and data content of Read parameters
Equipment under test (EUT)	Device and Legacy-Device and associated IODD
Test case version	1.0
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, C.2.2 to C.2.19, 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 reads dedicated IODD parameters from the Device. Verify that all parameters in the IODD with Read access can be read from the Device, have a correct structure and valid data content. The length of the read parameter is used to test the structure. The lengths of parameters depend on their data. The validity of the data content is only checked for parameter that can have invalid data content ("0x00" in the middle of a string).
Precondition	Device is in SDCI communication mode, matching VendorID and ProductID
Procedure	Read all parameter with read access according to the IODD (parameter by parameter) and evaluate
Input parameter	-
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	For each read out parameter: a) Check for ErrorType according Table C.1 in [9] b) Check if length corresponds to IODD entry c) Check if data content is valid (no "0x00" in the middle of a string)
Test passed	Successful evaluation
Test failed (examples)	Any ErrorType out of C.2.3 to C.2.8 (see [9]) is indicated; invalid data content or read length is not as described in the IODD
Results	For each and every parameter with Read access in the IODD: Parameter Read access: <ok/not ok> <pass/fail> Parameter length match: <yes/no> <pass/fail> Parameter string without "0x00": <yes/no> <pass/fail>

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1455   **7.3.4   IODD parameter write verification**

1456   Table 154 defines the test conditions for this test case.

1457   **Table 154 – IODD parameter write verification**

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	1.0
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, 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	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: 18.04.2011 12:00 - Timespan: 1 s - 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>

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1460   **7.3.5   IODD reset to factory settings verification**

1461   Table 155 defines the test conditions for this test case.

1462   **Table 155 – IODD reset to factory settings verification**

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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	1.0
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

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Device-Tester tests if parameters are set to default values via the System-Command "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 b) If evaluation b) is successful
Test failed (examples)	a) Errors occur 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>

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1466   **7.3.6   IODD parameter access lock verification**

1467   Table 156 defines the test conditions for this test case.

1468   **Table 156 – IODD parameter access lock verification**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0156
Name	TCD_IODD_PARV_ACCESSLOCK
Purpose (short)	Test IODD parameter access locking function (Option)

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Equipment under test (EUT)	Device and associated IODD
Test case version	1.0
Category / type	IODD parameter verification test; test to pass (negative testing)
Specification (clause)	[3] 5.3.2.3; [9] B.2.4, C.2.3 to C.2.8
Configuration / setup	Device-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Device-Tester tests if parameters are locked by the "Device Access Lock" parameter. The access to write values is locked if this feature is implemented. (Version 1.1).
Precondition	Connection established, vendor and product ID of Device and IODD are equal
Procedure	a) Write the value "0x01" to Index 0x000C, Subindex 0x00 ("Device Access Locks – parameter access locked") b) Identify parameter with Write access within the IODD c) Write <value> to the identified parameter
Input parameter	<value> to be defined by manufacturer
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	For each written parameter: a) Check for ErrorType according Table C.1
Test passed	If an ErrorType out of C.2.3 to C.2.8 is indicated at each attempt to write
Test failed (examples)	No error was indicated and Write access was possible
Results	For each and every parameter with Write access in the IODD: Parameter Write access: <no error/ErrorType> <pass/fail>

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1472 **7.3.7 IODD parameter Index/Subindex consistency**

1473 Table 157 defines the test conditions for this test case.

1474 **Table 157 – IODD parameter Index/Subindex consistency**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0157
Name	TCD_IODD_PARV_INDEXCONSISTENT
Purpose (short)	Test the consistency between Indices and Subindices for IODD parameters
Equipment under test (EUT)	Device and Legacy-Device and associated IODD
Test case version	1.0
Category / type	IODD parameter verification test; test to pass (positive testing)
Specification (clause)	[3] 5.3.2.1, 5.3.5.3; [9] A.5.4, E.3.2, E.3.3
Configuration / setup	Device-Tester

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Device-Tester tests if reading or writing parameters with Subindex access has the same results for access via Index and Subindex. This test is only for non-dynamic parameters with complex data type and "subindexAccessSupported = true" within the IODD.
Precondition	Connection established, vendor and product ID of Device and IODD are equal
Procedure	a) Identify parameter from IODD (see "Purpose") b) Identify a valid <value1> to write c) Write <value1> into parameter d) Read parameter (Index, Subindex "0x00") e) Read <value2> of particular Subindex of Index f) Write <value2> into Subindex of the same parameter

TEST CASE	CONDITIONS / PERFORMANCE
	g) Read parameter (Index, Subindex "0x00") h) Read <value3> particular Subindex of Index
Input parameter	<value1> to be defined by manufacturer
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether <value2> fits into <value1> b) Check whether <value2> matches <value3>
Test passed	If evaluations are positive
Test failed (examples)	If evaluations are negative
Results	For each and every parameter with Subindex access in the IODD: Parameter consistency: <value2/value1> <pass/fail> Parameter consistency: <value2/value3> <pass/fail>

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7.4   Fictive IODD

The Master-Tester ("Golden Device") shall provide a so-called Fictive IODD with critical constellations of parameters, which are supported by the "Golden Device". The IODD interpreter tools associated or related to a particular Master can be tested with the help of this IODD. Clause 4.5 describes how these tests can be performed.

8   Master protocol tests

8.1   General

The protocol tests can be performed almost automatically with the help of a Master-Tester ("Golden Device") as defined in A.2.4. The test sequences are described in 4.5 together with a list of the relevant test cases for Legacy-Master in Table 7 and a list of the relevant test cases for Master in Table 8. Supplementary requirements for Legacy-Masters beyond the definitions in [13] are listed in Annex B.

8.2   Timings

8.2.1   Delay times after WURQ and Master messages (TDMT)

Table 158 defines the test conditions for this test case.

Table 158 – Delay times after WURQ and Master messages (TDMT)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0158
Name	TCM_ PHYL_TIME_TDMT
Purpose (short)	Check delay times after WURQ and Master messages
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.2.2, Table 34
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Measuring the delays between WURQ and first request (230,4 kbit/s) or between the requests in the individual transmission rates respectively.
Precondition	Master is in SDCI communication mode (Scan mode)

TEST CASE	CONDITIONS / PERFORMANCE
Procedure	a) Detect end of Wake-up b) Measure time to the start bit of the first request c) Detect transmission rate d) Check if TDMT is within the tolerance of 27 to 37 TBIT of the subsequent transmission rate e) Measure and evaluate times between stop bit and start bit of the next request
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Measure TDMT and check tolerances
Test passed	TDMT within tolerance
Test failed (examples)	TDMT out of tolerance
Results	TDMT (230,4 kbit/s): <value> <pass/fail> TDMT (38,4 kbit/s): <value> <pass/fail> TDMT (4,8 kbit/s): <value> <pass/fail>

8.2.2 Delay time between three WURQs (TDWU)

Table 159 defines the test conditions for this test case.

Table 159 – Delay time between three WURQs (TDWU)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0159
Name	TCM_ PHYL_TIME_TDWU
Purpose (short)	Check whether delay time between wake-up retries is within tolerance
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.2.2, Table 34
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Measuring the times between the three Wake-up retries. Master-Tester ("Device") shall detect the beginning of all Wake-up requests and measure the time in between. It shall not react to the requests.
Precondition	Master is in SDCI communication mode (Scan mode)
Procedure	a) Detect start of first Wake-up b) Measure time to second Wake-up c) Check if TDWU is within the tolerance of 30 to 50 ms d) Measure and evaluate time between second and third Wake-up
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Measure TDWU
Test passed	Times within tolerance
Test failed (examples)	Times out of tolerance
Results	TDWU (interval between first and second): <value> <pass/fail> TDWU (interval between second and third): <value> <pass/fail>

1503   **8.2.3   Number of WURQs**

1504   Table 160 defines the test conditions for this test case.

1505   **Table 160 – Number of WURQs**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0160
Name	TCM_ PHYL_TIME_NUMOFWURQS
Purpose (short)	Check number of Wake-up retries
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.2.2, Table 34
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The number of WURQs during one Wake-up sequence is counted. The number of retries shall be exactly 2 (total number 3). Master-Tester ("Device") shall detect the start of the first WURQ and then start time measurement. Another 2 WURQs shall follow within the next 100 ms. No further requests except these 3 WURQs shall follow within 500 ms after start of the first WURQ.
Precondition	Master is in SDCI communication mode (Scan mode)
Procedure	a) Detect start of first Wake-up b) Measure time until third detected Wake-up (shall be ≤ 100ms) c) Time (after these 3 WURQs) until a new WURQ shall be minimum 500 ms.
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Measure between two subsequent WakeUp request cycles
Test passed	a) Number of WURQ retries during one Wake-up sequence = 2 within ≤ 100ms and b) No retries between 100ms and 500ms
Test failed (examples)	a) Number of WURQ retries during one Wake-up sequence ≠ 2, or b) Reties between 100ms and 500 ms
Results	Number of WURQs: \<value\> \<pass/fail\> Reties between 100ms and 500 ms: \<value\> \<pass/fail\>

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1509   **8.2.4   Delay time between WURQ retry sequences (TSD)**

1510   Table 161 defines the test conditions for this test case.

1511   **Table 161 – Delay time between WURQ retry sequences (TSD)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0161
Name	TCM_ PHYL_TIME_TSD
Purpose (short)	Check time between two WURQs is between 0.5 s and 1 s.
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.2.2, Table 34

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The time between the start of two Wake-up sequences is measured. Master-Tester ("Device") shall detect the start of the first WURQ and start time measurement. 2 more WURQs shall follow within the next 100 ms. No further requests except these 3 WURQs shall follow within 500 ms after start of the first WURQ. 1 s after the first WURQ at the latest the Master shall start a new Wake-up sequence. Master-Tester ("Device") shall check these times.
Precondition	Master is in SDCI communication mode (Scan mode)
Procedure	a) Detect start of first Wake-up b) Measure time until third detected Wake-up (shall be ≤ 100ms) c) No further WURQ shall follow within the first 500 ms after start of the first WURQ. d) Master-Tester ("Device") shall detect a new WURQ within 1 s after the first WURQ at the latest.
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Measure TSD
Test passed	0.5 s ≤ TSD ≤ 1 s
Test failed (examples)	TSD > 1 s
Results	TSD: <value> <pass/fail>

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8.2.5   Delay time between two Master messages at STARTUP (TINITCYC)

Table 162 defines the test conditions for this test case.

Table 162 – Delay time between two Master messages at STARTUP (TINITCYC)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0162
Name	TCM_ PHYL_TIME_TINITCYC
Purpose (short)	At STARTUP the time between two beginning messages shall be ≥ 100 TBIT
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.3.3, A.2.6
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	During the start-up phase the time between the start of two Master messages is measured. This is repeated for all transmission rates supported by the Master. Master-Tester ("Device") detects the start of each Master message and measures the time in between. These times shall be ≥ 100 TBIT of the transmission rate. This test is repeated for all supported transmission rates.
Precondition	Master is in SDCI communication mode (Scan mode)
Procedure	a) Master start-up b) Master-Tester ("Device") detects the starting time of the Master message and measures the time between the individual messages. It responds to the requests as specified. c) Master-Tester ("Device") checks whether the time between two messages is ≥ 100 TBIT of the transmission rate in use. d) This process is repeated for all transmission rates.
Input parameter	-

The numbers 1512, 1513, 1515, 1516, 1517, 1518 appear in the left margin as line references.

TEST CASE	CONDITIONS / PERFORMANCE
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Measure TINITCYC for all detected messages
Test passed	TINITCYC is always ≥ 100 TBIT of the transmission rate in use
Test failed (examples)	TINITCYC is at least < 100 TBIT of the transmission rate in use
Results	Minimum TINITCYC: <value> <pass/fail> Average TINITCYC: <value> <pass/fail> Maximum TINITCYC: <value> <pass/fail>

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8.2.6   Adjustment of the MasterCycleTime

Table 163 defines the test conditions for this test case.

Table 163 – Adjustment of the MasterCycleTime

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0163
Name	TCM_ PHYL_TIME_MASTERCYCLETIME
Purpose (short)	The Master shall adapt correctly to a too short MinCycleTime of the Device
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] B.1.4
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master-Tester ("Device") shall suggest the F-sequence type for a too small MinCycleTime value. The Master shall not accept this time and shall write back a sensible MasterCycle time. The same applies if the MinCycleTime value is "0". At each F-sequence type the Master-Tester ("Device") starts with the MinCycleTime value "0" and with times below the time that can be reached by the Master. The Master shall correct these times by writing back a possible MasterCycleTime value.
Precondition	Master is in SDCI communication mode (Scan mode)
Procedure	a) Master-Tester ("Device") is configured with an unrealistic MinCycleTime. b) Master writes back a correct MasterCycleTime value.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check MasterCycleTime against limits
Test passed	Master writes back valid times
Test failed (examples)	Master does not write back valid times.
Results	MasterCycleTime: <value> <pass/fail>

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8.2.7   Written MasterCycleTime corresponds to real cycle time

Table 164 defines the test conditions for this test case.

1529 **Table 164 – Written MasterCycleTime corresponds to real cycle time**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0164
Name	TCM_ PHYL_TIME_MASTERCYCLETIMEREAL
Purpose (short)	Written MasterCycleTime matches real cycle time
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.3.3
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The Master shall read the MinCycleTime value from Master-Tester ("Device") and shall write back its MasterCycleTime value. This time shall be checked by the Master-Tester ("Device"). To do so, Master-Tester ("Device") shall start several times with different MinCycleTimes and shall then check them. Master-Tester ("Device") receives different values in the Direct Parameter page 1 for the MinCycleTime and carries out a start-up to OPERATE mode. In this state the MasterCycleTime is checked.
Precondition	Master in OPERATE mode
Procedure	a) MinCycleTime = "0" in Master-Tester ("Device") b) Connection start-up to OPERATE c) Master-Tester ("Device") measures the time between the start bit of the Master message and that of the subsequent message. d) The measured time shall vary only within the MasterCycleTime tolerance (0 % and a maximum of +10 %). e) This test is repeated with different transmission rates and MinCycleTimes.
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Measure cycle times and test against tolerance limits 0 % and +10 %
Test passed	Within tolerance limits
Test failed (examples)	Outside time tolerance limits
Results	Minimum cycle time: <value> <pass/fail> Average cycle time: <value> <pass/fail> Maximum cycle time: <value> <pass/fail>

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1533 **8.2.8   Master tolerates different Device response times**

1534 Table 165 defines the test conditions for this test case.

1535 **Table 165 – Master tolerates different Device response times**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0165
Name	TCM_ PHYL_TIME_DEVRESPTIMES
Purpose (short)	Master tolerates different Device response times
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.3.5
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master-Tester ("Device") shall answer with different response times after receiving the Master message. The Master shall be able to handle this jitter. Master-Tester ("Device") responds with different response times between 1 and 10 TBIT.
Precondition	Master in OPERATE mode
Procedure	a) Master-Tester ("Device") responds after 1 TBIT b) Master-Tester ("Device") responds after 5 TBIT c) Master-Tester ("Device") responds after 10 TBIT
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check cyclic communication
Test passed	No aborts or repeated messages
Test failed (examples)	Abort or repeated messages
Results	Master reaction abort: <yes/no> <pass/fail> Master reaction retry: <yes/no> <pass/fail>

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8.2.9 Master tolerates different UART frame delay times (T2)

Table 166 defines the test conditions for this test case.

Table 166 – Master tolerates different UART frame delay times (T2)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0166
Name	TCM_ PHYL_TIME_UARTT2
Purpose (short)	Master tolerates different UART frame delay times (T2) of the Device.
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.3.4
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master-Tester ("Device") shall respond with different delays between the octets. The Master shall be able to handle this variation. Master-Tester ("Device") responds with different delays between 0 and 3 TBIT.
Precondition	Master in OpERATE mode
Procedure	a) Master-Tester ("Device") responds with 0 TBIT b) Master-Tester ("Device") responds with 1 TBIT c) Master-Tester ("Device") responds with 2 TBIT d) Master-Tester ("Device") responds with 3 TBIT.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check cyclic communication
Test passed	No aborts or repeated messages
Test failed (examples)	Abort or repeated messages
Results	Master reaction abort: <yes/no> <pass/fail> Master reaction retry: <yes/no> <pass/fail>

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1545 **8.2.10 Master sends UART frames within tolerated times (T1)**

1546 Table 167 defines the test conditions for this test case.

1547 **Table 167 – Master sends UART frames within tolerated times (T1)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0167
Name	TCM_ PHYL_TIME_UARTT1
Purpose (short)	Master sends UART frames within tolerated times (T1)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.3.3
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Measuring the delays between the UART octets. Master-Tester ("Device") shall measure the delays between the end of the stop bit and the beginning of the start bit of the next octet.
Precondition	Master in OPERATE mode
Procedure	a) Measure the delays between the end of the stop bit and the beginning of the start bit of the next octet b) Check if T1 is within the tolerance of 0 to 1 TBIT
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Measure and check timing
Test passed	Times within tolerance
Test failed (examples)	Times out of tolerance
Results	T1: <value> <pass/fail>

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1551 **8.3 Process Data (PD)**

1552 **8.3.1 Master uses TYPE_2_1 for 8 bit PD input**

1553 Table 168 defines the test conditions for this test case.

1554 **Table 168 – Master uses TYPE_2_1 for 8 bit PD input**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0168
Name	TCM_ DLPD_CYCC_TYPE21BIT8IN
Purpose (short)	Master uses F-sequence TYPE_2_1 for 8 bit Process Data input
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.5, A.2.6
Configuration / setup	Master-Tester ("Device")

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Process data input length = 8 bits; Output length = 0 bit. Based on this information the Master shall select F-sequence TYPE_2_1. Parameterize Master to Process Data length input = 8 bits and output = 0 bit. Set Process Data length input = 8 bits and output = 0 bit in the Direct Parameterpage 1 of Master-Tester ("Device").
Precondition	Master port inactive.
Procedure	a) Master switches port to STARTUP b) Master switches ports to OPERATE to Process Data exchange.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check correct F-sequence TYPE_2_1
Test passed	Master communicates with correct F-sequence TYPE and message (Checksum etc.)
Test failed (examples)	Master communicates with wrong F-sequence TYPE or message error
Results	F-sequence type: <TYPE_x_y> <pass/fail> Message: <value/checksum> <pass/fail>

1556

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1558 **8.3.2   Master uses TYPE_2_2 for 16 bit PD input**

1559 Table 169 defines the test conditions for this test case.

1560   **Table 169 – Master uses TYPE_2_2 for 16 bit PD input**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0169
Name	TCM_ DLPD_CYCC_TYPE22BIT16IN
Purpose (short)	Master uses F-sequence TYPE_2_2 for 16 bit Process Data input
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.5, A.2.6
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Process data input length = 16 bit; output length = 0 bit. Based on this information the Master shall select F-sequence TYPE_2_2. Parameterize Master to Process Data length input = 8 bits and output = 0 bit. Set Process Data length input = 16 bits and output = 0 bit in the Direct Parameter page 1 of the Master-Tester ("Device").
Precondition	Master port inactive.
Procedure	a) Master switches port to STARTUP b) Master switches ports to OPERATE to Process Data exchange.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check correct F-sequence TYPE_2_2
Test passed	Master communicates with correct F-sequence TYPE and message (Checksum etc.)
Test failed (examples)	Master communicates with wrong F-sequence TYPE or message error
Results	F-sequence type: <TYPE_x_y> <pass/fail> Message: <value/checksum> <pass/fail>

1561

1562

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1564 **8.3.3 Master uses TYPE_2_3 for 8 bit PD output**

1565 Table 170 defines the test conditions for this test case.

1566 **Table 170 – Master uses TYPE_2_3 for 8 bit PD output**

1567

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0170
Name	TCM_ DLPD_CYCC_TYPE23BIT8OUT
Purpose (short)	Master uses F-sequence TYPE_2_3 for 8 bit Process Data output
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.5, A.2.6
Configuration / setup	Master-Tester ("Device")

1568

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Process data input length = 0 bit; output length = 8 bit. Based on this information the Master shall select F-sequence TYPE_2_3. Parameterize Master to Process Data length input = 0 bit and output = 8 bit. Set Process Data length input = 0 bit and output = 8 bit in the Direct Parameterpage 1 of Master-Tester ("Device").
Precondition	Master port inactive.
Procedure	a) Master switches port to STARTUP b) Master switches ports to OPERATE to process data exchange.
Input parameter	
Post condition	

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check correct F-sequence TYPE_2_3
Test passed	Master communicates with correct F-sequence TYPE and message (check sum etc.)
Test failed (examples)	Master communicates with wrong F-sequence TYPE or message error
Results	F-sequence type: <TYPE_x_y> <pass/fail> Message: <value/checksum> <pass/fail>

1569

1570 **8.3.4 Master uses TYPE_2_4 for 16 bit PD output**

1571 Table 171 defines the test conditions for this test case.

1572 **Table 171 – Master uses TYPE_2_4 for 16 bit PD output**

1573

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0171
Name	TCM_ DLPD_CYCC_TYPE24BIT16OUT
Purpose (short)	Master uses F-sequence TYPE_2_4 for 16 bit Process Data output
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test , test to pass (positive testing)
Specification (clause)	[9] 9.2.3.5, A.2.6
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Process data input length = 0 bit; output length = 16 bit. Based on this information

TEST CASE	CONDITIONS / PERFORMANCE
	the Master shall select F-sequence TYPE_2_4. Parameterize Master to Process Data length input = 0 bit and output = 16 bit. Set Process Data length input = 0 bit and output = 16 bit in the Direct Parameter page 1 of the Master-Tester ("Device").
Precondition	Master port inactive.
Procedure	a) Master switches port to STARTUP b) Master switches ports to OPERATE to process data exchange.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check correct F-sequence TYPE_2_4
Test passed	Master communicates with correct F-sequence TYPE and message (Checksum etc.)
Test failed (examples)	Master communicates with wrong F-sequence TYPE or message error
Results	F-sequence type: <TYPE_x_y> <pass/fail> Message: <value/checksum> <pass/fail>

1574

1575

8.3.5   Master uses TYPE_2_5 for 8/8 bit PD in/output

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1577   Table 172 defines the test conditions for this test case.

1578   **Table 172 – Master uses TYPE_2_5 for 8/8 bit PD in/output**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0172
Name	TCM_ DLPD_CYCC_TYPE25BIT8INBIT8OUT
Purpose (short)	Master uses F-sequence TYPE_2_5 for 8/8 bit Process Data in/output
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.5, A.2.6
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Process data input length = 8 bit; output length = 8 bit. Based on this information the Master shall select F-sequence TYPE_2_5. Parameterize Master to Process Data length input = 8 bit and output = 8 bit. Set Process Data length input = 8 bit and output = 8 bit in the Direct Parameter page 1 of the Master-Tester ("Device").
Precondition	Master port inactive.
Procedure	a) Master switches port to STARTUP b) Master switches ports to OPERATE to process data exchange.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check correct F-sequence TYPE_2_5
Test passed	Master communicates with correct F-sequence TYPE and message (Checksum etc.)
Test failed (examples)	Master communicates with wrong F-sequence TYPE or message error
Results	F-sequence type: <TYPE_x_y> <pass/fail> Message: <value/checksum> <pass/fail>

1579

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1582 **8.3.6 Master uses TYPE_1 for 256 bit PD input**

1583 Table 173 defines the test conditions for this test case.

1584 **Table 173 – Master uses TYPE_1 for 256 bit PD input**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0173
Name	TCM_ DLPD_CYCC_TYPE1BIT256IN
Purpose (short)	Master uses F-sequence TYPE_1 for 256 bit Process Data input
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.5, A.2.6
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Process data input length = 256 bit; output length = 0 bit. Based on this information the Master shall select F-sequence TYPE_1. Parameterize Master to Process Data length input = 256 bit and output = 0 bit. Set Process Data length input = 256 bit and output = 0 bit in the Direct Parameter page 1 of the Master-Tester ("Device").
Precondition	Master port inactive.
Procedure	a) Master switches port to STARTUP b) Master switches ports to OPERATE to process data exchange.
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check correct F-sequence TYPE_1
Test passed	Master communicates with correct F-sequence TYPE and message (Checksum etc.)
Test failed (examples)	Master communicates with wrong F-sequence TYPE or message error
Results	F-sequence type: <TYPE_x_y> <pass/fail> Message: <value/checksum> <pass/fail>

1588 **8.3.7 Master behaviour in case of no Device response**

1589 Table 174 defines the test conditions for this test case.

1590 **Table 174 – Master behaviour in case of no Device response**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0174
Name	TCM_ DLPD_CYCC_WATCHDOG
Purpose (short)	Master behaviour in case of no Device response
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test , test to pass (positive testing)
Specification (clause)	[9] 7.3.3.4
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	In case of no Device response the Master shall wait until a watchdog time expires

TEST CASE	CONDITIONS / PERFORMANCE
	and then repeat the last message. After a second repetition the Master shall establish a new connection.
Precondition	Master and Master-Tester ("Device") are in OPERATE mode and in Process Data exchange.
Procedure	Master-Tester ("Device") does not reply to Master messages
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Repetition of messages: after 2 repetitions connection is re-established.
Test passed	After a certain time the Master carries out a re-start.
Test failed (examples)	Master shows no reaction
Results	Watchdog time: <value> <pass/fail> Repetitions: <value> <pass/fail> New connection: <pass/fail>

1593

8.3.8   Master behaviour to wrong checksum in Device response

Table 175 defines the test conditions for this test case.

Table 175 – Master behaviour to wrong checksum in Device response

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0175
Name	TCM_ DLPD_CYCC_CHECKSUMWRONG
Purpose (short)	Master behaviour to wrong checksum in Device response
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.2.2.1
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	In case of a wrong checksum value in the "Device" response the Master shall repeat the last message. After a second repetition the Master shall establish a new connection.
Precondition	Master and Master-Tester ("Device") are in OPERATE mode and in Process Data exchange.
Procedure	Master-Tester ("Device") sends single messages with wrong Checksum.
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Message repetition and watchdog
Test passed	After a certain time the Master has carried out a re-start and the Process Data did not pass.
Test failed (examples)	No reaction of the Master or process data passed.
Results	Checksum: <value> <pass/fail> Repetitions: <value> <pass/fail> New connection: <yes/no> <pass/fail>

1599

1600 **8.3.9 Master reads mirrored in/out PD from Device**

1601 Table 176 defines the test conditions for this test case.

1602 **Table 176 – Master reads mirrored in/out PD from Device**

1603

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0176
Name	TCM_ DLPD_CYCC_MIRROREDPD
Purpose (short)	Master reads mirrored input/output Process Data from Device
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.5.4.2; [9] 7.3.3.2
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master-Tester ("Device") mirrors its Process Data such that the Master can check the consistency.
Precondition	a) Master-Tester ("Device") Process Data length in = 16 octets; out = 16 octets b) Master and Master-Tester ("Device") are in OPERATE mode and in Process Data exchange.
Procedure	a) Master-Tester ("Device") mirrors its input Process Data to the output Process Data. b) Master transmits different Process Data values and checks the received data after 50 times the cycle time.
Input parameter	-
Post condition	-

1604

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Transmitted and received data shall match.
Test passed	All transmitted process data correspond to the received data.
Test failed (examples)	Inconsistency between transmitted and received process data
Results	Sent and received PD match: <pass/fail>

1605

1606 **8.3.10 Master propagates "PD invalid" indication in a correct manner**

1607 Table 177 defines the test conditions for this test case.

1608 **Table 177 – Master propagates "PD invalid" indication in a correct manner**

1609

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0177
Name	TCM_ DLPD_CYCC_PDINVALID
Purpose (short)	Master propagates "PD invalid" indication in a correct manner
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2, Table 48; [9] A.6.2
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test PDValid – PDInvalid transition
Precondition	a) Master in SDCI communication mode. b) Master-Tester ("Device") is in OPERATE mode and provides valid Process Data (PDValid).
Procedure	a) Master-Tester ("Device") is prompted to set the Process Data to "PDInvalid". b) It sets bit 6 of the Checksum / status byte (CKS) to 1. c) The Device-Tester performs the "PDInvalid" handling. For example it marks the PDs at the upper level system "invalid".
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Process Data status shall signalise transition invalid (system-specific).
Test passed	Master defines the Process Data in the upper level system invalid
Test failed (examples)	Master defines the Process Data in the upper level system as valid
Results	"PDInvalid" = 1 propagated to higher level system: <pass/fail>

1611

8.3.11   Master propagates "PD valid" indication in a correct manner

Table 178 defines the test conditions for this test case.

Table 178 – Master propagates "PD valid" indication in a correct manner

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0178
Name	TCM_ DLPD_CYCC_PDVALID
Purpose (short)	Master propagates "PDValid" indication in a correct manner
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2, Table 48; [9] A.6.2
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test if PDInvalid – PDValid transition was handled correctly.
Precondition	a) Master in SDCI communication mode. b) Master-Tester ("Device") is in OPERATE mode and provides invalid Process Data (PDInvalid).
Procedure	a) Master-Tester ("Device") is prompted to set the Process Data to valid. b) It sets bit 6 of the Checksum / status byte (CKS) to "0". c) The Device-Tester performs the "PDInvalid" handling. For example it marks the PDs at the upper level system "valid".
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Process Data status shall signalise transition valid / invalid (system-specific).
Test passed	Master defines the Process Data in the upper level system invalid
Test failed (examples)	PDs remain system-specific invalid or
Results	"PDInvalid" = "0" propagated to higher level system: <pass/fail>

1617 **8.4 On-request Data (OD)**

1618 **8.4.1 Master uses TYPE_2_V for several PD in/out and 1 octet OD**

1619 Table 179 defines the test conditions for this test case.

1620 **Table 179 – Master uses TYPE_2_V for several PD in/out and 1 octet OD**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0179
Name	TCM_DLOD_CYCC_TYPE2VPDXOD1
Purpose (short)	Check whether Master uses TYPE_2_V for several in/output PD and 1 octet OD
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.5, A.2.4, B.1.5
Configuration / setup	Master-Tester, Line-Monitor (optionally)
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Check whether Master uses TYPE_2_V for several in/output Process Data and 1 octet OD. The Master receives the information about the target F-sequence type via address 0x03 (F-sequenceCapability), 0x05 (ProcessDataIn), and 0x06 (ProcessDataOut) out of the Direct Parameter page 1.
Precondition	a) In OPERATE mode the F-sequence type in F-sequenceCapability is set to the value 4. b) The process data width PDin is 0 to 32 octets (and 3 to 32 octets as they do not contain the F-sequence TYPE_2_x). c) The process data width PDout is 0 to 32 octets (and 3 to 32 octets as they do not contain the F-sequence TYPE_2_x). d) Master is in STARTUP mode.
Procedure	a) The Master writes the value 0xBF into Index 24 ("ApplicationSpecificTag") of the Master-Tester. b) The Master reads the value 0xBF from Index 24 of the Master-Tester. c) After each successful test cycle the Master is reset to STARTUP mode and another PD combination is set in the Master-Tester for checking the F-sequence type selection. d) Prior to a new test the Master-Tester sets the content of Index 24 to "0". e) The successful test cycles are indicated as follows: Number of Process Data in / number of Process Data out (PDin / PDout) f) The following 4 PD combinations are tested: 1/1, 32/32, 6/0, and 0/20. g) Each octet of the Process Data carries the content 0x5A. h) In OPERATE mode TYPE_0 is excluded in F-sequenceCapability (values in F-sequence Capability < 0x01).
Input parameter	4 PDin/PDout combinations: 1/1, 32/32, 6/0, and 0/20 with "0x01" to "0x20" depending on the length of PDin or PDout. OD with "0xBF".
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) For each combination of PDin and PDout it is checked whether the correct F-sequence type (correct detection of the PD width) is set in F-sequenceCapability and if the Process Data are correctly shown in the target system. b) The F-sequence type can be traced on the Line-Monitor or determined via the Checksum/F-sequence type (CKT) octet in the Master message.
Test passed	If the following three conditions are met: a) The Process Data entered per F-sequence are at the target system of the Master or in the Master-Tester. b) The value 0xBF is written into Index 24 of the Master-Tester. c) The Master succeeded to read back the value 0xBF.
Test failed (examples)	If one of the three conditions is not fulfilled.
Results	F-sequence type (1/1): <TYPE> <pass/fail> F-sequence type (32/32): <TYPE> <pass/fail> F-sequence type (6/0): <TYPE> <pass/fail> F-sequence type (0/20): <TYPE> <pass/fail>

1621

1622

1623   **8.4.2   Master uses TYPE_2_V for several PD in/out and 2 octets OD**

1624   Table 180 defines the test conditions for this test case.

1625   **Table 180 – Master uses TYPE_2_V for several PD in/out and 2 octets OD**

<table>
<tr><td>TEST CASE ATTRIBUTES</td><td>IDENTIFICATION / REFERENCE</td></tr>
<tr><td>Identification (ID)</td><td>SDCI_TC_0180</td></tr>
<tr><td>Name</td><td>TCM_DLOD_CYCC_TYPE2VPDXOD2</td></tr>
<tr><td>Purpose (short)</td><td>Check whether Master uses TYPE_2_V for several in/output PD and 2 octets OD</td></tr>
<tr><td>Equipment under test (EUT)</td><td>Master</td></tr>
<tr><td>Test case version</td><td>1.0</td></tr>
<tr><td>Category / type</td><td>Master protocol test, test to pass (positive testing)</td></tr>
<tr><td>Specification (clause)</td><td>[9] 9.2.3.5, A.2.4, B.1.5</td></tr>
<tr><td>Configuration / setup</td><td>Master-Tester, Line-Monitor (optionally)</td></tr>
<tr><td>TEST CASE</td><td>CONDITIONS / PERFORMANCE</td></tr>
<tr><td>Purpose (detailed)</td><td>Check whether Master uses TYPE_2_V for several in/output PD and 2 octets OD. The Master receives the information about the target F-sequence type via address 0x03 (F-sequenceCapability), 0x05 (ProcessDataIn), and 0x06 (ProcessDataOut) out of the Direct Parameter page 1.</td></tr>
<tr><td>Precondition</td><td>a) In OPERATE mode the F-sequence type in F-sequenceCapability is set to the value 5.
b) The process data width PDin is 0 to 32 octets.
c) The process data width PDout is 0 to 32 octets.
d) Master is in STARTUP mode.</td></tr>
<tr><td>Procedure</td><td>a) The Master writes the values 0xAA and 0xBF into Index 24 ("ApplicationSpecificTag") of the Master-Tester.
b) The Master reads the values 0xAA and 0xBF from Index 24 of the Master-Tester.
c) After each successful test cycle the Master is reset to STARTUP mode and another PD combination is set in the Master-Tester for checking the F-sequence type selection.
d) Prior to a new test the Master-Tester sets the content of Index 24 to "0".
e) The successful test cycles are indicated as follows: Number of Process Data in / number of Process Data out (PDin / PDout)
f) The following 4 PD combinations are tested: 1/1, 32/32, 6/0, and 0/20.
g) Each octet of the Process Data carries the content 0x5A.
h) In OPERATE mode TYPE_0 is excluded in F-sequenceCapability (values in F-sequence Capability < 0x01).</td></tr>
<tr><td>Input parameter</td><td>4 PDin/PDout combinations: 1/1, 32/32, 6/0, and 0/20 with "0x5A". OD with "0xAA, 0xBF".</td></tr>
<tr><td>Post condition</td><td>-</td></tr>
<tr><td>TEST CASE RESULTS</td><td>CHECK / REACTION</td></tr>
<tr><td>Evaluation</td><td>a) For each combination of PDin and PDout it is checked whether the correct F-sequence type (correct detection of the PD width) is set in F-sequenceCapability and if the Process Data are correctly shown in the target system.
b) The F-sequence type can be traced on the Line-Monitor or determined via the Checksum/F-sequence type (CKT) octet in the Master message.</td></tr>
<tr><td>Test passed</td><td>If the following three conditions are met:
a) The Process Data entered per F-sequence are at the target system of the Master or in the Master-Tester.
b) The values 0xAA and 0xBF are written into Index 24 in the Master-Tester.
c) The Master succeeded to read back the values 0xAA and 0xBF.</td></tr>
<tr><td>Test failed (examples)</td><td>If one of the three conditions is not fulfilled.</td></tr>
<tr><td>Results</td><td>F-sequence TYPE (1/1): <TYPE>   <pass/fail>
F-sequence TYPE (32/32): <TYPE>   <pass/fail>
F-sequence TYPE (6/0): <TYPE>   <pass/fail>
F-sequence TYPE (0/20): <TYPE>   <pass/fail></td></tr>
</table>

1626

1627

1628

1629   **8.4.3   Master uses TYPE_2_V for several PD in/out and 8 octets OD**

1630   Table 181 defines the test conditions for this test case.

1631   **Table 181 – Master uses TYPE_2_V for several PD in/out and 8 octets OD**

1632

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0181
Name	TCM_DLOD_CYCC_TYPE2VPDXOD8
Purpose (short)	Check whether Master uses TYPE_2_V for several in/out PD and 8 octets OD
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.5, A.2.4, B.1.5
Configuration / setup	Master-Tester, Line-Monitor (optionally)

1633

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check whether Master uses TYPE_2_V for several in/output PD and 8 octets OD. The Master receives the information about the target F-sequence type via address 0x03 (F-sequenceCapability), 0x05 (ProcessDataIn), and 0x06 (ProcessDataOut) out of the Direct Parameter page 1.
Precondition	a) In OPERATE mode the F-sequence type in F-sequenceCapability is set to the value 6. b) The process data width PDin is 0 to 32 octets. c) The process data width PDout is 0 to 32 octets. d) Master is in STARTUP mode.
Procedure	a) The Master writes the values 0xAA, 0xBF, 0x77, 0x40, 0x55, 0xCD, 0x33, 0xE4 into Index 24 ("ApplicationSpecificTag") of the Master-Tester. b) The Master reads the values 0xAA, 0xBF, 0x77, 0x40, 0x55, 0xCD, 0x33, 0xE4 from Index 24 of the Master-Tester. c) After each successful test cycle the Master is reset to STARTUP mode and another PD combination is set in the Master-Tester for checking the F-sequence type selection. d) Prior to a new test the Master-Tester sets the content of Index 24 to "0". e) The successful test cycles are indicated as follows: Number of Process Data in / number of Process Data out (PDin / PDout) f) The following 4 PD combinations are tested: 1/1, 32/32, 6/0, and 0/20. g) Each octet of the Process Data carries the content 0x5A. h) In OPERATE mode TYPE_0 is excluded in F-sequenceCapability (values in F-sequence Capability < 0x01).
Input parameter	4 PDin/PDout combinations: 1/1, 32/32, 6/0, and 0/20 with "0x5A". OD with "0xAA, 0xBF, 0x77, 0x40, 0x55, 0xCD, 0x33, 0xE4".
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) For each combination of PDin and PDout it is checked whether the correct F-sequence type (correct detection of the PD width) is set in F-sequenceCapability and if the Process Data are correctly shown in the target system. b) The F-sequence type can be traced on the Line-Monitor or determined via the Checksum/F-sequence type (CKT) octet in the Master message.
Test passed	If the following two conditions are met: a) The Process Data entered per F-sequence are at the target system of the Master or in the Master-Tester. b) The values 0xAA, 0xBF, 0x77, 0x40, 0x55, 0xCD, 0x33, 0xE4 are written into Index 24 in the Master-Tester.
Test failed (examples)	If one of the two conditions is not fulfilled.
Results	F-sequence TYPE (1/1): <TYPE> <pass/fail> F-sequence TYPE (32/32): <TYPE> <pass/fail> F-sequence TYPE (6/0): <TYPE> <pass/fail> F-sequence TYPE (0/20): <TYPE> <pass/fail>

1634

1635 **8.4.4   Master uses TYPE_2_V for several PD in/out and 32 octets OD**

1636   Table 182 defines the test conditions for this test case.

1637   **Table 182 – Master uses TYPE_2_V for several PD in/out and 32 octets OD**

1638

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0182
Name	TCM_DLOD_CYCC_TYPE2VPDXOD32
Purpose (short)	Check whether Master uses TYPE_2_V for several in/out PD and 32 octets OD
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.5, A.2.4, B.1.5
Configuration / setup	Master-Tester, Line-Monitor (optionally)

1639

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check whether Master uses TYPE_2_V for several in/out PD and 32 octets OD. The Master receives the information about the target F-sequence type via address 0x03 (F-sequenceCapability), 0x05 (ProcessDataIn), and 0x06 (ProcessDataOut) out of the Direct Parameter page 1.
Precondition	a) In OPERATE mode the F-sequence type in F-sequenceCapability is set to the value 7. b) The process data width PDin is 0 to 32 octets. c) The process data width PDout is 0 to 32 octets. d) Master is in STARTUP mode.
Procedure	a) The Master writes the text "Hello World, this is Master Test" into Index 24 ("ApplicationSpecificTag") of the Master-Tester. b) The Master reads the text "Hello World, this is Master Test" from Index 24 of the Master-Tester. c) After each successful test cycle the Master is reset to STARTUP mode and another PD combination is set in the Master-Tester for checking the F-sequence type selection. d) Prior to a new test the Master-Tester sets the content of Index 24 to "0". e) The successful test cycles are indicated as follows: Number of Process Data in / number of Process Data out (PDin / PDout) f) The following 4 PD combinations are tested: 1/1, 32/32, 6/0, and 0/20. g) Each octet of the Process Data carries the content 0x5A. h) In OPERATE mode TYPE_0 is excluded in F-sequenceCapability (values in F-sequenceCapability < 0x01).
Input parameter	4 PDin/PDout combinations: 1/1, 32/32, 6/0, and 0/20 with "0x5A". OD with "Hello World, this is Master Test".
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) For each combination of PDin and PDout it is checked whether the correct F-sequence type (correct detection of the PD width) is set in F-sequenceCapability and if the Process Data are correctly shown in the target system. b) The F-sequence type can be traced on the Line-Monitor or determined via the Checksum/F-sequence type (CKT) octet in the Master message.
Test passed	If the following three conditions are met: a) The Process Data entered per F-sequence are at the target system of the Master or in the Master-Tester. b) The text "Hello World, this is Master Test" is written into Index 24 in the Master-Tester. c) The Master succeeded to read back the text "Hello World, this is Master Test".
Test failed (examples)	If one of the three conditions is not fulfilled.
Results	F-sequence TYPE (1/1): <TYPE> <pass/fail> F-sequence TYPE (32/32): <TYPE> <pass/fail> F-sequence TYPE (6/0): <TYPE> <pass/fail> F-sequence TYPE (0/20): <TYPE> <pass/fail>

1640

1641 **8.5 STARTUP**

1642 **8.5.1 Master reads communication parameters (Direct Parameter)**

1643 Table 183 defines the test conditions for this test case.

1644 **Table 183 – Master reads communication parameters (Direct Parameter)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0183
Name	TCM_DLST_CHCK_COMPARAM
Purpose (short)	Check whether Master reads communication parameters 0x02 to 0x06
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.2, 9.3.3, Figures 66, 67, 76, 77
Configuration / setup	Master-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Checking of the correct startup for legacy Master (V1.0) and Master (≥ V1.1). Master reads communication parameters 0x02 to 0x06 (Direct Parameter page 1).
Precondition	a) Master is in STARTUP mode. b) Master-Tester is in STARTUP mode.
Procedure	The Master reads at least the communication parameters 0x02 to 0x06 from the Direct Parameter page 1.
Input parameter	-
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check plausibility of received communication parameters (0x02 to 0x06).
Test passed	The Master shall be able to read reasonable values from the Direct Parameter page 1 (0x02 to 0x06).
Test failed (examples)	If values could not be read completely or are not reasonable.
Results	Value of 0x02: <value> <pass/fail> Value of 0x03: <value> <pass/fail> Value of 0x04: <value> <pass/fail> Value of 0x05: <value> <pass/fail> Value of 0x06: <value> <pass/fail>

1645

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1648 **8.5.2 Master adjusts to protocol V1.1 (Direct Parameter)**

1649 Table 184 defines the test conditions for this test case.

1650 **Table 184 – Master adjusts to protocol V1.1 (Direct Parameter)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0184
Name	TCM_DLST_CHCK_VIDDID
Purpose (short)	Check whether Master adjusts to protocol V1.1 and reads VendorID and DeviceID
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.2, 9.2.3.3, Figures 66, 67, 78

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Configuration / setup	Master-Tester

1651

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master adjusts to protocol V1.1 and reads VendorID and DeviceID. Check for the right decision in respect to the protocol version.
Precondition	a) Master is in STARTUP mode. b) Master-Tester is in STARTUP mode. c) Protocol revision of the Device is > V1.0 (e.g. 0x11)
Procedure	The Master checks the protocol revision and carries out another startup according to protocol V1.1.
Input parameter	-
Post condition	-

1652

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check startup for V1.1, which is defined as follows: a) Write MasterCommand 0x95 b) Read VendorID c) Read DeviceID
Test passed	If the Master identified the protocol version > V1.0 and writes the MasterCommand 0x95. Master reads VendorID and DeviceID.
Test failed (examples)	If the Master did not write the MasterCommand 0x95.
Results	MasterCommand 0x95: <yes/no> <pass/fail> Master reads VendorID: <value> <pass/fail> Master reads DeviceID: <value> <pass/fail>

1653

1654 **8.5.3   Master adjusts to protocol V1.0 (Direct Parameter)**

1655   Table 185 defines the test conditions for this test case.

1656   **Table 185 – Master adjusts to protocol V1.0 (Direct Parameter)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0185
Name	TCM_DLST_CHCK_V10VIDDID
Purpose (short)	Check whether Master adjusts to protocol V1.0 and reads VendorID and DeviceID
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.2, 9.2.3.3, Figures 66, 67, 78
Configuration / setup	Master-Tester

1657

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check whether Master adjusts to protocol V1.0 and reads VendorID and DeviceID. Check for the right decision in respect to the protocol version.
Precondition	a) Master is in STARTUP mode. b) Master-Tester is in STARTUP mode. c) Protocol revision of the Device is V1.0 (0x10)
Procedure	The Master checks the protocol revision and carries out the startup according to protocol V1.0.
Input parameter	-
Post condition	-

1658

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check startup for V1.0, which is defined as follows: a) Read VendorID b) Read DeviceID
Test passed	If the Master identified the protocol version V1.0 and reads VendorID and DeviceID.
Test failed (examples)	If the Master did not recognize the correct protocol version and did not read the VendorID and DeviceID.
Results	Master identified protocol version: <yes/no> <pass/fail> Master reads VendorID: <value> <pass/fail> Master reads DeviceID: <value> <pass/fail>

1659

8.5.4 Master start-up with non configured VID and DID

1660

1661   Table 186 defines the test conditions for this test case.

1662   **Table 186 – Master start-up with non configured VID and DID**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0186
Name	TCM_DLST_CHCK_NONCONFVIDDID
Purpose (short)	Check whether Master performs start-up with non configured VID and DID
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.2, 9.2.3.3, Figures 66, 67, 78
Configuration / setup	Master-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check the Master behaviour with not configured VendorID and DeviceID (VendorID = 0x00, 0x00; DeviceID = 0x00, 0x00, 0x00)
Precondition	a) Master is in STARTUP mode. b) Master-Tester is in STARTUP mode. c) Protocol revision of the Device is > V1.0 (e.g. 0x11). d) Revision test successfully completed. e) The Process Data width is not changed.
Procedure	The Master establishes communication with the Device and turns it into the PREOPERATE mode.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check startup for V1.1, which is defined as follows: a) Read VendorID b) Read DeviceID c) Write MasterCommand 0x9A
Test passed	If the Master reads VendorID and DeviceID and writes the MasterCommand 0x9A.
Test failed (examples)	If the Master does not write the MasterCommand 0x9A.
Results	Master reads VendorID: <value> <pass/fail> Master reads DeviceID: <value> <pass/fail> MasterCommand 0x95: <yes/no> <pass/fail>

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8.5.5 Master start-up with configured VID and DID

1666

1667   Table 187 defines the test conditions for this test case.

1668   **Table 187 – Master start-up with configured VID and DID**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0187
Name	TCM_DLST_CHCK_CONFVIDDID
Purpose (short)	Check Master start-up behaviour with configured VendorID and DeviceID
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.2, 9.2.3.3, Figures 66, 67, 78
Configuration / setup	Master-Tester

1669

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Master start-up behaviour with configured VendorID and DeviceID (VendorID ≠ 0x00, 0x00; DeviceID ≠ 0x00, 0x00, 0x00).
Precondition	a) Master is in STARTUP mode. b) Master is configured to VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (VID selected randomly). c) Master-Tester is in STARTUP mode. d) Master-Tester has the VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (DID is selected randomly) e) Protocol revision of the Device is ≥ V1.1 (e.g. 0x11). f) Revision test successfully completed. g) The command 0x95 is written successfully. h) The Process Data width is not changed.
Procedure	The Master establishes communication with the Device and turns it into the PREOPERATE mode.
Input parameter	-
Post condition	-

1670

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check startup for V1.1, which is defined as follows: a) Read VendorID b) Read DeviceID c) Write MasterCommand 0x9A
Test passed	If the Master writes the MasterCommand 0x9A after checking.
Test failed (examples)	If the Master does not write the MasterCommand 0x9A.
Results	Master reads VendorID: <value> <pass/fail> Master reads DeviceID: <value> <pass/fail> MasterCommand 0x95: <yes/no> <pass/fail>

1671

1672   **8.5.6   Master start-up with overwrite of the DID (compatible)**

1673   Table 188 defines the test conditions for this test case.

1674   **Table 188 – Master start-up with overwrite of the DID (compatible)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0188
Name	TCM_DLST_CHCK_OVERDIDOK
Purpose (short)	Check Master start-up behaviour with overwrite of the DeviceID (compatible)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.2, 9.3.3, Figure 78

1675

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Configuration / setup	Master-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Master start-up behaviour with overwrite of the DeviceID (compatible). The configured VendorID is ≠ 0x00, 0x00 and the DeviceID is ≠ 0x00, 0x00, 0x00.
Precondition	a) Master is in STARTUP mode. b) Master is configured to VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (VID selected randomly). c) Master-Tester is in STARTUP mode. d) Master-Tester has the VendorID 0x02, 0xA4 and DeviceID 0x00, 0xA4, 0x39 (DID is selected randomly) e) Protocol revision of the Device is ≥ V1.1 (e.g. 0x11). f) Revision test successfully completed. g) The MasterCommand 0x95 (MasterIdent) is written successfully. h) The Process Data width is not changed.
Procedure	The Master establishes communication with the "Device" (Master-Tester), detects the wrong "Device", overwrites the DeviceID with the requested DeviceID, reads communication parameters again, and turns the "Device" into the PREOPERATE mode.
Input parameter	Master: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2 Master-Tester: VendorID 0x02, 0xA4; DeviceID 0x00, 0xA4, 0x39
Post condition	-

1676

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Read VendorID b) Read DeviceID c) Write Revision with "0x11" (V1.1) d) Write configured DeviceID e) Write MasterCommand 0x96 (announces new read of communication parameters) f) Read address 0x02 (MinCycleTime) g) Read communication parameters 0x02 to 0x06 (Direct Parameter page 1) h) Read again VendorID i) Read again DeviceID j) Write MasterCommand 0x9A
Test passed	Check startup with configured DeviceID for V1.1, which is defined as follows: a) After checking, the Master overwrites the DeviceID with the configured values b) Master sends MasterCommand 0x96 to announce new readout of communication parameters and VID and DID c) Master writes MasterCommand 0x9A d) Test-Master/Device has the DeviceID 0x00, 0x2B, 0xD2 (Master does not send an error message as the reread DeviceID matches the configured values).
Test failed (examples)	If the Master does not write the Master Command 0x9A or the Test-Master/Device does not have the DeviceID 0x00, 0x2B, 0xD2
Results	Master writes Revision 0x11: <yes/no> <pass/fail> MasterCommand 0x96: <yes/no> <pass/fail> Master reads VendorID: <value> <pass/fail> Master reads DeviceID: <value> <pass/fail> MasterCommand 0x9A: <yes/no> <pass/fail>

1677

1678 **8.5.7 Master start-up with overwrite of the DID (incompatible)**

1679 Table 189 defines the test conditions for this test case.

1680 **Table 189 – Master start-up with overwrite of the DID (incompatible)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0189
Name	TCM_DLST_CHCK_OVERDIDNOK
Purpose (short)	Check Master start-up behaviour with overwrite of the DeviceID (incompatible)
Equipment under test (EUT)	Master

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.2, 9.3.3, Figure 78
Configuration / setup	Master-Tester; Event propagation to the upper level system defined for example by a corresponding "upper level integration system" such as [17].

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Master start-up behaviour with overwrite of the DeviceID. This test case supposes an incompatible DeviceID that causes the Master-Tester to initiate a corresponding Event. The configured VendorID is ≠ 0x00, 0x00 and the DeviceID is ≠ 0x00, 0x00, 0x00.
Precondition	a) Master is in STARTUP mode. b) Master is configured to VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (VID selected randomly). c) Master-Tester is in STARTUP mode. d) Master-Tester has the VendorID 0x02, 0xA4 and DeviceID 0x00, 0xA4, 0x39 (DID is selected randomly) e) Protocol revision of the Device is V1.1 (0x11). f) Revision test successfully completed. g) The MasterCommand 0x95 (MasterIdent) is written successfully. h) The Process Data width is not changed.
Procedure	The Master establishes communication with the "Device" (Master-Tester), detects the wrong "Device", overwrites the DeviceID with the requested DeviceID, reads communication parameters again, and turns the "Device" into the PREOPERATE mode.
Input parameter	Master: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2 Master-Tester: VendorID 0x02, 0xA4; DeviceID 0x00, 0xA4, 0x39
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Read VendorID b) Read DeviceID c) Write Revision with "0x11" (V1.1) d) Write configured DeviceID e) Write MasterCommand 0x96 (announces new read of communication parameters) f) Read address 0x02 (MinCycleTime) g) Read communication parameters 0x02 to 0x06 (Direct Parameter page 1) h) Read again VendorID i) Read again DeviceID j) Write MasterCommand 0x9A k) Master indicates an Event
Test passed	a) If the Master indicates a corresponding Event to the upper level system (optional) b) If the Master sent the MasterCommand 0x9A and thereafter no MasterCommand 0x99
Test failed (examples)	a) If the Master does not indicate an Event. b) If the Master sent the MasterCommand 0x9A and thereafter a MasterCommand 0x99
Results	Master writes Revision 0x11: <yes/no> <pass/fail> Master writes configured DeviceID: <yes/no> <pass/fail> MasterCommand 0x96: <yes/no> <pass/fail> Master reads VendorID: <value> <pass/fail> Master reads DeviceID: <value> <pass/fail> MasterCommand 0x9A: <yes/no> <pass/fail> Master indicates Event: <EventCode> <pass/fail>

8.5.8   Master start-up with overwrite of the RID (incompatible)

Table 190 defines the test conditions for this test case.

Table 190 – Master start-up with overwrite of the RID (incompatible)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0190

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Name	TCM_DLST_CHCK_OVERRIDNOK
Purpose (short)	Check Master start-up behaviour with overwrite of the RevisionID (incompatible)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.2, 9.3.3, Figure 78
Configuration / setup	Master-Tester ("Device"); Event propagation to the upper level system defined for example by a correponding "upper level integration system" such as [17].

1687

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Master start-up behaviour with overwrite of the RevisionID (RID). This test case supposes an incompatible RevisionID (>V1.1). The Master overwrites the RID, the "Device" (Master-Tester) in turn restores the original RID that causes the Master-Tester to initiate a corresponding Event. The configured VendorID is ≠ 0x00, 0x00 and the DeviceID is ≠ 0x00, 0x00, 0x00.
Precondition	a) Master is in STARTUP mode. b) Master is configured to VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (VID selected randomly). c) Master-Tester is in STARTUP mode. d) Master-Tester has the VendorID 0x02, 0xA4 and DeviceID 0x00, 0xA4, 0x39 (DID is selected randomly) e) Protocol revision of the Device is V1.2 (0x12). f) Revision test successfully completed. g) The MasterCommand 0x95 (MasterIdent) is written successfully. h) The Process Data width is not changed.
Procedure	The Master establishes communication with the "Device" (Master-Tester), detects the "wrong" RevisionID and overwrites the RevisionID with the requested RevisionID. The "Device" restores the original RevisionID. The Master reads communication parameters again.
Input parameter	Master: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2 Master-Tester: VendorID 0x02, 0xA4; DeviceID 0x00, 0xA4, 0x39; RevisionID: 0x12
Post condition	-

1688

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Read VendorID b) Read DeviceID c) Write Revision with "0x11" (V1.1) d) Write configured DeviceID e) Write MasterCommand 0x96 (announces new read of communication parameters) f) Read address 0x02 (MinCycleTime) g) Read communication parameters 0x02 to 0x06 (Direct Parameter page 1) h) Read again VendorID i) Read again DeviceID k) Master indicates an Event
Test passed	a) If the revision 0x12 is restored in the Device (address 0x04 in Direct Parameter page 1) after the actions and the Master did not send the command 0x9A. b) If the Master indicates a corresponding Event to the upper level system (optional).
Test failed (examples)	If the Master does not indicate a system-specific Event or turns into PREOPERATE mode.
Results	Master writes Revision 0x11: <yes/no> <pass/fail> Master writes configured DeviceID: <yes/no> <pass/fail> MasterCommand 0x96: <yes/no> <pass/fail> Master reads VendorID: <value> <pass/fail> Master reads DeviceID: <value> <pass/fail> MasterCommand 0x9A: <yes/no> <pass/fail> Master-Tester ("Device") RevisionID: <value> <pass/fail> Master indicates Event: <EventCode> <pass/fail>

1689

1690 **8.5.9 Master start-up with non configured VID and DID (V1.0)**

1691 Table 191 defines the test conditions for this test case.

1692   **Table 191 – Master start-up with non configured VID and DID (V1.0)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0192
Name	TCM_DLST_CHCK_VIDDIDNONCONFIG
Purpose (short)	Check Master start-up behaviour with non configured VID and DID (V1.0)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.2.1; [9] 9.2.3.2, 9.3.3, Figure 78
Configuration / setup	Master-Tester

1693

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Master start-up behaviour with non configured VID and DID for a legacy "Device" (V1.0). The Master shall write the MasterCycleTime and turn the "Device" from PREOPERATE to OPERATE mode. The configured VendorID is = 0x00, 0x00 and the DeviceID is = 0x00, 0x00, 0x00.
Precondition	a) Master is in STARTUP mode. b) Master is configured to VendorID 0x00, 0x00 and DeviceID 0x00, 0x00, 0x00. c) Master-Tester is in STARTUP mode. d) Master-Tester has the VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (DID is selected randomly) e) Protocol revision of the Device is V1.0 (0x10).
Procedure	The Master establishes communication with the "Device" (Master-Tester), writes the MasterCycleTime (address 0x01 in Direct Parameter page 1), and sends the MasterCommand 0x99 (OPERATE).
Input parameter	Master: VendorID: 0x00, 0x00; DeviceID 0x00, 0x00, 0x00 Master-Tester: VendorID 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2; RevisionID: 0x10
Post condition	-

1694

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Read VendorID b) Read DeviceID c) Write MasterCycleTime (address 0x01 in Direct Parameter page 1) d) Write MasterCommand 0x99 (turn "Device" into OPERATE mode)
Test passed	If the Master writes the MasterCycleTime (address 0x01) and successfully sent the Master-Command 0x99.
Test failed (examples)	If the Master does not write the MasterCycleTime (address 0x01) or does not send the MasterCommand 0x99.
Results	Master reads VendorID: <value> <pass/fail> Master reads DeviceID: <value> <pass/fail> MasterCyleTime written: <yes/no> <pass/fail> MasterCommand 0x99: <yes/no> <pass/fail>

1695

1696   8.5.10   Master start-up with configured VID and DID (Device V1.0)

1697   Table 192 defines the test conditions for this test case.

1698   **Table 192 – Master start-up with configured VID and DID (V1.0)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0193
Name	TCM_DLST_CHCK_VIDDIDCONFIG
Purpose (short)	Check Master start-up behaviour with configured VID and DID (Device V1.0)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0

1699

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.2.1; [9] 9.2.3.2, 9.3.3, Figure 78
Configuration / setup	Master-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Master start-up behaviour with configured VID and DID for a legacy "Device" (V1.0). The Master shall write the MasterCycleTime only if the configured values match the values in the "Device". Then, the Master shall turn the "Device" from PREOPERATE to OPERATE mode. The configured VendorID is ≠ 0x00, 0x00 and the DeviceID is ≠ 0x00, 0x00, 0x00.
Precondition	a) Master is in STARTUP mode. b) Master is configured to VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2. c) Master-Tester is in STARTUP mode. d) Master-Tester has the VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (DID is selected randomly) e) Protocol revision of the Device is V1.0 (0x10). f) Revision test successfully completed.
Procedure	The Master establishes communication with the "Device" (Master-Tester) and writes the MasterCycleTime (address 0x01 in Direct Parameter page 1) only, if the configured values match the values in the "Device". The Master sends the MasterCommand 0x99 to turn the "Device" into the OPERATE mode.
Input parameter	Master: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2 Master-Tester: VendorID 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2; RevisionID: 0x10
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Read VendorID b) Read DeviceID c) Write MasterCycleTime (address 0x01 in Direct Parameter page 1) d) Write MasterCommand 0x99 (turn "Device" into OPERATE mode)
Test passed	If the Master writes the MasterCycleTime (address 0x01) and successfully sent the MasterCommand 0x99.
Test failed (examples)	If the Master does not write the MasterCycleTime (address 0x01) or does not send the MasterCommand 0x99.
Results	Master reads VendorID: <value> <pass/fail> Master reads DeviceID: <value> <pass/fail> MasterCyleTime written: <yes/no> <pass/fail> MasterCommand 0x99: <yes/no> <pass/fail>

1700

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1702 **8.5.11   Master start-up with wrong DID (Device V1.0)**

1703   Table 193 defines the test conditions for this test case.

1704   **Table 193 – Master start-up with wrong DID (V1.0)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0194
Name	TCM_DLST_CHCK_DIDWRONG
Purpose (short)	Check Master start-up behaviour with wrong DID (Device V1.0)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.2.1; [9] 9.2.3.2, 9.3.3, Figure 78
Configuration / setup	Master-Tester; Event propagation to the upper level system defined for example by a correponding "upper level integration system" such as [17].

1705

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Master start-up behaviour with wrong configured DID for a legacy "Device" (V1.0). The Master shall indicate a corresponding Event to the upper level system and stops communicating with the "Device". The configured VendorID is ≠ 0x00, 0x00 and the DeviceID is ≠ 0x00, 0x00, 0x00.
Precondition	a) Master is in STARTUP mode. b) Master is configured to VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2. c) Master-Tester is in STARTUP mode. d) Master-Tester has a deviating DeviceID e) Protocol revision of the "Device" is V1.0 (0x10). f) Revision test successfully completed.
Procedure	The Master establishes communication with the "Device" (Master-Tester), recognizes a deviating DeviceID, indicates a corresponding Event to the upper level system and stops communicating with the "Device".
Input parameter	Master: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2 Master-Tester: Deviating DeviceID; RevisionID: 0x10
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Read VendorID b) Read DeviceID c) Master indicates an Event The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	If Master indicates a system specific error information and does not continue.
Test failed (examples)	If Master sends MasterCommand 0x99.
Results	Master reads VendorID: <value> <pass/fail> Master reads DeviceID: <value> <pass/fail> Master indicates Event: <EventCode> <pass/fail>

1706

1707

8.5.12   Master start-up with wrong SerialNumber (Device V1.0)

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1709   Table 194 defines the test conditions for this test case.

1710   **Table 194 – Master start-up with wrong SerialNumber (V1.0)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0195
Name	TCM_DLST_CHCK_SNWRONG
Purpose (short)	Check Master start-up behaviour with wrong SerialNumber (Device V1.0)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.2.1; [9] 9.2.3.2, 9.2.3.4, 9.3.3, Figure 78
Configuration / setup	Master-Tester ("Device"); Event propagation to the upper level system defined for example by a correponding "upper level integration system" such as [17].
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Check Master start-up behaviour with wrong SerialNumber (Device V1.0). After the transition to the OPERATE mode (MasterCommand 0x99) the Master detects a wrong or not matching SerialNumber. The Master shall indicate a corresponding Event to the upper level system.
Precondition	a) Master is in STARTUP mode. b) Master is configured to VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2. c) Master is configured to SerialNumber "0123456789FEDCBA" (selected randomly). d) Master-Tester is in STARTUP mode. e) Master-Tester has the VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (DID is selected randomly)

1711

TEST CASE	CONDITIONS / PERFORMANCE
	f) Master-Tester has the SerialNumber "0123456789ABCDEF" (selected randomly)
	g) Protocol revision of the "Device" is V1.0 (0x10).
	h) Revision test successfully completed.
	i) Transition to OPERATE mode was successful.
Procedure	The Master establishes communication with the "Device" (Master-Tester), detects a deviating SerialNumber in OPERATE mode, indicates a corresponding Event to the upper level system, and stops communicating with the "Device".
Input parameter	Master: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2; SerialNumber: 0123456789FEDCBA
	Master-Tester: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2; SerialNumber: e.g. 0123456789ABCDEF (Master tester is free to choose any number); RevisionID: 0x10
Post condition	-

1712

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Write MasterCommand 0x99 (turn "Device" into OPERATE mode)
	b) Read SerialNumber
	c) Master indicates Event to upper level sytem
	The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	If the Master indicates a system-specific Event to the upper level system and stops communicating with the "Device".
Test failed (examples)	If the Master sends the MasterCommand 0x99 again or does not indicate a system-specific Event to the upper level system.
Results	Master writes MasterCommand 0x99: <yes/no> <pass/fail>
	Master reads SerialNumber: <value> <pass/fail>
	Master indicates Event: <EventCode> <pass/fail>

1713

1714   ### 8.5.13   Master start-up with correct SerialNumber (Device V1.0)

1715   Table 195 defines the test conditions for this test case.

1716   **Table 195 – Master start-up with correct SerialNumber (V1.0)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0196
Name	TCM_DLST_CHCK_SNRIGHT
Purpose (short)	Check Master start-up behaviour with correct SerialNumber (Device V1.0)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.2.1; [9] 9.2.3.2, 9.2.3.4, 9.3.3, Figure 72
Configuration / setup	Master-Tester ("Device")

1717

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Master start-up behaviour with correct SerialNumber (Device V1.0). After the transition to the OPERATE mode (MasterCommand 0x99) the Master detects a matching SerialNumber. The Master shall write the MasterCycleTime and the MasterCommand 0x99 again.
Precondition	a) Master is in STARTUP mode.
	b) Master is configured to VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2.
	c) Master is configured to SerialNumber "0123456789ABCDEF".
	d) Master-Tester is in STARTUP mode.
	e) Master-Tester has the VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (DID is selected randomly)
	f) Master-Tester has the SerialNumber "0123456789ABCDEF" (selected randomly)
	g) Protocol revision of the "Device" is V1.0 (0x10).
	h) Revision test successfully completed.

TEST CASE	CONDITIONS / PERFORMANCE
	i) Transition to OPERATE mode was successful.
Procedure	The Master establishes communication with the "Device" (Master-Tester), detects a matching SerialNumber in OPERATE mode. The Master writes the MasterCycleTime and the MasterCommand 0x99 again.
Input parameter	Master: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2; SerialNumber: 0123456789 ABCDEF Master-Tester: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2; SerialNumber: e.g. 0123456789ABCDEF (Master tester is free to choose any number); RevisionID: 0x10
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Master writes MasterCommand 0x99 (turn "Device" into OPERATE mode) b) Read SerialNumber c) Master writes MasterCycleTime (address 0x01 in Direct Parameter page 1) d) Master writes MasterCommand 0x99
Test passed	If the Master after writing the first MasterCommand 0x99 reads the SerialNumber and then writes the MasterCycleTime and the MasterCommand 0x99 again.
Test failed (examples)	If the Master does not read the SerialNumber, or does not write the MasterCycleTime again, or does not send the MasterCommand 0x99 again.
Results	Master writes MasterCommand 0x99: <yes/no> <pass/fail> Master reads SerialNumber: <value> <pass/fail> Master writes MasterCycleTime: <yes/no> <pass/fail> Master writes MasterCommand 0x99: <yes/no> <pass/fail>

The row label **1718** appears to the left of this table.

1719

8.6   PREOPERATE

8.6.1   Master PREOPERATE with correct SerialNumber

Table 196 defines the test conditions for this test case.

Table 196 – Master PREOPERATE with correct SerialNumber

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0198
Name	TCM_DLOD_PREP_SNCORRECT
Purpose (short)	Check Master PREOPERATE behaviour with correct SerialNumber
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.4
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Check Master PREOPERATE behaviour with correct SerialNumber. The Master writes the command 0x9A and turns into the PREOPERATE mode. The Master then reads the SerialNumber of the "Device". If it matches the configured SerialNumber the Master can start the Data Storage mechanism.
Precondition	a) Master is in STARTUP mode. b) Master is configured to VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2. c) Master is configured to SerialNumber 0x02, 0x66, 0x64, 0xAF, 0xBD (selected randomly) d) Master-Tester is in STARTUP mode. e) Master-Tester has VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (selected randomly) f) Master-Tester has SerialNumber 0x02, 0x66, 0x64, 0xAF, 0xBD (selected randomly). g) Protocol revision of the "Device" is V1.1 (0x11). h) Revision test successfully completed.

The row label **1724** appears to the left of this table.

TEST CASE	CONDITIONS / PERFORMANCE
Procedure	The Master establishes communication with the "Device" (Master-Tester) and detects a matching SerialNumber in PREOPERATE mode.
Input parameter	Master: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2; SerialNumber: 0x02, 0x66, 0x64, 0xAF, 0xBD Master-Tester: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2; SerialNumber: 0x02, 0x66, 0x64, 0xAF, 0xBD; RevisionID: 0x11
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Master writes MasterCommand 0x9A (turn "Device" into PREOPERATE mode) b) Read SerialNumber
Test passed	If the Master reads the SerialNumber after the first MasterCommand 0x9A.
Test failed (examples)	If the Master does not write the MasterCommand 0x9A or does not read the SerialNumber.
Results	Master writes MasterCommand 0x9A: <yes/no> <pass/fail> Master reads SerialNumber: <value> <pass/fail>

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1727   8.6.2   Master PREOPERATE without configured SerialNumber

1728   Table 197 defines the test conditions for this test case.

1729   **Table 197 – Master PREOPERATE without configured SerialNumber**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0199 (PreOperate_2)
Name	TCM_DLOD_PREP_SNNONCONFIG
Purpose (short)	Check Master PREOPERATE behaviour without configured SerialNumber
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.4
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Check Master PREOPERATE behaviour without configured SerialNumber. The Master writes the MasterCommand 0x9A and turns into PREOPERATE mode. The Master then reads the SerialNumber of the "Device". The following comparison has no effect. The Master can start the Data Storage mechanism.
Precondition	a) Master is in STARTUP mode. b) Master is configured to VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2. c) Master is configured to no SerialNumber d) Master-Tester is in STARTUP mode. e) Master-Tester has VendorID 0x02, 0xA4 and DeviceID 0x00, 0x2B, 0xD2 (selected randomly). f) Protocol revision of the "Device" is V1.1 (0x11). g) Revision test successfully completed.
Procedure	The Master establishes communication with the "Device" (Master-Tester) and turns the "Device" into the PREOPERATE mode.
Input parameter	Master: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2; SerialNumber: none Master-Tester: VendorID: 0x02, 0xA4; DeviceID 0x00, 0x2B, 0xD2; RevisionID: 0x11
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Master writes MasterCommand 0x9A (turn "Device" into PREOPERATE mode).
Test passed	If the Master writes the MasterCommand 0x9A.
Test failed (examples)	If the Master does not write the MasterCommand 0x9A.

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TEST CASE RESULTS	CHECK / REACTION
Results	Master writes MasterCommand 0x9A: <yes/no> <pass/fail>

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8.6.3   Master PREOPERATE Write with configured S/N and Upload

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Table 198 defines the test conditions for this optional test case, which is also covered by TC_0202 through TC_0209.

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Table 198 – Master PREOPERATE Write with configured S/N and Upload

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0200
Name	TCM_DLOD_PREP_SNCONFIGWRITEUPLOAD
Purpose (short)	Check Master PREOPERATE behaviour with configured SerialNumber and Upload
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.2, 9.2.3.4, 9.3.3, 11.2.2.6, 11.3.3
Configuration / setup	Master-Tester ("Device"), Line-Monitor (optionally)

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Master PREOPERATE behaviour with configured SerialNumber and Upload. The Master writes the MasterCommand 0x9A and turns into the PREOPERATE mode. The Master then reads the SerialNumber out of the "Device". If it matches the configured Serial-Number the Master can start the Data Storage upload mechanism. After successful completition of the Data Storage upload, the Master application writes a defined string of 32 octets into Index 24 ("ApplicationSpecificTag"). The Master then writes the MasterCycleTime into address 0x01 (Direct Parameter page 1) and the MasterCommand 0x99.
Precondition	a) Data Storage upload / download to be activated in the Master. b) Successful write of the MasterCommand 0x9A and completed Data Storage.
Procedure	a) The Master or the layer above (upper level system / gateway) writes the following contents into Index 24 via a Write request: "Check application specific tag!!" b) The Master then writes the MasterCycleTime again and turns into the OPERATE mode with MasterCommand 0x99.
Input parameter	Text string: "Check application specific tag!!" (32 octets)
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Writing into Index 24 can be traced with the help of a Line-Monitor. b) Index 24 holds the following content: "Check application specific tag!!" c) Master writes MasterCommand 0x99. d) Master and "Device" in OPERATE mode.
Test passed	a) If Index 24 of the Master-Tester ("Device") holds: "Check application specific tag!!" b) Master wrote MasterCommand 0x99.
Test failed (examples)	a) If content of Index 24 of the Master-Tester deviates from: "Check application specific tag!!" b) Master did not write MasterCommand 0x99.
Results	Index 24 holds defined text string: <yes/no> <pass/fail> Master writes MasterCommand 0x99: <yes/no> <pass/fail>

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8.6.4   Master PREOPERATE Read with configured S/N and Upload

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Table 199 defines the test conditions for this optional test case, which is also covered by TC_0202 through TC_0209.

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Table 199 – Master PREOPERATE Read with configured S/N and Upload

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0201
Name	TCM_DLOD_PREP_SNCONFIGREADUPLOAD
Purpose (short)	Check Master PREOPERATE Write behaviour with configured S/N and Upload
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 9.2.3.2, 9.2.3.4, 9.3.3, 11.2.2.6, 11.3.3
Configuration / setup	Master-Tester

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Check Master PREOPERATE behaviour with configured SerialNumber (S/N) and Upload. The Master writes the MasterCommand 0x9A and turns into the PREOPERATE mode. The Master then reads the SerialNumber out of the "Device". If it matches the configured SerialNumber the Master can start the Data Storage upload mechanism. After successful completition of the Data Storage upload, the Master application reads a defined string of 32 octets out of Index 24 ("ApplicationSpecific-Tag"). The Master then writes the MasterCycleTime into address 0x01 (Direct Parameter page 1) and the MasterCommand 0x99.
Precondition	a) Successful write of the MasterCommand 0x9A and completed Data Storage. b) Establish communication and wait until OD request data communication is available
Procedure	a) The Master or the layer above (upper level system / gateway) reads the following contents out of Index 24 via a Read request: "Check application specific tag!!" b) The Master then writes the MasterCycleTime again and turns into the OPERATE mode with MasterCommand 0x99.
Input parameter	Text string: "Check application specific tag!!" (32 octets)
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Reading out of Index 24 can be traced with the help of a Line-Monitor. b) Upper level system shows the following content: "Check application specific tag!!" c) Master writes MasterCommand 0x99. d) Master and "Device" in OPERATE mode.
Test passed	a) If upper level system shows: "Check application specific tag!!" b) Master wrote MasterCommand 0x99.
Test failed (examples)	a) If upper level system does not show: "Check application specific tag!!" b) Master did not write MasterCommand 0x99.
Results	Upper level system shows defined text string: <yes/no> <pass/fail> Master writes MasterCommand 0x99: <yes/no> <pass/fail>

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1747 **8.6.5 Master PREOPERATE uses TYPE_0 to read Index 24 (1OD)**

1748 Table 200 defines the test conditions for this test case.

1749 **Table 200 – Master PREOPERATE uses TYPE_0 to read Index 24 (1OD)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0202
Name	TCM_DLOD_PREP_TYPE0READOD1
Purpose (short)	Master to use TYPE_0 to read Index 24 in PREOPERATE mode (1OD)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Specification (clause)	[9] A.2.2, A.5.2, Table A.13, B.2.1
Configuration / setup	Master-Tester, Line-Monitor (optionally)
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master to use TYPE_0 to read Index 24 in PREOPERATE mode (1OD). The Master reads from address 0x03 of the Direct Parameter page 1 the information which PREOPERATE F-sequence type can be used.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) The Index 24 contains the string 'TestFrameTypeXOD'. c) Data Storage is activated and DS_UPLOAD_REQ_FLAG is active. d) DS_IndexList contains Index 24 only. e) Master Data Storage is enabled. f) Master is in SIO mode.
Procedure	Master is switched to communication and performs Data Storage during PREOPERATE phase.
Input parameter	Another Index than Index 24 and content can be selected by the Master tester.
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Master shall use the correct F-sequence type (TYPE_X), test via line monitor.
Test passed	If the correct F-sequence type is used (TYPE_X).
Test failed (examples)	Usage of other F-sequence types than TYPE_X.
Results	Used F-sequence type: <type> <pass/fail> Value read from Index 24: <value> <pass/fail>

8.6.6   Master PREOPERATE uses TYPE_1_2 to read Index 24 (2OD)

Table 201 defines the test conditions for this test case.

Table 201 – Master PREOPERATE uses TYPE_1_2 to read Index 24 (2OD)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0203
Name	TCM_DLOD_PREP_TYPE12READOD2
Purpose (short)	Master to use TYPE_1_2 to read Index 24 in PREOPERATE mode (2OD)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.5.2, Table A.13, B.2.1, B.2.3
Configuration / setup	Master-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master to use TYPE_1_2 to read Index 24 in PREOPERATE mode. The Master reads from address 0x03 of the Direct Parameter page 1 the information which PREOPERATE F-sequence type can be used.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) The Index 24 contains the string 'TestFrameTypeXOD'. c) Data Storage is activated and DS_UPLOAD_REQ_FLAG is active. d) DS_IndexList contains Index 24 only. e) Master Data Storage is enabled. f) Master is in SIO mode.
Procedure	Master is switched to communication and performs Data Storage during PREOPERATE phase.
Input parameter	Another Index than Index 24 and content can be selected by the Master tester.

TEST CASE	CONDITIONS / PERFORMANCE
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Master shall use the correct F-sequence type (TYPE_X), test via line monitor.
Test passed	If the correct F-sequence type is used (TYPE_X).
Test failed (examples)	Usage of other F-sequence types than TYPE_X.
Results	Used F-sequence type: <type> <pass/fail> Values read from Index 24: <values> <pass/fail>

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8.6.7 Master PREOPERATE uses TYPE_1_V to read Index 24 (8 OD)

Table 202 defines the test conditions for this test case.

Table 202 – Master PREOPERATE uses TYPE_1_V to read Index 24 (8 OD)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0204
Name	TCM_DLOD_PREP_TYPE1VREADOD8
Purpose (short)	Master to use TYPE_1_V to read Index 24 in PREOPERATE mode (8OD)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.5.2, Table A.13, B.2.1, B.2.3
Configuration / setup	Master-Tester, Line-Monitor (optionally)

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master to use TYPE_1_V to read Index 24 in PREOPERATE mode (8OD). The Master reads from address 0x03 of the Direct Parameter page 1 the information which PREOPERATE F-sequence type can be used.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) The Index 24 contains the string 'TestFrameTypeXOD'. c) Data Storage is activated and DS_UPLOAD_REQ_FLAG is active. d) DS_IndexList contains Index 24 only. e) Master Data Storage is enabled. f) Master is in SIO mode.
Procedure	Master is switched to communication and performs Data Storage during PREOPERATE phase.
Input parameter	Another Index than Index 24 and content can be selected by the Master tester.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Master shall use the correct F-sequence type (TYPE_X), test via line monitor.
Test passed	If the correct F-sequence type is used (TYPE_X).
Test failed (examples)	Usage of other F-sequence types than TYPE_X.
Results	Used F-sequence type: <type> <pass/fail> Values read from Index 24: <values> <pass/fail>

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8.6.8 Master PREOPERATE uses TYPE_1_V to read Index 24 (32 OD)

Table 203 defines the test conditions for this test case.

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Table 203 – Master PREOPERATE uses TYPE_1_V to read Index 24 (32 OD)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0205
Name	TCM_DLOD_PREP_TYPE1VREADOD32
Purpose (short)	Master to use TYPE_1_V to read Index 24 in PREOPERATE mode (32 OD)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.5.2, Table A.13, B.2.1
Configuration / setup	Master-Tester, Line-Monitor (optionally)
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master to use TYPE_1_V to read Index 24 in PREOPERATE mode (32 OD). The Master reads from address 0x03 of the Direct Parameter page 1 the information which PREOPERATE F-sequence type can be used.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) The Index 24 contains the string 'TestFrameTypeXOD'. c) Data Storage is activated and DS_UPLOAD_REQ_FLAG is active. d) DS_IndexList contains Index 24 only. e) Master Data Storage is enabled. f) Master is in SIO mode.
Procedure	Master is switched to communication and performs Data Storage during PREOPERATE phase.
Input parameter	Another Index than Index 24 and content can be selected by the Master tester.
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Master shall use the correct F-sequence type (TYPE_X), test via line monitor.
Test passed	If the correct F-sequence type is used (TYPE_X).
Test failed (examples)	Usage of other F-sequence types than TYPE_X.
Results	Used F-sequence type: <type> <pass/fail> Text string read from Index 24: <text string> <pass/fail>

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1771 **8.6.9   Master PREOPERATE uses TYPE_0 to write Index 24 (1 OD)**

1772   Table 204 defines the test conditions for this test case.

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Table 204 – Master PREOPERATE uses TYPE_0 to write Index 24 (1 OD)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0206
Name	TCM_DLOD_PREP_TYPE0WRITEOD1
Purpose (short)	Master to use TYPE_0 to write to Index 24 in PREOPERATE mode (1 OD)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.5.2, Table A.13, B.2.1, B.2.3
Configuration / setup	Master-Tester
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master to use TYPE_0 to write to Index 24 in PREOPERATE mode (1 OD). The Master reads from address 0x03 of the Direct Parameter page 1 the information which

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TEST CASE	CONDITIONS / PERFORMANCE
	PREOPERATE F-sequence type can be used.
Precondition	a) A parameter set is already stored within the Master b) The Index 24 contains the string 'TestFrameTypeXOD'. c) Data Storage is activated and DS_UPLOAD_REQ_FLAG is active. d) DS_IndexList contains Index 24 only. e) Master Data Storage is enabled. f) Master is in SIO mode.
Procedure	Master is switched to communication and performs Data Storage during PREOPERATE phase.
Input parameter	Another Index than Index 24 and content can be selected by the Master tester.
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Master shall use the correct F-sequence type (TYPE_X), test via line monitor.
Test passed	If the correct F-sequence type is used (TYPE_X).
Test failed (examples)	Usage of other F-sequence types than TYPE_X.
Results	Used F-sequence type: <type> <pass/fail> Value in Index 24: <value> <pass/fail>

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8.6.10 Master PREOPERATE uses TYPE_1_2 to write Index 24 (2 OD)

1777

1778 Table 205 defines the test conditions for this test case.

1779 **Table 205 – Master PREOPERATE uses TYPE_1_2 to write Index 24 (2 OD)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0207
Name	TCM_DLOD_PREP_TYPE12WRITEOD2
Purpose (short)	Master to use TYPE_1_2 to write to Index 24 in PREOPERATE mode (2 OD)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.5.2, Table A.13, B.2.1, B.2.3
Configuration / setup	Test-Master, Line-Monitor (optionally)
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master to use TYPE_1_2 to write to Index 24 in PREOPERATE mode (2 OD). The Master reads from address 0x03 of the Direct Parameter page 1 the information which PREOPERATE F-sequence type can be used.
Precondition	a) A parameter set is already stored within the Master b) The Index 24 contains the string 'TestFrameTypeXOD'. c) Data Storage is activated and DS_UPLOAD_REQ_FLAG is active. d) DS_IndexList contains Index 24 only. e) Master Data Storage is enabled. f) Master is in SIO mode.
Procedure	Master is switched to communication and performs Data Storage during PREOPERATE phase.
Input parameter	Another Index than Index 24 and content can be selected by the Master tester.
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Master shall use the correct F-sequence type (TYPE_X), test via line monitor.
Test passed	If the correct F-sequence type is used (TYPE_X).
Test failed (examples)	Usage of other F-sequence types than TYPE_X.

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TEST CASE RESULTS	CHECK / REACTION	
Results	Used F-sequence type: \<type\>	\<pass/fail\>
	Values in Index 24: \<values\>	\<pass/fail\>

1782

8.6.11 Master PREOPERATE uses TYPE_1_V to write Index 24 (8 OD)

1783

1784   Table 206 defines the test conditions for this test case.

1785   **Table 206 – Master PREOPERATE uses TYPE_1_V to write Index 24 (8 OD)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE	
Identification (ID)	SDCI_TC_0208	
Name	TCM_DLOD_PREP_TYPE1VWRITEOD8	
Purpose (short)	Master to use TYPE_1_V to write to Index 24 in PREOPERATE mode (8 OD)	
Equipment under test (EUT)	Master	
Test case version	1.0	
Category / type	Master protocol test, test to pass (positive testing)	
Specification (clause)	[9] A.5.2, Table A.13, B.2.1, B.2.3	
Configuration / setup	Master-Tester, Line-Monitor (optionally)	
TEST CASE	**CONDITIONS / PERFORMANCE**	
Purpose (detailed)	Master to use TYPE_1_V to write to Index 24 in PREOPERATE mode (8 OD). The Master reads from address 0x03 of the Direct Parameter page 1 the information which PREOPERATE F-sequence type can be used.	
Precondition	a) A parameter set is already stored within the Master b) The Index 24 contains the string 'TestFrameTypeXOD'. c) Data Storage is activated and DS_UPLOAD_REQ_FLAG is active. d) DS_IndexList contains Index 24 only. e) Master Data Storage is enabled. f) Master is in SIO mode.	
Procedure	Master is switched to communication and performs Data Storage during PREOPER-ATE phase.	
Input parameter	Another Index than Index 24 and content can be selected by the Master tester.	
Post condition	-	
TEST CASE RESULTS	**CHECK / REACTION**	
Evaluation	Master shall use the correct F-sequence type (TYPE_X), test via line monitor.	
Test passed	If the correct F-sequence type is used (TYPE_X).	
Test failed (examples)	Usage of other F-sequence types than TYPE_X.	
Results	Used F-sequence type: \<type\>	\<pass/fail\>
	Values in Index 24: \<values\>	\<pass/fail\>

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8.6.12 Master PREOPERATE uses TYPE_1_V to write Index 24 (32 OD)

1789

1790   Table 207 defines the test conditions for this test case.

1791   **Table 207 – Master PREOPERATE TYPE_1_V to write Index 24 (32 OD)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0209
Name	TCM_DLOD_PREP_TYPE1VWRITEOD32
Purpose (short)	Master to use TYPE_1_V to write to Index 24 in PREOPERATE mode (32 OD)
Equipment under test (EUT)	Master

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.5.2, Table A.13, B.2.1, B.2.3
Configuration / setup	Master-Tester, Line-Monitor (optionally)
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master to use TYPE_1_V to write to Index 24 in PREOPERATE mode (32 OD). The Master reads from address 0x03 of the Direct Parameter page 1 the information which PREOPERATE F-sequence type can be used.
Precondition	a) A parameter set is already stored within the Master b) The Index 24 contains the string 'TestFrameTypeXOD'. c) Data Storage is activated and DS_UPLOAD_REQ_FLAG is active. d) DS_IndexList contains Index 24 only. e) Master Data Storage is enabled. f) Master is in SIO mode.
Procedure	Master is switched to communication and performs Data Storage during PREOPERATE phase.
Input parameter	Another Index than Index 24 and content can be selected by the Master tester.
Post condition	-

1793

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Master shall use the correct F-sequence type (TYPE_X), test via line monitor.
Test passed	If the correct F-sequence type is used (TYPE_X).
Test failed (examples)	Usage of other F-sequence types than TYPE_X.
Results	Used F-sequence type: <type> <pass/fail> Values in Index 24: <values> <pass/fail>

1794

1795 **8.7   OPERATE**

1796 **8.7.1   Master OPERATE uses TYPE_0 to read Index 24 (1 OD)**

1797 Table 208 defines the test conditions for this test case.

1798 **Table 208 – Master OPERATE uses TYPE_0 to read Index 24 (1 OD)**

1799

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0210
Name	TCM_DLOD_OPER_TYPE0READOD1
Purpose (short)	Master to use TYPE_0 to read Index 24 in OPERATE mode (1 OD)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.5.2, Table A.13, B.2.1, B.2.3
Configuration / setup	Master-Tester, Line-Monitor (optionally)
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master to use TYPE_0 to read Index 24 in OPERATE mode (1 OD). The Master reads from address 0x03 of the Direct Parameter page 1 the information which OPERATE F-sequence type can be used.
Precondition	a) The parameter F-sequenceCapability contains the value "0" for the OPERATE mode. b) The On-request Data are fixed to 1 octet for reading from Index 24, which contains the value 0xBF. c) Master in STARTUP mode.

TEST CASE	CONDITIONS / PERFORMANCE
Procedure	Master is in STARTUP mode and reads the communication parameters in the Direct Parameter page 1. The address 0x03 provides information on the OPERATE F-sequence type. Master reads the Index 24 of the Master-Tester ("Device").
Input parameter	-
Post condition	-

1800

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Master shall be able to read the correct content (0xBF) out of Index 24 in the Master-Tester ("Device"). b) The F-sequence type can be traced via a Line-Monitor or determined via the Checksum/F-sequence type (CKT) octet in the Master message.
Test passed	a) If the correct F-sequence type is used (TYPE_0). b) The value "0xBF" is read from Index 24 of the Master-Tester ("Device").
Test failed (examples)	a) From Index 24 a value deviating from "0xBF" is read or b) The Master triggers a restart.
Results	Used F-sequence type: <type> <pass/fail> Value read from Index 24: <value> <pass/fail>

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1802   8.7.2   Master OPERATE uses TYPE_0 to write Index 24 (1 OD)

1803   Table 209 defines the test conditions for this test case.

1804   **Table 209 – Master OPERATE TYPE_0 to write Index 24 (1 OD)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0211
Name	TCM_DLOD_OPER_TYPE0WRITEOD1
Purpose (short)	Master to use TYPE_0 to write to Index 24 in OPERATE mode (1 OD)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.5.2, Table A.13, B.2.1, B.2.3
Configuration / setup	Master-Tester, Line-Monitor (optionally)

1805

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master to use TYPE_0 to write to Index 24 in OPERATE mode (1 OD). The Master reads from address 0x03 of the Direct Parameter page 1 the information which OPERATE F-sequence type can be used.
Precondition	a) The parameter F-sequenceCapability contains the value "0" for the OPERATE mode. b) The On-request Data are fixed to 1 octet for writing to Index 24. c) Master in STARTUP mode.
Procedure	Master is in STARTUP mode and reads the communication parameters in the Direct Parameter page 1. The address 0x03 provides information on the OPERATE F-sequence type. Master writes the text string "0xBF" into the Index 24 of the Master-Tester ("Device").
Input parameter	"0xBF" for Index 24
Post condition	-

1806

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Master-Tester ("Device") contains "0xBF" in Index 24. b) The F-sequence type can be traced via a Line-Monitor or determined via the Checksum/F-sequence type (CKT) octet in the Master message.
Test passed	a) If the correct F-sequence type is used (TYPE_0). b) Master-Tester ("Device") contains "0xBF" in Index 24.

TEST CASE RESULTS	CHECK / REACTION
Test failed (examples)	a) Master-Tester ("Device") contains a different value than "0xBF" in Index 24 or b) The Master triggers a restart.
Results	Used F-sequence type: \<type\> \<pass/fail\> Value in Index 24: \<values\> \<pass/fail\>

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1808   ### 8.7.3   Master OPERATE uses TYPE_1_2 to write Index 24 (2 OD)

1809   Table 210 defines the test conditions for this test case.

1810   **Table 210 – Master OPERATE uses TYPE_1_2 to write Index 24 (2 OD)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0212
Name	TCM_DLOD_OPER_TYPE12WRITEOD2
Purpose (short)	Master to use TYPE_1_2 to write to Index 24 in OPERATE mode (2 OD)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] A.5.2, Table A.13, B.2.1, B.2.3
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master to use TYPE_1_2 to write to Index 24 in OPERATE mode (2 OD). The Master reads from address 0x03 of the Direct Parameter page 1 the information which OPERATE F-sequence type can be used.
Precondition	a) The parameter F-sequenceCapability contains the value "1" for the OPERATE mode. b) The On-request Data are fixed to 2 octets for writing to Index 24. c) Master in STARTUP mode.
Procedure	Master is in STARTUP mode and reads the communication parameters in the Direct Parameter page 1. The address 0x03 provides information on the OPERATE F-sequence type. Master writes the values "0xAA, 0xBF" into the Index 24 of the Master-Tester ("Device").
Input parameter	"0xAA, 0xBF" for Index 24
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Master-Tester ("Device") contains "0xAA, 0xBF" in Index 24. b) The F-sequence type can be traced via a Line-Monitor or determined via the Checksum/F-sequence type (CKT) octet in the Master message.
Test passed	a) If the correct F-sequence type is used (TYPE_1_2). b) Master-Tester ("Device") contains "0xAA, 0xBF" in Index 24.
Test failed (examples)	a) Master uses an F-sequence type different from TYPE_1_2 or b) Master-Tester ("Device") contains different values than "0xAA, 0xBF" in Index 24 or c) The Master triggers a restart.
Results	Used F-sequence type: \<type\> \<pass/fail\> Values in Index 24: \<values\> \<pass/fail\>

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1814   ### 8.8   Fallback

1815   ### 8.8.1   Fallback from PREOPERATE

1816   Table 211 defines the test conditions for this test case.

1817   **Table 211 – Fallback from PREOPERATE**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0213
Name	TCM_DLFB_PROP_OK
Purpose (short)	Test of Master Fallback from PREOPERATE mode
Equipment under test (EUT)	Master and Legacy-Master (see B.13)
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.2.3, 7.3.2.4, Figure 32, Table B.2
Configuration / setup	Master-Tester, Line-Monitor (optionally)

1818

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of Master Fallback from PREOPERATE mode. The Master is in PREOPERATE communication when it sends the MasterCommand 0x5A (Fallback). Upon receipt of the valid response the Master switches its port to SIO mode "DI".
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) The Master is communicating with the Device while in PREOPERATE mode. If the Master does not support the Fallback through a command from the upper level system such as a fieldbus, the Master-Tester shall generate a warning for the person in charge of the test. See B.13.
Procedure	a) Master sends the MasterCommand 0x5A (Fallback). b) Upon receipt of a valid response message the Master port is switched to SIO mode "DI". c) The Master-Tester sets signal to logical "1" (high-level)
Input parameter	-
Post condition	-

1819

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Upon receipt of a valid response message the Master stops its communication at the port (visible on Line-Monitor). b) After a maximum of 500 ms the digital input signal is visible at the target system (Master-Tester) of the Master (logical 1).
Test passed	a) If the Master stops its communication upon receipt of a valid response message and b) If the logical 1 signal is shown correctly on the target system (Master-Tester) within 500 ms after receipt of the valid response message.
Test failed (examples)	a) If the Master does not stop communication upon receipt of a valid response message or b) If the Master stops communication upon receipt of the valid response message and the logical 1 does not appear on the target system (Master_Tester) after 500 ms.
Results	Master stops communication: <yes/no> <pass/fail> DI signal shows logical 1: <yes/no> <pass/fail>

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1821   **8.8.2   Fallback request from PREOPERATE fails**

1822   Table 212 defines the test conditions for this test case.

1823   **Table 212 – Fallback request from PREOPERATE fails**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0214
Name	TCM_DLFB_PROP_FAILS
Purpose (short)	Test of Master when Fallback request from PREOPERATE fails
Equipment under test (EUT)	Master and Legacy-Master (see B.13)
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.2.3, 7.3.2.4, Figure 32, Table B.2

1824

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Configuration / setup	Master-Tester, Line-Monitor (optionally)
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test of Master when Fallback request from PREOPERATE fails. The Master is in PREOPERATE communication and sends the MasterCommand 0x5A (Fallback). Upon receipt of an invalid response the Master shall repeat the Fallback request (Master stays in communication mode). The Master shall start another MasterCommand after the reception of a second invalid response. Upon receipt of the valid response the Master iniates a port restart.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) The Master is communicating with the "Device" while in PREOPERATE mode. If the Master does not support the Fallback through a command from the upper level system such as a fieldbus, the Master-Tester shall generate a warning for the person in charge of the test. See B.13.
Procedure	a) Master sends the MasterCommand 0x5A (Fallback). b) Upon receipt of a first invalid response message the Master repeats the Master Command 0x5A and stays in communication mode c) Upon receipt of a second invalid response message the Master repeats the MasterCommand 0x5A a second time and stays in communication mode d) Upon receipt of a third valid response message the Master initiates a restart for the port.
Input parameter	-
Post condition	-

1825

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The Line-Monitor follows the communication on the signal line of the Master-Tester. In total, three Master Fallback requests are to be traced.
Test passed	If the Master sends three MasterCommands 0x5A (Fallback). See B.13.
Test failed (examples)	a) If the Master does not send two repetitions or b) If the Master stops communication upon receipt of the valid response message.
Results	Master sends three MasterCommands 0x5A (Fallback): <yes/no> <pass/fail>

1826

1827 ## 8.8.3 Fallback from OPERATE

1828 Table 213 defines the test conditions for this test case.

1829 **Table 213 – Fallback from OPERATE**

1830

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0215
Name	TCM_DLFB_OPER_OK
Purpose (short)	Test of Master Fallback from OPERATE mode
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.2.3, 7.3.2.4, Figure 32, Table B.2
Configuration / setup	Master-Tester, Line-Monitor (optionally)
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Test of Master Fallback from OPERATE mode. The Master is in OPERATE communication when it sends the MasterCommand 0x5A (Fallback). Upon receipt of the valid response the Master switches its port to SIO mode "DI".
Precondition	The Master is communicating with the "Device" while in OPERATE mode.
Procedure	a) Master sends the MasterCommand 0x5A (Fallback). b) Upon receipt of a valid response message the Master port is switched to SIO mode "DI". c) The Master-Tester sets signal to logical "1" (high-level)

TEST CASE	CONDITIONS / PERFORMANCE
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Upon receipt of a valid response message the Master stops its communcation at the port (visible on Line-Monitor). b) After a maximum of 500 ms the digital input signal is visible at the target system (Master-Tester) of the Master (logical 1).
Test passed	a) If the Master stops its communication upon receipt of a valid response message and b) If the logical 1 signal is shown correctly on the target system (Master-Tester) within 500 ms after receipt of the valid response message.
Test failed (examples)	a) If the Master does not stop communication upon receipt of a valid response message or b) If the Master stops communication upon receipt of the valid response message and the logical 1 does not appear on the target system (Master_Tester) after 500 ms.
Results	Master stops communication: <yes/no> <pass/fail> DI signal shows logical 1: <yes/no> <pass/fail>

8.8.4   Fallback request from OPERATE fails

Table 214 defines the test conditions for this test case.

Table 214 – Fallback request from OPERATE fails

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0216
Name	TCM_DLFB_OPER_FAILS
Purpose (short)	Test of Master when Fallback request from STARTUP fails
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.2.3, 7.3.2.4, Figure 32, Table B.2
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of Master when Fallback request from STARTUP fails. The Master is in OPERATE communication and sends the MasterCommand 0x5A (Fallback). Upon receipt of an invalid response the Master shall repeat the Fallback request (Master stays in communication mode). The Master shall start another MasterCommand after the reception of a second invalid response. Upon receipt of the invalid response the Master iniates a port restart.
Precondition	The Master is communicating with the "Device" while in OPERATE mode.
Procedure	a) Master sends the MasterCommand 0x5A (Fallback). b) Upon receipt of a first invalid response message the Master repeats the Master Command 0x5A and stays in communication mode c) Upon receipt of a second invalid response message the Master repeats the MasterCommand 0x5A a second time and stays in communication mode d) Upon receipt of a third invalid response message the Master initiates a restart for the port.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The Line-Monitor follows the communication on the signal line of the Master-Tester. In total, three Master Fallback requests are to be traced.
Test passed	If the Master sends three MasterCommands 0x5A (Fallback).

TEST CASE RESULTS	CHECK / REACTION
Test failed (examples)	a) If the Master does not send two repetitions or b) If the Master stops communication upon receipt of the valid response message.
Results	Master sends three MasterCommands 0x5A (Fallback): <yes/no> <pass/fail>

1838

8.9 Retry

8.9.1 Master retries after responses with wrong Checksum

1841   Table 215 defines the test conditions for this test case.

1842   **Table 215 – Master retries after responses with wrong Checksum**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0217
Name	TCM_DLCC_RTRY_CHCKSUMWRONG
Purpose (short)	Test of Master retry behavior after response with wrong Checksum
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to fail (positive testing)
Specification (clause)	[9] 7.3.3.4, Figure 37, Table 38
Configuration / setup	Master-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of Master retry behavior after responses with wrong Checksum. Master is in communication. The Master sends a message which is responded with the wrong checksum. The Master resends the message, again the checksum of the response is incorrect or there is no response to the message. The Master repeats the message one more time and receives a valid response from the "Device". The test shall be carried out for the STARTUP, PREOPERATE and OPERATE mode.
Precondition	Master is in communication in the STARTUP, PREOPERATE, or OPERATE mode. Legacy-Master in the STARTUP and OPERATE mode only.
Procedure	a) The Master sends a random message. b) The Master-Tester ("Device") sends response with a wrong checksum. c) The Master resends the same random message. d) The Master-Tester ("Device") responds again with the wrong checksum. e) The Master sends the same message for a third time. f) The Master-Tester ("Device") replies with the correct checksum. g) The test is carried out in STARTUP, PREOPERATE and OPERATE mode.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The Line-Monitor follows the communication on the signal line of the Master-Tester. In total, three Master messages are to be traced.
Test passed	If the Master sends three Master messages with the same contents.
Test failed (examples)	a) If the Master does not send two repetitions or b) If the Master stops the communication.
Results	STARTUP: Number of identical Master messages: <number> <pass/fail> PREOPERATE: Number of identical Master messages: <number> <pass/fail> OPERATE: Number of identical Master messages: <number> <pass/fail>

1845

8.9.2 Master retries after responses with wrong Checksum and restart

1847   Table 216 defines the test conditions for this test case.

1848   **Table 216 – Master retries after responses with wrong Checksum and restart**

1849

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0218
Name	TCM_DLCC_RTRY_CHCKSUMWRONGRESTART
Purpose (short)	Test of Master retry behavior after response with wrong Checksum and restart
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to fail (positive testing)
Specification (clause)	[9] 7.3.3.4, Figure 37, Table 38
Configuration / setup	Master-Tester, Line-Monitor (optionally)

1850

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test of Master retry behavior after responses with wrong Checksum and restart. Master is in communication. The Master sends a message for the first time, which is responded with the wrong checksum. The Master resends the message, again the checksum of the response is incorrect or there is no response to the message. The Master repeats the message one more time and does not receive a valid response from the "Device". The Master thus forces the Device to a restart to take the system back into a defined state. The test shall be carried out for the STARTUP, PREOPERATE and OPERATE mode.
Precondition	Master is in communication in the STARTUP, PREOPERATE, or OPERATE mode. Legacy-Master in the STARTUP and OPERATE mode only.
Procedure	a) The Master sends a random message. b) The Master-Tester ("Device") sends response with a wrong checksum. c) The Master resends the same random message. d) The Master-Tester ("Device") responds again with the wrong checksum. e) The Master sends the same message for a third time. f) The Master-Tester ("Device") replies again with the wrong checksum. g) The Master starts a wakeup sequence. h) The Master-Tester ("Device") replies to this with a valid response. i) The test is carried out in STARTUP, PREOPERATE and OPERATE mode.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The Line-Monitor follows the communication on the signal line of the Master-Tester. In total, three Master messages are to be traced followed by a Wake-up sequence.
Test passed	If the Master sends three Master requests with the same contents and starts a Wake-up sequence with WURQ after the third attempt.
Test failed (examples)	a) If the Master does not send two repetitions or b) If the Master stops the communication or c) If no Wake-up sequence follows.
Results	STARTUP: Number of Master requests: <number> <pass/fail> STARTUP: Wake-up request: <yes/no> <pass/fail> PREOPERATE: Number of Master requests: <number> <pass/fail> PREOPERATE: Wake-up request: <yes/no> <pass/fail> OPERATE: Number of Master requests: <number> <pass/fail> OPERATE: Wake-up request: <yes/no> <pass/fail>

1851

1852   **8.9.3   Master retries after no responses and final correct Checksum**

1853   Table 217 defines the test conditions for this test case.

1854   **Table 217 – Master retries after no responses and final correct Checksum**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0219

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Name	TCM_DLCC_RTRY_NORESPCHCKSUMRIGHT
Purpose (short)	Test Master retry behavior after no responses and final correct Checksum
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.3.4, Figure 37, Table 38
Configuration / setup	Master-Tester

1855

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test Master retry behavior after no responses and final correct Checksum. Master in communication. The Master sends for the first time a message, which is not re-sponded. The Master resends the message and again the checksum is incorrect or there is no response to the message. The Master repeats the request message one last time and receives a valid response from the Device. The test shall be carried out for the STARTUP, PREOPERATE and OPERATE mode.
Precondition	Master is in communication in the STARTUP, PREOPERATE, or OPERATE mode. Legacy-Master in the STARTUP and OPERATE mode only.
Procedure	a) The Master sends a random message. b) The Master-Tester ("Device") does not respond. c) The Master resends the same random message. d) The Master-Tester ("Device") does not respond. e) The Master sends the same message for a third time. f) The Master-Tester ("Device") responds with the correct checksum. g) The test is carried out in STARTUP, PREOPERATE and OPERATE mode.
Input parameter	-
Post condition	-

1856

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The Line-Monitor follows the communication on the signal line of the Master-Tester. In total, three Master messages to the same address are to be traced.
Test passed	If the Master sends three Master request messages with the same content.
Test failed (examples)	a) If the Master does not send two repetitions or b) If the Master stops the communication or
Results	STARTUP: Number of Master requests: \<number\> \<pass/fail\> PREOPERATE: Number of Master requests: \<number\> \<pass/fail\> OPERATE: Number of Master requests: \<number\> \<pass/fail\>

1857

8.9.4 Master retries after no responses ending with restart

1858

1859 Table 218 defines the test conditions for this test case.

1860 **Table 218 – Master retries after no responses ending with restart**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0220
Name	TCM_DLCC_RTRY_NORESPRESTART
Purpose (short)	Test Master retry behavior after no responses ending with restart
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.3.4, Figure 37, Table 38, 9.3.3.2
Configuration / setup	Master-Tester

1861

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test Master retry behavior after no responses ending with restart. Master is in communication. The Master sends for the first time a message, which is not responded. The Master resends the message and again the checksum is incorrect or there is no response to the message. The Master repeats the request message one last time and receives no response from the "Device". The test shall be carried out for the STARTUP, PREOPERATE and OPERATE mode.
Precondition	Master is in communication in the STARTUP, PREOPERATE, or OPERATE mode. Legacy-Master in the STARTUP and OPERATE mode only.
Procedure	a) The Master sends a random message. b) The Master-Tester ("Device") does not respond. c) The Master resends the same random message. d) The Master-Tester ("Device") does not respond. e) The Master sends the same message for a third time. f) The Master-Tester ("Device") does not respond. g) The Master starts a Wakeup sequence. h) The Master-Tester ("Device") reacts with a valid response. i) The test is carried out in STARTUP, PREOPERATE and OPERATE mode.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The Line-Monitor follows the communication on the signal line of the Master-Tester. In total, three Master messages are to be traced followed by a Wake-up sequence.
Test passed	If the Master sends three Master requests with the same contents and starts a Wake-up sequence with WURQ after the third attempt.
Test failed (examples)	a) If the Master does not send two repetitions or b) If the Master stops the communication or c) If no Wake-up sequence follows.
Results	STARTUP: Number of Master requests: \<number\> \<pass/fail\> STARTUP: Wake-up request: \<yes/no\> \<pass/fail\> PREOPERATE: Number of Master requests: \<number\> \<pass/fail\> PREOPERATE: Wake-up request: \<yes/no\> \<pass/fail\> OPERATE: Number of Master requests: \<number\> \<pass/fail\> OPERATE: Wake-up request: \<yes/no\> \<pass/fail\>

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8.9.5 Master with maximum WURQs and final success

1864

1865 Table 219 defines the test conditions for this test case.

1866 **Table 219 – Master with maximum WURQs and final success**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0221
Name	TCM_DLCC_RTRY_MAXWURQSUCCESS
Purpose (short)	Test Master behavior with maximum WURQ sequences and final success
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.2.4, 7.3.2.2, Figures 28, 29, 30, 32, and 33
Configuration / setup	Master-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test Master behavior with maximum WURQ sequences and final success. Master is in STARTUP mode. The Master sends for the first time a Wakeup pulse (WURQ) with subsequent communication requests; the "Device" does not respond to the subsequent communication requests. The Master resends the Wakeup pulse (WURQ) with subsequent communication requests and again there is no response from the "Device". The Master repeats for the last time the Wakeup pulse (WURQ) with subsequent communication requests. Finally, the

1867

TEST CASE	CONDITIONS / PERFORMANCE
	"Device" responds to the communication requests.
Precondition	The Master is in STARTUP mode
Procedure	a) The Master sends a Wakeup pulse (WURQ) with subsequent communication requests. b) The Master-Tester does not respond. c) The Master sends a Wakeup pulse (WURQ) with subsequent communication requests. d) The Master-Tester does not respond. e) The Master sends a third time a Wakeup pulse (WURQ) with subsequent communication requests. f) The Master-Tester responds with the contents of address 0x02 ("MinCycleTime") of the Direct Parameter page 1.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The Line-Monitor follows the communication on the signal line of the Master-Tester. In total, three Master messages are to be traced followed by a Wake-up sequence and the startup to PREOPERATE.
Test passed	If the Master sends three Wakeup requests that finally result in a communication startup.
Test failed (examples)	a) If the Master does not send two repetitions of the Wake-up requests or b) If the Master stops the communication
Results	Number of Wake-up requests: <number> <pass/fail> Start-up to PREOPERATE: <yes/no> <pass/fail>

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8.9.6   Master with maximum WURQs and no final success

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1871   Table 220 defines the test conditions for this test case.

1872   **Table 220 – Master with maximum WURQs and no final success**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0222
Name	TCM_DLCC_RTRY_MAXWURQNOSUCCESS
Purpose (short)	Test Master behavior with maximum WURQ sequences and no final success
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[9] 7.3.2.4, 7.3.2.2, Figures 28, 29, 30, 32, and 33
Configuration / setup	Master-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test Master behavior with maximum WURQ sequences and no final success. Master is in STARTUP mode. The Master sends for the first time a Wakeup pulse (WURQ) with subsequent communication requests; the "Device" does not respond to the subsequent communication requests. The Master resends the Wakeup pulse (WURQ) with subsequent communication requests and again there is no response from the "Device". The Master repeats for the last time the Wakeup pulse (WURQ) with subsequent communication requests and again there is no response from the "Device". After a waiting time, the Master restarts the Wake-up requests and the "Device" responds in a correct manner.
Precondition	The Master is in STARTUP mode
Procedure	a) The Master sends a Wakeup pulse (WURQ) with subsequent communication requests. b) The Master-Tester does not respond. c) The Master sends a Wakeup pulse (WURQ) with subsequent communication requests. d) The Master-Tester does not respond. e) The Master sends a third time a Wakeup pulse (WURQ) with subsequent communication requests. f) The Master-Tester does not respond. g) The Master-Tester waits TSD – 3*TDWU. h) The Master sends a Wakeup pulse (WURQ) with subsequent communication requests.

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TEST CASE	CONDITIONS / PERFORMANCE
	i) The Master-Tester responds with the contents of address 0x02 ("MinCycleTime") of the Direct Parameter page 1.
Input parameter	-
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	The Line-Monitor follows the communication on the signal line of the Master-Tester. In total, three Master Wake-up requests are to be traced and a pause of TSD – 3*TDWU followed by another Wake-up sequence and the startup to PREOPERATE.
Test passed	If the Master sent three Wakeup requests followed by a pause TSD – 3*TDWU and another Wake-up sequence and the startup to PREOPERATE.
Test failed (examples)	a) If the Master does not send two repetitions or b) If the Master stops the communication or c) If no Wakeup request follows after a pause TSD – 3*TDWU.
Results	Number of Wake-up requests: <number> <pass/fail> Pause TSD – 3*TDWU: <ms> <pass/fail> Start-up to PREOPERATE: <yes/no> <pass/fail>

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8.10 ISDU (Indexed Service Data Unit) – Application ErrorTypes

8.10.1 ISDU Write rejected with ErrorType

Table 221 defines the test conditions for this test case.

Table 221 – ISDU Write rejected with ErrorType

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0223
Name	TCM_ALIC_AERR_WRITEREJECT
Purpose (short)	ISDU Write service rejected with defined ErrorType, no details
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write service rejected with ErrorType, no details. Access to an ISDU service supported by the Master-Tester ("Device") is rejected with an application error without details. The response reports an ErrorType "0x8000" (APP_ERR).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 16383 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8000)
Test failed (examples)	Error not identified or unspecific error message

TEST CASE RESULTS	CHECK / REACTION
Results	Response: <none/ErrorType> <pass/fail>

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8.10.2 ISDU Write to unsupported Index rejected with ErrorType

1883

1884 Table 222 defines the test conditions for this test case.

1885 **Table 222 – ISDU Write to unsupported Index rejected with ErrorType**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0224
Name	TCM_ALIC_AERR_WRITEINDEXUNSUPPORTED
Purpose (short)	ISDU Write to unsupported Index rejected with ErrorType
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write to unsupported Index rejected with ErrorType. Access to a non supported Index in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8011" (IDX_NOTAVAIL).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 254 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8011)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

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8.10.3 ISDU Write to unsupported Subindex rejected with ErrorType

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1890 Table 223 defines the test conditions for this test case.

1891 **Table 223 – ISDU Write to unsupported Subindex rejected with ErrorType**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0225
Name	TCM_ALIC_AERR_WRITESUBINDEXNOTSUPPORTED
Purpose (short)	ISDU Write to unsupported Subindex (>0) rejected with ErrorType
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write to unsupported Subindex (>0) rejected with ErrorType. Access to a non supported Subindex in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8012" (SUBIDX_NOTAVAIL).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 253 / 1 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8012)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

8.10.4   ISDU Write to temporarily unavailable Index rejected with ErrorType

Table 224 defines the test conditions for this test case.

Table 224 – ISDU Write to temporarily unavailable Index rejected with ErrorType

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0226
Name	TCM_ALIC_AERR_WRITETEMPUNAV
Purpose (short)	ISDU Write to temporarily unavailable Index rejected with ErrorType
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write to temporarily unavailable Index rejected with ErrorType. Access to a temporarily unavailable Index in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8020" (SERV_NOTAVAIL).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 252 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.

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TEST CASE	CONDITIONS / PERFORMANCE
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8020)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

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8.10.5 ISDU Write to temporarily unavailable Index due to local control

Table 225 defines the test conditions for this test case.

Table 225 – ISDU Write to temporarily unavailable Index due to local control

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0227
Name	TCM_ALIC_AERR_WRITEINDEXTEMPANAVLC
Purpose (short)	ISDU Write to temporarily unavailable Index due to local control
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to a temporarily unavailable Index due to local control in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8021" (SERV_NOTAVAIL_LOCCRTL).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with <value> to <Index/Subindex> b) Evaluate response code (Error_Type)
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 251 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8021)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

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8.10.6 ISDU Write to temporarily unavailable Index due to Device control

Table 226 defines the test conditions for this test case.

1909   **Table 226 – ISDU Write to temporarily unavailable Index due to Device control**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0228
Name	TCM_ALIC_AERR_WRITEINDEXTEMPANAVDC
Purpose (short)	ISDU Write to temporarily unavailable Index due to Device control
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	ISDU Write access to temporarily unavailable Index due to Device control in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8022" (SERV_NOTAVAIL_DEVCRTL).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with \<value\> to \<Index/Subindex\>
Input parameter	\<value\> = 0x00 (one octet), \<Index/Subindex\> = 250 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8022)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: \<none/ErrorType\> \<pass/fail\>

(1910, 1911 are line markers at left)

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1913   **8.10.7   ISDU Write to read-only Index denied**

1914   Table 227 defines the test conditions for this test case.

1915   **Table 227 – ISDU Write to read-only Index denied**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0229
Name	TCM_ALIC_AERR_WRITEINDEXRO
Purpose (short)	ISDU Write to read-only Index denied
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	ISDU Write access to read-only Index in the Master-Tester ("Device") is denied with an application error. The response reports an ErrorType "0x8023" (IDX_NOT_WRITEABLE).

(1916 is a line marker at left)

TEST CASE	CONDITIONS / PERFORMANCE
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 249 / 0
	Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

1917

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8023)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

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1919   8.10.8   ISDU Write with invalid Length

1920   Table 228 defines the test conditions for this test case.

1921   **Table 228 – ISDU Write with invalid Length**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0230
Name	TCM_ALIC_AERR_WRITEINVALIDLEN
Purpose (short)	ISDU Write with invalid Length
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

1922

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access with too short data length to an Index in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8034" (VAL_LENUNDRUN).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with <value> to <Index/Subindex> (length = correct length – 1 octet)
Input parameter	<value> = 0x00, 0x01, 0x02 (3 octets), <Index/Subindex> = 248 / 0 (Index 248 expects 4 octets)
	Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

1923

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8034)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

1924   **8.10.9   ISDU Write with parameter value out of range**

1925   Table 229 defines the test conditions for this test case.

1926   **Table 229 – ISDU Write with parameter value out of range**

1927

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0231
Name	TCM_ALIC_AERR_WRITEPARAMOUTOFRNG
Purpose (short)	ISDU Write with parameter value out of range
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	ISDU Write access with parameter values out of range to an Index in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8030" (PAR_VALOUTOFRNG).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> out of range to <Index/Subindex>
Input parameter	<value> = 0xFF, 0xFF (2 octets), <Index/Subindex> = 16382/ 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8030)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

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1930   **8.10.10 ISDU Write with parameter value above limit**

1931   Table 230 defines the test conditions for this test case.

1932   **Table 230 – ISDU Write with parameter value above limit**

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0232
Name	TCM_ALIC_AERR_WRITEPARAMABOVELIMIT
Purpose (short)	ISDU Write with parameter value above limit
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access with parameter values above limit to an Index in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8031" (PAR_VALGTLIM).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> above limit to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 16381/ 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

1934

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8031)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

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1936   8.10.11 ISDU Write with parameter value below limit

1937   Table 231 defines the test conditions for this test case.

1938   **Table 231 – ISDU Write with parameter value below limit**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0233
Name	TCM_ALIC_AERR_WRITEPARAMBELOWLIMIT
Purpose (short)	ISDU Write with parameter value below limit
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

1939

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access with parameter values below limit to an Index in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8032" (PAR_VALLTLIM).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> below limit to <Index/Subindex>
Input parameter	<value> = 0xFF (one octet), <Index/Subindex> = 16380 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8032)

TEST CASE RESULTS	CHECK / REACTION	
Test failed (examples)	Error not identified or unspecific error message	
Results	Response: <none/ErrorType>	<pass/fail>

1941

8.10.12 ISDU Write with invalid parameter set

Table 232 defines the test conditions for this test case.

Table 232 – ISDU Write with invalid parameter set

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE	
Identification (ID)	SDCI_TC_0234	
Name	TCM_ALIC_AERR_WRITEPARAMINVALID	
Purpose (short)	ISDU Write with invalid parameter set	
Equipment under test (EUT)	Master and Legacy-Master	
Test case version	1.0	
Category / type	Master protocol test, test to pass (positive testing)	
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C	
Configuration / setup	Master-Tester ("Device")	
TEST CASE	**CONDITIONS / PERFORMANCE**	
Purpose (detailed)	ISDU Write access with invalid parameter values to an Index in the Master-Tester ("Device") is rejected with an application error. For example, lower threshold value is above upper threshold value. The response reports an ErrorType "0x8040" (PAR_SETINVALID).	
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU	
Procedure	Write access with invalid parameter <value> to <Index/Subindex>	
Input parameter	<value> = 0xFF, 0xFF (2 octets), <Index/Subindex> = 16379 / 0	
	Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.	
Post condition	-	
TEST CASE RESULTS	**CHECK / REACTION**	
Evaluation	Check response and corresponding error message.	
Test passed	Error identified (ErrorType 0x8040)	
Test failed (examples)	Error not identified or unspecific error message	
Results	Response: <none/ErrorType>	<pass/fail>

1947

8.10.13 ISDU Write while Device application fault

Table 233 defines the test conditions for this test case.

Table 233 – ISDU Write while Device application fault

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0235
Name	TCM_ALIC_AERR_WRITEDEVICEAPPFAULT
Purpose (short)	ISDU Write while Device application fault

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the Master-Tester ("Device"), whose technology specific application is not performing, is rejected with an application error. The response reports an ErrorType "0x8082" (APP_DEVNOTRDY).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with invalid parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 16378 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8082)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

8.10.14 ISDU Write while Device application not ready

Table 234 defines the test conditions for this test case.

Table 234 – ISDU Write while Device application not ready

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0236
Name	TCM_ALIC_AERR_WRITEDEVICEAPPNOTREADY
Purpose (short)	ISDU Write while Device application not ready
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the Master-Tester ("Device"), whose technology specific application is not ready to perform, is rejected with an application error. The response reports an ErrorType "0x8082" (APP_DEVNOTRDY).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with invalid parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 16377 / 0

TEST CASE	CONDITIONS / PERFORMANCE
	Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8082)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

1958

1959

8.10.15 ISDU Write to reserved Indices

Table 235 defines the test conditions for this test case.

Table 235 – ISDU Write to reserved Indices

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0237
Name	TCM_ALIC_AERR_WRITERESERVEDINDEX
Purpose (short)	ISDU Write to reserved Indices
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Table B.7, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to a reserved Index in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8011" (IDX_NOTAVAIL).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with invalid parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 65535 / 0
	Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8011)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

1963

1964

1965

8.10.16 ISDU Write to reserved Indices and no ISDU (V1.0)

Table 236 defines the test conditions for this test case.

1968 **Table 236 – ISDU Write to reserved Indices and no ISDU (V1.0)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0238
Name	TCM_ALIC_AERR_WRITERESERVEDINDEXNOISDU
Purpose (short)	ISDU Write to reserved Indices and unavailable ISDU is rejected with ErrorType.
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	ISDU Write access to a reserved Index and unavailable ISDU in the Master-Tester ("Device") is rejected with an application error. The response reports an ErrorType "0x8011" (IDX_NOTAVAIL).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") is set to SDCI V1.0 d) Master-Tester ("Device") does not support ISDU
Procedure	Write access with parameter <value> to reserved <Index/Subindex> and no ISDU
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 16 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x8011 or 0x5700)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

1971

1972 **8.11   ISDU (Indexed Service Data Unit) – Derived ErrorTypes**

1973 **8.11.1   ISDU Write response without busy indication**

1974   Table 237 defines the test conditions for this test case.

1975 **Table 237 – ISDU Write response without busy indication**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0239
Name	TCM_ALIC_DERR_WRITENOBUSY
Purpose (short)	ISDU Write response without "Device busy" bit indication reports Derived ErrorType.
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

1969

1970

1976

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the Master-Tester ("Device") without indicating the "Device busy" bit in the ISDU Service/Length octet. The "Device" aborts the ISDU access and responds with "No Service". The response reports the derived ErrorType "0x1000" (COM_ERR).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 16376 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x1000)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

1977

1978

8.11.2   ISDU Write response with timeout after busy indication

1979

1980   Table 238 defines the test conditions for this test case.

1981   **Table 238 – ISDU Write response with timeout after busy indication**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0240
Name	TCM_ALIC_DERR_WRITEAFTERBUSYTIMEOUT
Purpose (short)	ISDU Write response with timeout after busy indication reports Derived ErrorType
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] 10.7.6, Table 91, A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the Master-Tester ("Device"), which does not generate a response after an adequate time for the ISDU acknowledgement and despite indicating the "Device busy" bit in the ISDU Service/Length octet, is responded with an application error. The response reports a derived ErrorType "0x1000" (COM_ERR).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 16376 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

1982

1983

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	a) Legacy-Master: ErrorType = 0x1000 b) Master: ErrorType = 0x1100
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

1984

8.11.3 ISDU Write response with illegal service code

1985

1986   Table 239 defines the test conditions for this test case.

1987   **Table 239 – ISDU Write response with illegal service code**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0241
Name	TCM_ALIC_DERR_ILLSERVICECODE
Purpose (short)	ISDU Write response with illegal service code reports Derived ErrorType
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the Master-Tester ("Device") generating a response with wrong service code, is responded with an application error. The response reports a derived ErrorType "0x5700" (M_ISDU_ILLEGAL).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 16374 / 0
	Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x5700)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

1990

8.11.4 ISDU Write response with wrong checksum (CHKPDU)

1991

1992   Table 240 defines the test conditions for this test case.

1993   **Table 240 – ISDU Write response with wrong checksum (CHKPDU)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0242

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Name	TCM_ALIC_DERR_WRONGCHECKSUM
Purpose (short)	ISDU Write response with wrong checksum (CHKPDU) reports Derived ErrorType.
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the Master-Tester ("Device") generating a response with wrong CHKPDU, is responded with an application error. The response reports a derived ErrorType "0x5600" (M_ISDU_CHECKSUM).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 16373 / 0
	Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x5600)
Test failed (examples)	Error not identified or unspecific error message
Results	Response: <none/ErrorType> <pass/fail>

8.11.5 ISDU Write response with reserved data length

Table 241 defines the test conditions for this test case.

Table 241 – ISDU Write response with reserved data length

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0244
Name	TCM_ALIC_DERR_WRITERESERVEDDL
Purpose (short)	ISDU Write response with reserved data length reports Derived ErrorType
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the Master-Tester ("Device") is responded with "reserved data length" and results in an application error. The response reports a derived ErrorType "0x1000" (COM_ERR).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU

TEST CASE	CONDITIONS / PERFORMANCE
Procedure	a) Write access with parameter <value> to <Index/Subindex>. Response uses re-served data lengths, for example 0 and 1 with extended length (0, 16, 239, or 255) b) Checksum of the responses shall be always correct to avoid other ErrorTypes
Input parameter	<Index/Subindex> = 16372 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response and corresponding error message.
Test passed	Error identified (ErrorType 0x1000) for all reserved data lengths
Test failed (examples)	Error not identified or unspecific error message for any of the reserved data lengths
Results	For all reserved data lengths: Response: <none/ErrorType> <pass/fail>

2001

2002

8.12 ISDU (Indexed Service Data Unit) – Limit checks

8.12.1 ISDU Read response without data

Table 242 defines the test conditions for this test case.

Table 242 – ISDU Read response without data

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0243
Name	TCM_ALIC_DERR_READNODATA
Purpose (short)	ISDU Read response without data reports no Derived ErrorType
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Read access to an Index in the Master-Tester ("Device") generating a positive response without data, is responded without error.
Precondition	a) Master is in SDCI communication mode b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Read access to <Index/Subindex>
Input parameter	<Index/Subindex> = 16372 / 0 Error codes shown on the fieldbus level may differ from the Device's ErrorType due to individual fieldbus mapping strategies. Test person shall enter the expected error code manually.
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response.
Test passed	Response delivers no data and returns without errors
Test failed (examples)	Error identified or unspecific error message

2003

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2007

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TEST CASE RESULTS	CHECK / REACTION
Results	Response with no data: <no error/ErrorType> <pass/fail>

2009

8.12.2 ISDU Write with minimum data length (0 octets)

2010

2011   Table 243 defines the test conditions for this test case.

2012   **Table 243 – ISDU Write with minimum data length (0 octets)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0245
Name	TCM_ALIC_LIMT_WRITEMINDATALENGTH
Purpose (short)	ISDU Write with minimum data length (0 octet)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

2013

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the Master-Tester ("Device") using the minimum data of 0 octets. The response shall be positive.
Precondition	a) Master is in SDCI communication mode b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = no data, <Index/Subindex> = 16000 / 0
Post condition	-

2014

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response.
Test passed	Service is carried out successfully
Test failed (examples)	a) Service is not carried out successfully, or b) Unspecific error message
Results	Response: <ok/ErrorType> <pass/fail>

2015

8.12.3 ISDU Write with maximum service length (238 octets)

2016

2017   Table 244 defines the test conditions for this test case.

2018   **Table 244 – ISDU Write with maximum service length (238 octets)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0246
Name	TCM_ALIC_LIMT_WRITEMAXDATALENGTH
Purpose (short)	ISDU Write with maximum service length (238 octets)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to an Index in the Master-Tester ("Device") using the maximum service length of 238 octets. The response shall be positive.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00, 0x01 to 0xE7 (232 octets user data), <Index/Subindex> = 16001 / 0
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response or corresponding error message.
Test passed	Service is carried out successfully
Test failed (examples)	a) Service is not carried out successfully, or b) Unspecific error message
Results	Response: <ok/ErrorType> <pass/fail>

8.12.4   ISDU Read with maximum service length (238 octets)

Table 245 defines the test conditions for this test case.

Table 245 – ISDU Read with maximum service length (238 octets)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0248
Name	TCM_ALIC_LIMT_READMAXDATALENGTH
Purpose (short)	ISDU Read with maximum service length (238 octets)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Read access to an Index in the Master-Tester ("Device") using the minimum service length of 238 octets. The response shall be positive.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Read access to <Index/Subindex>
Input parameter	<Index/Subindex> = 16003 / 0
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response or corresponding error message.
Test passed	Service is carried out successfully: Expected : <value> = 0x01, 0x02 to 0xE8 (232 octets user data)
Test failed (examples)	a) Service is not carried out successfully, or b) Unspecific error message
Results	Response: <ok/ErrorType> <pass/fail>

2027   **8.12.5   ISDU Write to 8 bit Index and no Subindex**

2028   Table 246 defines the test conditions for this test case.

2029   **Table 246 – ISDU Write to 8 bit Index and no Subindex**

2030

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0249
Name	TCM_ALIC_LIMT_WRITEINDEX8NOSUBINDEX
Purpose (short)	ISDU Write to 8 bit Index and no Subindex
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	ISDU Write access to an 8 bit Index in the Master-Tester ("Device"). The response shall be positive.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 255 / 0
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check response or corresponding error message.
Test passed	Service is carried out successfully
Test failed (examples)	a) Service is not carried out successfully, or b) Unspecific error message
Results	Response: <ok/ErrorType> <pass/fail>

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2032

2033   **8.12.6   ISDU Write to 8 bit Index and 8 bit Subindex**

2034   Table 247 defines the test conditions for this test case.

2035   **Table 247 – ISDU Write to 8 bit Index and 8 bit Subindex**

2036

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0250
Name	TCM_ALIC_LIMT_WRITEINDEX8SUBINDEX8
Purpose (short)	ISDU Write to 8 bit Index and 8 bit Subindex
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	ISDU Write access to an 8 bit Index and 8 bit Subindex in the Master-Tester ("Device"). The response shall be positive.

TEST CASE	CONDITIONS / PERFORMANCE
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 255 / 255
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response or corresponding error message.
Test passed	Service is carried out successfully
Test failed (examples)	a) Service is not carried out successfully, or b) Unspecific error message
Results	Response: <ok/ErrorType> <pass/fail>

2038

8.12.7 ISDU Write to 16 bit Index and 8 bit Subindex

Table 248 defines the test conditions for this test case.

Table 248 – ISDU Write to 16 bit Index and 8 bit Subindex

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0251
Name	TCM_ALIC_LIMT_WRITEINDEX16SUBINDEX8
Purpose (short)	ISDU Write to 16 bit Index and 8 bit Subindex
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to a 16 bit Index and 8 bit Subindex in the Master-Tester ("Device"). The response shall be positive.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 16004 / 1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response or corresponding error message.
Test passed	Service is carried out successfully
Test failed (examples)	a) Service is not carried out successfully, or b) Unspecific error message
Results	Response: <ok/ErrorType> <pass/fail>

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8.12.8 ISDU Write response without busy bit

Table 249 defines the test conditions for this test case.

2047   **Table 249 – ISDU Write response without busy bit**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0252
Name	TCM_ALIC_LIMT_IMMEDIATERESPNOBUSY
Purpose (short)	ISDU Write response without busy bit (immediate response)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, A.5.4, Table A.15, Annex C
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	ISDU Write access to an 8 bit Index and 8 bit Subindex in the Master-Tester ("Device"). Master-Tester ("Device") generates an immediate response to the request without setting the "Device busy" bit.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 255 / 1
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check response or corresponding error message.
Test passed	Service is carried out successfully
Test failed (examples)	a) Service is not carried out successfully, or b) Unspecific error message
Results	Response: <ok/ErrorType> <pass/fail>

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2051   **8.12.9   ISDU Write response with busy bit**

2052   Table 250 defines the test conditions for this test case.

2053   **Table 250 – ISDU Write response with busy bit**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0253
Name	TCM_ALIC_LIMT_IMMEDIATERESPWITHBUSY
Purpose (short)	ISDU Write response after setting the busy bit
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, A.5.4, Table A.15, Annex C
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	ISDU Write access to an 8 bit Index and 8 bit Subindex in the Master-Tester ("Device"). Master-Tester ("Device") generates a response to the request setting the "Device busy" bit.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE

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TEST CASE	CONDITIONS / PERFORMANCE
	c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to <Index/Subindex>
Input parameter	<value> = 0x00 (one octet), <Index/Subindex> = 255 / 2
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response or corresponding error message.
Test passed	Service is carried out successfully
Test failed (examples)	a) Service is not carried out successfully, or b) Unspecific error message
Results	Response: <ok/ErrorType> <pass/fail>

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8.12.10 ISDU Write with maximum service Length (15 octets)

Table 251 defines the test conditions for this test case.

Table 251 – ISDU Write with maximum service Length (15 octets)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0254
Name	TCM_ALIC_LIMT_WRITEMAXSERVICELEN15
Purpose (short)	ISDU service (with maximum service length 15) is carried out.
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	ISDU Write access to several Index and Subindex combinations in the Master-Tester ("Device"). Master-Tester ("Device") with maximum service length 15. The response shall be positive.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to a) 8 bit Index and no Subindex, and Length = 15 b) 8 bit Index and 8 bit Subindex, and Length = 15 c) 16 bit Index and 8 bit Subindex, and Length = 15
Input parameter	a) <value> = 0x01, 0x02 to 0x0D (13 octets), <Index/Subindex> = 100 / 0 b) <value> = 0x01, 0x02 to 0x0C (12 octets), <Index/Subindex> = 100 / 1 c) <value> = 0x01, 0x02 to 0x0B (11octets), <Index/Subindex> = 16005 / 1
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check response or corresponding error message.
Test passed	Services are carried out successfully
Test failed (examples)	a) Service is not carried out successfully, or b) Unspecific error message
Results	For each combination: Response: <ok/ErrorType> <pass/fail>

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2063   **8.12.11 ISDU Write with minimum service Extended Length (17)**

2064   Table 252 defines the test conditions for this test case.

2065   **Table 252 – ISDU Write with minimum service Extended Length (17)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0255
Name	TCM_ALIC_LIMT_WRITEMINSERVICEEXTLEN17
Purpose (short)	ISDU service (with minimum Extended Length 17) is carried out.
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 8.2.4.1.2; [9] A.5.2, Annex C
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	ISDU Write access to several Index and Subindex combinations in the Master-Tester ("Device"). Master-Tester ("Device") with minimum Extended Length 17. The response shall be positive.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Master-Tester ("Device") supports ISDU
Procedure	Write access with parameter <value> to a) 8 bit Index, no Subindex, and Length = 1, Extended Length = 17 b) 8 bit Index, 8 bit Subindex, and Length = 1, Extended Length = 17 c) 16 bit Index and 8 bit Subindex, and Length = 1, Extended Length = 17
Input parameter	a) <value> = 0x01, 0x02 to 0x0E (14 octets), <Index/Subindex> = 100 / 0 b) <value> = 0x01, 0x02 to 0x0D (13 octets), <Index/Subindex> = 100 / 1 c) <value> = 0x01, 0x02 to 0x0C (12 octets), <Index/Subindex> = 16005 / 1
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check response or corresponding error message
Test passed	Services are carried out successfully
Test failed (examples)	a) Service is not carried out successfully, or b) Unspecific error message
Results	For each combination: Response: <ok/ErrorType> <pass/fail>

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2069   **8.13 Events**

2070   **8.13.1   General**

2071   The Event propagation to the upper level system, for example a fieldbus, is not subject matter
2072   of this document. This behavior shall be defined in the corresponding "upper level systems
2073   integration" specification. Thus, there is no immediate Event acknowledgement of the Master
2074   as with the Legacy-Master. Therefore the timeout for waiting on the acknowledgement shall
2075   be adjustable in the Master-Tester.

2076   **8.13.2   Master receives Event without details (notification)**

2077   Table 253 defines the test conditions for this test case.

2078 **Table 253 – Master receives Event without details (notification)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0256
Name	TCM_ALIC_EVNT_NODETAILSNOTIFY
Purpose (short)	Master receives Event (notification) without details (notification)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6, Annex D
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master receives Event without details (StatusCode type 1, notification). Master extracts the EventCode (type 1), converts it accordingly into StatusCode (type 2) and transfers it to the upper level system. Master acknowledges the Event; the Master-Tester ("Device") resets the Event flag.
Precondition	a) Master is in SDCI communication mode b) Master-Tester ("Device") in OPERATE
Procedure	a) Master-Tester ("Device") is prompted to prepare an Event message with Status Code type 1: all bits = 0, except bit 0 = "1". b) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). c) Master performs Event handling d) Master acknowledges the Event by writing back the (Event) StatusCode
Input parameter	Notification
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0xFF80 and EventQualifier = 0x54). b) Master acknowledges by writing to the StatusCode b) Event flag shall be reset by the Master-Tester ("Device"). The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0")
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: <code> <pass/fail> Master acknowledgement: <code> <pass/fail> Event flag: <0/1> <pass/fail>

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8.13.3 Master receives Event without details (Warning)

2083 Table 254 defines the test conditions for this test case.

2084 **Table 254 – Master receives Event without details (Warning)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0257
Name	TCM_ALIC_EVNT_NODETAILSWARNING
Purpose (short)	Master receives Event without details (Warning)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6, Annex D
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master receives Event without details (StatusCode type 1, warning). Master extracts the EventCode (type 1), converts it accordingly into StatusCode (type 2) and transfers it to the upper level system. Master acknowledges the Event; the Master-Tester ("Device") resets the Event flag.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE
Procedure	a) Master-Tester ("Device") is prompted to prepare an Event message with Status Code type 1: all bits = 0, except bit 1 = "1". b) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). c) Master performs Event handling d) Master acknowledges the Event by writing back the (Event) StatusCode
Input parameter	Warning
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0xFF80 and EventQualifier = 0x64). b) Master acknowledges by writing to the StatusCode b) Event flag shall be reset by the Master-Tester ("Device"). The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0")
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: <code> <pass/fail> Master acknowledgement: <code> <pass/fail> Event flag: <0/1> <pass/fail>

8.13.4   Master receives Event without details (Error)

Table 255 defines the test conditions for this test case.

Table 255 – Master receives Event without details (Error)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0258
Name	TCM_ALIC_EVNT_NODETAILSERROR
Purpose (short)	Master receives Event without details (Error)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6, Annex D
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master receives Event without details (StatusCode type 1, error). Master extracts the EventCode (type 1), converts it accordingly into StatusCode (type 2) and transfers it to the upper level system. Master acknowledges the Event; the Master-Tester ("De-

TEST CASE	CONDITIONS / PERFORMANCE
	vice") resets the Event flag.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE
Procedure	a) Master-Tester ("Device") is prompted to prepare an Event message with Status Code type 1: all bits = 0, except bit 3 = "1". b) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). c) Master performs Event handling d) Master acknowledges the Event by writing back the (Event) StatusCode
Input parameter	Error
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0xFF80 and EventQualifier = 0x74). b) Master acknowledges by writing to the StatusCode b) Event flag shall be reset by the Master-Tester ("Device"). The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0")
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: \<code\> \<pass/fail\> Master acknowledgement: \<code\> \<pass/fail\> Event flag: \<0/1\> \<pass/fail\>

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8.13.5 Master receives Event without details (parameter error)

Table 256 defines the test conditions for this test case.

Table 256 – Master receives Event without details (parameter error)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0259
Name	TCM_ALIC_EVNT_NODETAILSPARAMERROR
Purpose (short)	Master receives Event without details (parameter error)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6, Annex D
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master receives Event without details (StatusCode type 1, parameter error). Master extracts the EventCode (type 1), converts it accordingly into StatusCode (type 2) and transfers it to the upper level system. Master acknowledges the Event; the Master-Tester ("Device") resets the Event flag.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE
Procedure	a) Master-Tester ("Device") is prompted to prepare an Event message with Status Code type 1: all bits = 0, except bit 2 = "1". b) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). c) Master performs Event handling d) Master acknowledges the Event by writing back the (Event) StatusCode

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TEST CASE	CONDITIONS / PERFORMANCE
Input parameter	Parameter error
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0x6320 and EventQualifier = 0x74). b) Master acknowledges by writing to the StatusCode b) Event flag shall be reset by the Master-Tester ("Device"). The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0")
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: <code> <pass/fail> Master acknowledgement: <code> <pass/fail> Event flag: <0/1> <pass/fail>

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8.13.6   Master receives event without details (communication error)

2101   Table 257 defines the test conditions for this test case.

2102   **Table 257 – Master receives event without details (communication error)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0260
Name	TCM_ALIC_EVNT_NODETAILSCOMMERROR
Purpose (short)	Master receives event without details (communication error)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6, Annex D
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master receives Event without details (StatusCode type 1, communication error). Master extracts the EventCode (type 1), converts it accordingly into StatusCode (type 2) and transfers it to the upper level system. Master acknowledges the Event; the Master-Tester ("Device") resets the Event flag. This is an interoperability test for legacy Devices (V1.0).
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE
Procedure	a) Master-Tester ("Device") is prompted to prepare an Event message with Status Code type 1: all bits = 0, except bit 4 = "1". b) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). c) Master performs Event handling d) Master acknowledges the Event by writing back the (Event) StatusCode
Input parameter	Communication error
Post condition	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0xFF10 and EventQualifier = 0x70). b) Master acknowledges by writing to the StatusCode b) Event flag shall be reset by the Master-Tester ("Device"). The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0")
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: <code> <pass/fail> Master acknowledgement: <code> <pass/fail> Event flag: <0/1> <pass/fail>

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8.13.7 Master receives event with details (single event)

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2107 Table 258 defines the test conditions for this test case.

2108 **Table 258 – Master receives event with details (single event)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0261
Name	TCM_ALIC_EVNT_WITHDETAILSSINGLEEVENT
Purpose (short)	Master receives event with details (single event)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6, Annex D
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master receives Event with details (StatusCode type 2). Master transfers the EventCode and EventQuaifier to the upper level system. Master acknowledges the Event; the Master-Tester ("Device") resets the Event flag.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Events are numbered from n = 1 to n = 6. d) "Activated Events" addresses are numbered from m = 0 to m = 5.
Procedure	a) Master-Tester ("Device") is prompted to prepare an Event n with EventCode = 0x1000 and EventQualifier = 0xF4. b) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). c) Master performs Event handling d) Master acknowledges the Event by writing back the (Event) StatusCode.
Input parameter	Single Event (type2; "General malfunction")
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0x1000 and EventQualifier = 0xF4). b) Master acknowledges by writing to the StatusCode b) Event flag shall be reset by the Master-Tester ("Device"). The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".

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TEST CASE RESULTS	CHECK / REACTION
Test passed	a) If Master propagates Event to the upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0")
Test failed (examples)	a) If Event code 0x1000, or b) If EventQualifier 0xF4 did not reach the upper level system, or c) If Event flag in Master-Tester ("Device") is not acknowledged.
Results	Propagated information to the upper level system: \<code\> \<pass/fail\> Master acknowledgement: \<code\> \<pass/fail\> Event flag: \<0/1\> \<pass/fail\>

2111

8.13.8   Master receives event with details (double event)

Table 259 defines the test conditions for this test case.

Table 259 – Master receives event with details (double event)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0262
Name	TCM_ALIC_EVNT_WITHDETAILSDOUBLEEVENT
Purpose (short)	Master receives event with details (double event)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6, Annex D
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master receives Event with details (StatusCode type 2). Master transfers it to the upper level system. Master acknowledges the Event; the Master-Tester ("Device") resets the Event flag. This procedure can be carried out for different Events in the Event buffer. These Events are numbered with "n".
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Events are numbered from n = 1 to n = 6. d) "Activated Events" addresses are numbered from m = 0 to m = 5. e) Event buffer address assignment with y and z, where y,z ∈ n, y ≠ z

Procedure	a) Master-Tester ("Device") is prompted to prepare two Events:
	   - Event a with EventCode = 0x1000 and EventQualifier = 0xF4
	   - Event b with EventCode = 0x4000 and EventQualifier = 0xE4
	b) It puts Event a to address n = y
	c) It puts Event b to address z.
	d) It sets bit 7 of the StatusCode to "1".
	e) It sets bit "m = y-1" of the StatusCode to 1.
	f) It sets bit "m = z-1" of the StatusCode to 1.
	g) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet).
	h) Master performs Event handling
	i) Master acknowledges the Event by writing back the (Event) StatusCode.

Input parameter	Loop 1: Ev1: 0x1000 / 0xF4, Ev6: 0x4000 / 0xE4 Loop 2: Ev2: 0x1000 / 0xF4, Ev5: 0x4000 / 0xE4 Loop 3: Ev3: 0x1000 / 0xF4, Ev4: 0x4000 / 0xE4 Loop 4: Ev4: 0x1000 / 0xF4, Ev3: 0x4000 / 0xE4 Loop 5: Ev5: 0x1000 / 0xF4, Ev2: 0x4000 / 0xE4 Loop 6: Ev6: 0x1000 / 0xF4, Ev1: 0x4000 / 0xE4
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether Master propagates the Event a to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0x1000 and EventQualifier = 0xF4).

TEST CASE RESULTS	CHECK / REACTION
	a) Check whether Master propagates the Event b to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0x4000 and EventQualifier = 0xE4). b) Master acknowledges by writing to the StatusCode b) Event flag shall be reset by the Master-Tester ("Device"). The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event a and Event b to the upper level system b) If Master acknowledges the Events c) If Master-Tester ("Device") resets Event flag (= "0")
Test failed (examples)	a) Event a with EventCode 0x1000, or b) EventQualifier 0xF4 did not reach the upper level system, or c) Event b with Eventcode 0x4000, or d) EventQualifier 0xE4 did not reach the upper level system, or e) If Event flag in Master-Tester ("Device") is not acknowledged.
Results	Event a: Propagated information to the upper level system: \<code\> \<pass/fail\> Master acknowledgement: \<code\> \<pass/fail\> Event flag: \<0/1\> \<pass/fail\> Event b: Propagated information to the upper level system: \<code\> \<pass/fail\> Master acknowledgement: \<code\> \<pass/fail\> Event flag: \<0/1\> \<pass/fail\>

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8.13.9 Master receives event with details (six events)

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2119 Table 260 defines the test conditions for this test case.

2120 **Table 260 – Master receives event with details (six events)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0263
Name	TCM_ALIC_EVNT_WITHDETAILSSIXEVENTS
Purpose (short)	Master receives event with details (six events)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master receives Event with details (StatusCode type 2). Master transfers it to the upper level system. Master acknowledges the Event; the Master-Tester ("Device") resets the Event flag. This procedure can be carried out for different Events in the Event buffer. These Events are numbered with "n".
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Events are numbered from a to f d) "Activated Events" addresses are numbered from m = 0 to m = 5.
Procedure	a) Master-Tester ("Device") is prompted to generate six Events: - Event a with Eventcode = 0x1000 and EventQualifier = 0xF4 - Event b with Eventcode = 0x4000 and EventQualifier = 0xE4 - Event c with Eventcode = 0x5000 and EventQualifier = 0xD4 - Event d with Eventcode = 0x5500 and EventQualifier = 0xB4 - Event e with Eventcode = 0x6000 and EventQualifier = 0xA4 - Event f with Eventcode = 0x8000 and EventQualifier = 0x94 b) Master-Tester ("Device") puts Events into the Event buffer: - Event a to address n = 1 - Event b to address n = 2 - Event c to address n = 3

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TEST CASE	CONDITIONS / PERFORMANCE
	- Event d to address n = 4 - Event e to address n = 5 - Event f to address n= 6 d) Master-Tester ("Device") sets bit 7 of the StatusCode to "1" (= with details). e) Master-Tester ("Device") sets bits in m = 0 to 5 to "1" ("Activated Events") g) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). h) Master performs Event handling i) Master acknowledges the Event by writing back the (Event) StatusCode.
Input parameter	Six Events
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether Master propagates the Event a through f to the uppper level system in an appropriate form (matching semantics or syntax of EventCode and EventQualifier, see procedure step a). b) Master acknowledges by writing to the StatusCode. b) Event flag shall be reset by the Master-Tester ("Device"). The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Evaluation a) is positive b) If Master acknowledges the Events c) If Master-Tester ("Device") resets Event flag (= "0")
Test failed (examples)	a) Events a through f did not reach the upper level system, or b) If Event flag in Master-Tester ("Device") is not acknowledged.
Results	Event a: Propagated information to the upper level system: \<code> \<pass/fail> Master acknowledgement: \<code> \<pass/fail> Event flag: \<0/1> \<pass/fail> Event b: Propagated information to the upper level system: \<code> \<pass/fail> Master acknowledgement: \<code> \<pass/fail> Event flag: \<0/1> \<pass/fail> Event c: Propagated information to the upper level system: \<code> \<pass/fail> Master acknowledgement: \<code> \<pass/fail> Event flag: \<0/1> \<pass/fail> Event d: Propagated information to the upper level system: \<code> \<pass/fail> Master acknowledgement: \<code> \<pass/fail> Event flag: \<0/1> \<pass/fail> Event e: Propagated information to the upper level system: \<code> \<pass/fail> Master acknowledgement: \<code> \<pass/fail> Event flag: \<0/1> \<pass/fail> Event f: Propagated information to the upper level system: \<code> \<pass/fail> Master acknowledgement: \<code> \<pass/fail> Event flag: \<0/1> \<pass/fail>

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2123

8.13.10 Master receives Event while in ISDU Write transfer (stopover)

Table 261 defines the test conditions for this test case.

Table 261 – Master receives Event while in ISDU Write transfer (stopover)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0264
Name	TCM_ALIC_EVNT_WRITEISDUWITH EVENT
Purpose (short)	Master receives one Event while in ISDU transfer (stopover; no details)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0

2127

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6, Annex I
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master receives one Event while in ISDU Write transfer (stopover; no details). The Event flag shall be set during transfer of an ISDU. The Master interrupts the ISDU and retrieves the Event content. After Event handling, the ISDU transfer shall be continued.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE
Procedure	a) Master starts writing an ISDU with 64 octets long ASCII string: "0123456789abc-defghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ+-" to Index 0x0018 b) Master-Tester ("Device") generates an Event during transmission of the ISDU. c) Master-Tester ("Device") is prompted to prepare an Event message with Status Code type 1: all bits = 0, except bit 2 = "1" (parameter error). d) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). e) Master performs Event handling f) Master resumes transfer of the ISDU d) Master acknowledges the Event by writing back the (Event) StatusCode
Input parameter	ASCII string for the ISDU; Event "Parameter error"
Post condition	-

2128

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0xFF80 and EventQualifier = 0x74). b) Master acknowledges by writing to the StatusCode c) Event flag shall be reset by the Master-Tester ("Device"). d) ISDU transfer shall be completed The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0") d) Index 0x0018 within the Master-Tester ("Device") contains the complete ASCII string
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: <code> <pass/fail> Master acknowledgement: <code> <pass/fail> Event flag: <0/1> <pass/fail> Index 0x0018: <content> <pass/fail>

2129

2130 **8.13.11 Master receives Event while in ISDU Read transfer (stopover)**

2131   Table 262 defines the test conditions for this test case.

2132   **Table 262 – Master receives Event while in ISDU Read transfer (stopover)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0265
Name	TCM_ALIC_EVNT_READISDUWITH EVENT
Purpose (short)	Master receives event while in ISDU Read transfer (stopover; no details)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)

2133

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master receives one Event while in ISDU Read transfer (stopover; no details). The Event flag shall be set during transfer of an ISDU. The Master interrupts the ISDU and retrieves the Event content. After Event handling, the ISDU transfer shall be continued.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE
Procedure	a) Master starts a Read ISDU from Index 0x0013. Content is the ProductID: "IO-Link Golden Device V1.0 test case ISDU_Stopover" b) Master-Tester ("Device") generates an Event during transmission of the ISDU. c) Master-Tester ("Device") is prompted to prepare an Event message with Status Code type 1: all bits = 0, except bit 2 = "1" (parameter error). d) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). e) Master performs Event handling f) Master resumes transfer of the ISDU d) Master acknowledges the Event by writing back the (Event) StatusCode
Input parameter	ProductID for the ISDU; Event "Parameter error"
Post condition	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0xFF80 and EventQualifier = 0x74). b) Master acknowledges by writing to the StatusCode c) Event flag shall be reset by the Master-Tester ("Device"). d) ISDU transfer shall be completed The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0") d) Complete ProductID out of Index 0x0013 transferred to the upper level system
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: \<code\> \<pass/fail\> Master acknowledgement: \<code\> \<pass/fail\> Event flag: \<0/1\> \<pass/fail\> Transfer from Index 0x0013: \<ProductID\> \<pass/fail\>

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2136 **8.13.12 Master receives Event details while in ISDU Write transfer (stopover)**

2137 Table 263 defines the test conditions for this test case.

2138 **Table 263 – Master receives Event details while in ISDU Write transfer (stopover)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0266
Name	TCM_ALIC_EVNT_WRITEISDUWITH EVENTDETAILS
Purpose (short)	Master receives event while in ISDU Write transfer (stopover; with details)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6
Configuration / setup	Master-Tester ("Device")

2139

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master receives Event while in ISDU Write transfer (stopover; with details). The Event flag shall be set during transfer of an ISDU. The Master interrupts the ISDU and retrieves the Event content. After Event handling, the ISDU transfer shall be continued.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE
Procedure	a) Master starts writing an ISDU with 64 octets long ASCII string: "0123456789abc-defghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ+-" to Index 0x0018 b) During ISDU transfer the Master-Tester ("Device") is prompted to prepare an Event n = 1with EventCode = 0x1000 and EventQualifier = 0xF4. c) Master-Tester ("Device") sets bit 7 of the StatusCode to "1" (= with details). d) Master-Tester ("Device") sets bit in m = 0 to "1" ("Activated Events") e) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). f) Master performs Event handling g) Master resumes transfer of the ISDU h) Master acknowledges the Event by writing back the (Event) StatusCode.
Input parameter	ASCII string for the ISDU; Single Event (type2; "General malfunction")
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0x1000 and EventQualifier = 0xF4). b) Master acknowledges by writing to the StatusCode c) Event flag shall be reset by the Master-Tester ("Device"). d) ISDU transfer shall be completed The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0") d) Index 0x0018 within the Master-Tester ("Device") contains the complete ASCII string
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: <code> <pass/fail> Master acknowledgement: <code> <pass/fail> Event flag: <0/1> <pass/fail> Index 0x0018: <content> <pass/fail>

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8.13.13 Master receives Event details while in ISDU Read transfer (stopover)

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Table 264 defines the test conditions for this test case.

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Table 264 – Master receives Event details while in ISDU Read transfer (stopover)

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0267
Name	TCM_ALIC_EVNT_READISDUWITH EVENTDETAILS
Purpose (short)	Master receives event while in ISDU Read transfer (stopover; with details)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6
Configuration / setup	Master-Tester ("Device")

2145

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master receives one Event while in ISDU Read transfer (stopover; with details). The Event flag shall be set during transfer of an ISDU. The Master interrupts the ISDU and retrieves the Event content. After Event handling, the ISDU transfer shall be continued.
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE
Procedure	a) Master starts a Read ISDU from Index 0x0013. Content is the ProductID: "IO-Link Golden Device V1.0 test case ISDU_Stopover" b) During ISDU transfer the Master-Tester ("Device") is prompted to prepare an Event n = 1 with EventCode = 0x1000 and EventQualifier = 0xF4. c) Master-Tester ("Device") sets bit 7 of the StatusCode to "1" (= with details). d) Master-Tester ("Device") sets bit in m = 0 to "1" ("Activated Events") e) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet). f) Master performs Event handling g) Master resumes transfer of the ISDU h) Master acknowledges the Event by writing back the (Event) StatusCode.
Input parameter	ProductID for the ISDU; Single Event (type2; "General malfunction")
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0x1000 and EventQualifier = 0xF4). b) Master acknowledges by writing to the StatusCode c) Event flag shall be reset by the Master-Tester ("Device"). d) ISDU transfer shall be completed The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0") d) Complete ProductID out of Index 0x0013 transferred to the upper level system
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: <code> <pass/fail> Master acknowledgement: <code> <pass/fail> Event flag: <0/1> <pass/fail> Transfer from Index 0x0013: <ProductID> <pass/fail>

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8.13.14 Master receives one selected Event from Device Event buffer

Table 265 defines the test conditions for this test case. This test case is for information only. It can not be performed due to missing features in the fieldbus integration specifications.

Table 265 – Master receives one selected Event from Device Event buffer

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0268
Name	TCM_ALIC_EVNT_ONEEVENTFROMBUFFER
Purpose (short)	Master receives one selected Event from Device Event buffer (with details)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master receives one selected Event from the Master-Tester ("Device") Event buffer

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TEST CASE	CONDITIONS / PERFORMANCE
	(with details). Master transfers it to the upper level system. Master acknowledges the Events; the Master-Tester ("Device") resets the Event flag. This procedure can be carried out for different Events in the Event buffer. These Events are numbered with "n".
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Events are numbered from n = 1 to n = 6. d) "Activated Events" addresses are numbered from m = 0 to m = 5.

Procedure	a) Master-Tester ("Device") is prompted to generate an:
	   - Event a with Eventcode = 0x1000 and EventQualifier = 0xF4
	b) Master-Tester ("Device") puts Event into the Event buffer:
	   - Event a to address n
	d) Master-Tester ("Device") sets bit 7 of the StatusCode to "1" (= with details).
	e) Master-Tester ("Device") sets bit in m = n-1 to "1" ("Activated Events")
	g) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet).
	h) Master performs Event handling
	i) Master acknowledges the Event by writing back the (Event) StatusCode after an
	   acknowledgement of the upper level system.

Input parameter	Event (type2; "General malfunction")
Post condition	-

2153

TEST CASE RESULTS	CHECK / REACTION

Evaluation	a) Check whether Master propagates the Event to the uppper level system in an
	   appropriate form (matching semantics or syntax = EventCode = 0x1000 and
	   EventQualifier = 0xF4).
	b) Master acknowledges by writing to the StatusCode
	c) Event flag shall be reset by the Master-Tester ("Device") after an acknowledge
	   ment of the upper level system.
	d) After the aknowledgement, the Master-Tester ("Device") can activate the next
	   Event in the Event buffer (only 1 Event at a time).
	The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".

Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0")
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: <code> <pass/fail> Master acknowledgement: <code> <pass/fail> Event flag: <0/1> <pass/fail>

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2155 8.13.15 Master receives several selected Events from Device Event buffer

2156 Table 266 defines the test conditions for this test case. This test case is for information only.
2157 It can not be performed due to missing features in the fieldbus integration specifications.

2158 **Table 266 – Master receives several selected Events from Device Event buffer**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0269
Name	TCM_ALIC_EVNT_MULTIPLEEVENTSFROMBUFFER
Purpose (short)	Master receives several selected Events from Device Event buffer (with details)
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.2.1; [9] 7.3.8.3, 8.3.3.1, 11.5, Annex A.6
Configuration / setup	Master-Tester ("Device"), Device (according V1.1)

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TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master receives several selected Events from Master-Tester ("Device") Event buffer (with details). Master transfers them one at a time to the upper level system. Master acknowledges the Events; the Master-Tester ("Device") resets the Event flag. This procedure can be carried out for different Events in the Event buffer. These Events are numbered with "n".
Precondition	a) Master is in SDCI communication mode (Scan mode) b) Master-Tester ("Device") in OPERATE c) Events are numbered from n = 1 to n = 6. d) "Activated Events" addresses are numbered from m = 0 to m = 5. e) Event buffer address assignment with y and z, where y,z ∈ n, y ≠ z

Procedure	a) Master-Tester ("Device") is prompted to generate an Event:
	    - Event a with Eventcode = 0x1000 and EventQualifier = 0xF4
	b) Master-Tester ("Device") puts Events into the Event buffer:
	    - Event a to address n = y
	    - Event a to address n = z
	d) Master-Tester ("Device") sets bit 7 of the StatusCode to "1" (= with details).
	e) Master-Tester ("Device") sets bit in m = y-1 to "1" ("Activated Events")
	g) Master-Tester ("Device") sets the Event flag = 1 (within response CKS octet).
	h) Master performs Event handling
	i) Master acknowledges the Event by writing back the (Event) StatusCode.

Input parameter	Loop 1: Ev1: 0x1000 / 0xF4, Ev6: 0x4000 / 0xE4 Loop 2: Ev2: 0x1000 / 0xF4, Ev5: 0x4000 / 0xE4 Loop 3: Ev3: 0x1000 / 0xF4, Ev4: 0x4000 / 0xE4 Loop 4: Ev4: 0x1000 / 0xF4, Ev3: 0x4000 / 0xE4 Loop 5: Ev5: 0x1000 / 0xF4, Ev2: 0x4000 / 0xE4 Loop 6: Ev6: 0x1000 / 0xF4, Ev1: 0x4000 / 0xE4
Post condition	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check whether Master propagates the Event to the uppper level system in an appropriate form (matching semantics or syntax = EventCode = 0x1000 and EventQualifier = 0xF4). b) Check whether Master writes back the StatusCode. c) Event flag shall be reset by the Master-Tester ("Device") after an acknowledge ment of the upper level system. The mechanism shall be tested. However, the reported information (EventCode) is optional: Mapping into more general diagnosis information of an upper level system is possible or even nothing at all, e.g in case of a "notification".
Test passed	a) If Master propagates Event to upper level system b) If Master acknowledges the Event c) If Master-Tester ("Device") resets Event flag (= "0")
Test failed (examples)	If one of the evaluation steps failed.
Results	Propagated information to the upper level system: <code> <pass/fail> Master acknowledgement: <code> <pass/fail> Event flag: <0/1> <pass/fail>

8.14 Data Storage (DS)

8.14.1 General

Some test cases need cleared Data Storage as a precondition to perform the test. One possibility is the re-configuration of the Master port.

8.14.2 DS-Upload upon request in PREOPERATE state

Table 267 defines the test conditions for this test case.

Table 267 – DS-Upload upon request in PREOPERATE state

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0270

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Name	TCM_ALIC_STOR_PREOPUPLOADREQ
Purpose (short)	Data Storage upload upon request in PREOPERATE mode
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, B.2.3, Table B.9, B.2.4
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Master is configured to support the entire Data Storage mechanism comprising directions upload and download. The Data Storage mechanism is tested in PREOPERATE mode.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) Master in PREOPERATE mode. c) Master is configured for Upload enabled (see 11.2.2.6) d) Master-Tester ("Device") in PREOPERATE mode. e) Master-Tester ("Device") Data Storage unlocked (see B.2.4) f) Master-Tester ("Device") sets DS_UPLOAD_FLAG (see Table B.11)
Procedure	a) Master-Tester ("Device") sends Data Storage upload request Event b) Master reads this Event and acknowledges this Event (Write Event StatusCode) c) Master reads at least Index 3, Subindex 3, and Index 3, Subindex 2 d) Master sends DS_UploadStart e) Master reads all parameters listed in Index 3, Subindex 5 (Index_List) f) Master reads Parameter_Checksum in Index 3, Subindex 4 g) Master sends DS_UploadEnd
Input parameter	-
Post condition / next test	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check procedure steps b) to g)
Test passed	Master processes Data Storage upload according to procedure steps b) to g)
Test failed (examples)	Master did not process Data Storage upload according to procedure steps b) to g)
Results	Data Storage upload procedure correct: <yes/no> <pass/fail>

8.14.3 DS-Upload upon request in OPERATE state

Table 268 defines the test conditions for this test case.

Table 268 – DS-Upload upon request in OPERATE state

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0271
Name	TCM_ALIC_STOR_OPERUPLOADREQ
Purpose (short)	Data Storage upload upon request in OPERATE mode
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Master is configured to support the entire Data Storage mechanism comprising directions upload and download. The Data Storage mechanism is tested in OPER-

TEST CASE	CONDITIONS / PERFORMANCE
	ATE mode.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) Master in OPERATE mode. c) Master is configured for Upload enabled (see 11.2.2.6) d) Master-Tester ("Device") in OPERATE mode. e) Master-Tester ("Device") Data Storage unlocked (see B.2.4) f) Master-Tester ("Device") sets DS_UPLOAD_FLAG (see Table B.11)
Procedure	a) Master-Tester ("Device") sends Data Storage upload request Event b) Master reads this Event and acknowledges this Event (Write Event StatusCode) c) Master reads at least Index 3, Subindex 3, and Index 3, Subindex 2 d) Master sends DS_UploadStart e) Master reads all parameters listed in Index 3, Subindex 5 (Index_List) f) Master reads Parameter_Checksum in Index 3, Subindex 4 g) Master sends DS_UploadEnd
Input parameter	-
Post condition / next test	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check procedure steps b) to g)
Test passed	Master processes Data Storage upload according to procedure steps b) to g)
Test failed (examples)	Master did not process Data Storage upload according to procedure steps b) to g)
Results	Data Storage upload procedure correct: <yes/no> <pass/fail>

8.14.4 DS-Download upon mismatch of parameter sets (replacement)

Table 269 defines the test conditions for this test case.

Table 269 – DS-Download upon mismatch of parameter sets (replacement)

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0272
Name	TCM_ALIC_STOR_PARAMMISMATCH
Purpose (short)	Data Storage download upon mismatch of parameter sets (Device replacement)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Master is configured to support the entire Data Storage mechanism comprising directions upload and download. The Master behaviour in case of a Device replacement ("hot swap") is tested.
Precondition	a) Master supports the entire Data Storage mechanism. b) Master already finished a complete parameter upload successfully before (parameter set 1 is stored within Master) c) Master-Tester adjusted to play the role of the "New Device" (replacement) d) "New Device" offers a parameter set 2 different from parameter set 1 e) "New Device" in DI mode f) "New Device" offers identical VID, DID g) "New Device" does not set the DS_UPLOAD_FLAG h) InspectionLevel = TYPE_COMP
Procedure	a) Master establishes communication with Device validation b) Master switches to PREOPERATE mode c) Master reads at least Index 3, Subindex 4 (Parameter_Checksum) d) Master sends DS_DownloadStart e) Master writes all parameters of parameter set 1 f) Master sends DS_DownloadEnd

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TEST CASE	CONDITIONS / PERFORMANCE
	g) Master reads Index 3, Subindex 4 (Parameter_Checksum)
Input parameter	Parameter set 1 and 2 (to be defined by the Test-Master)
Post condition / next test	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check procedure steps a) to g) b) Check correct parameter set 1 in "New Device"
Test passed	a) Master processes Data Storage download according to procedure steps a) to g) b) Parameter set in "New Device" is identical to parameter set 1
Test failed (examples)	a) Master does not follow sequence of test case procedure, or b) Master does not fulfill any step of the procedure, or c) Parameter set is not identical to parameter set 1
Results	Master processes Data Storage download correctly: <yes/no> <pass/fail>

2183

8.14.5   DS-Download despite DS_UPLOAD_REQ from Device (PREOP)

2184

2185   Table 270 defines the test conditions for this test case.

2186   **Table 270 – DS-Download despite DS_UPLOAD_REQ from Device (PREOP)**

2187

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0273
Name	TCM_ALIC_STOR_PROPDLDDESPITEULDREQ
Purpose (short)	DS-Download in PREOPERATE mode despite DS_UPLOAD_REQ Event from Device
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The Master is configured to support the Data Storage mechanism for download only. Master behaviour in case of a DS_UPLOAD_REQ of the Device is tested. The Master shall overwrite the parameter set of a Device in case of a DS_UPLOAD_REQ in PREOPERATE mode.
Precondition	a) A parameter set 1 is already stored within the Master b) Master is configured to support Data Storage for download only c) Master is in PREOPERATE mode d) Master-Tester ("Device") is in PREOPERATE mode
Procedure	a) Master-Tester ("Device") sends a DS_UPLOAD_REQ Event b) Master reads this Event and acknowledges this Event (Write Event StatusCode) c) Master reads at least Index 3, Subindex 4 (Parameter_Checksum) d) Master sends DS_DownloadStart e) Master writes all parameters of parameter set 1 f) Master sends DS_DownloadEnd g) Master reads Index 3, Subindex 4 (Parameter_Checksum)
Input parameter	Parameter set 1 and 2 (to be defined by the Master-Tester)
Post condition / next test	-

2188

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check Index 3, Subindex 4 (Parameter_Checksum). b) Check if download starts, if Parameter_Checksum does not match configured Parameter_Checksum of parameter set 1. c) Check if download is processed as described in [9] 11.3.3.
Test passed	a) Master processes Data Storage download according to procedure steps a) to g) b) Parameter set in "Device" is identical to parameter set 1

TEST CASE RESULTS	CHECK / REACTION
Test failed (examples)	a) Master does not follow sequence of test case procedure, or b) Master does not fulfill any step of the procedure, or c) Parameter set is not identical to parameter set 1
Results	Master processes Data Storage download correctly: <yes/no> <pass/fail>

2189

8.14.6 DS-Download despite DS_UPLOAD_REQ from Device (OPERATE)

2190

2191   Table 271 defines the test conditions for this test case.

2192   **Table 271 – DS-Download despite DS_UPLOAD_REQ from Device (OPERATE)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0274
Name	TCM_ALIC_STOR_OPERDLDDESPITEULDREQ
Purpose (short)	Data Storage download despite DS_UPLOAD_REQ from Device (OPERATE)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, 11.3.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Master is configured to support the Data Storage mechanism for download only. Master behaviour in case of a DS_UPLOAD_REQ of the Device is tested. The Master shall overwrite the parameter set of a Device in case of a DS_UPLOAD_REQ in OPERATE mode.
Precondition	a) A parameter set 1 is already stored within the Master b) Master is configured to support Data Storage for download only c) Master is in OPERATE mode d) Master-Tester ("Device") is in OPERATE mode
Procedure	a) Master-Tester ("Device") sends a DS_UPLOAD_REQ Event b) Master reads this Event and acknowledges this Event (Write Event StatusCode) c) Master reads at least Index 3, Subindex 4 (Parameter_Checksum) d) Master sends DS_DownloadStart e) Master writes all parameters of parameter set 1 f) Master sends DS_DownloadEnd g) Master reads Index 3, Subindex 4 (Parameter_Checksum)
Input parameter	Parameter set 1 and 2 (to be defined by the Master-Tester)
Post condition / next test	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check Index 3, Subindex 4 (Parameter_Checksum). b) Check if download starts, if Parameter_Checksum does not match configured Parameter_Checksum of parameter set 1. c) Check if download is processed as described in [9] 11.3.3.
Test passed	a) Master processes Data Storage download according to procedure steps a) to g) b) Parameter set in "Device" is identical to parameter set 1
Test failed (examples)	a) Master does not follow sequence of test case procedure, or b) Master does not fulfill any step of the procedure, or c) Parameter set is not identical to parameter set 1
Results	Master processes Data Storage download correctly: <yes/no> <pass/fail>

2193

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8.14.7 DS-Download upon mismatch of parameter sets (PREOPERATE)

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2197   Table 272 defines the test conditions for this test case.

2198 **Table 272 – DS-Download upon mismatch of parameter sets (PREOPERATE)**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0275
Name	TCM_ALIC_STOR_PROPDLDPARAMMISMATCH
Purpose (short)	Data Storage download upon mismatch of parameter sets (PREOPERATE)
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Master is configured to support the Data Storage mechanism for download only. If the Master detects a deviating parameter checksum directly after entering the PREOPERATE mode the Master shall overwrite the current parameter set in the "Device". This function to be tested in PREOPERATE mode.
Precondition	a) A parameter set 1 is already stored within the Master b) Master is configured to support Data Storage for download only c) InspectionLevel = TYPE_COMP d) Master-Tester ("Device") has set the DS_UPLOAD_FLAG e) Master-Tester provides parameter set 2
Procedure	a) Master establishes communication with "Device" validation b) Master switches to PREOPERATE mode c) Master reads at least Index 3, Subindex 4 (Parameter_Checksum) d) Master sends DS_DownloadStart e) Master writes all parameters of parameter set 1 f) Master sends DS_DownloadEnd g) Master reads Index 3, Subindex 4 (Parameter_Checksum)
Input parameter	Parameter set 1 and 2 (to be defined by the Master-Tester)
Post condition / next test	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check procedure steps a) to g) b) Check correct parameter set 1 in "New Device"
Test passed	a) Master processes Data Storage download according to procedure steps a) to g) b) Parameter set in "New Device" is identical to parameter set 1
Test failed (examples)	a) Master does not follow sequence of test case procedure, or b) Master does not fulfill any step of the procedure, or c) Parameter set is not identical to parameter set 1
Results	Master processes Data Storage download correctly: <yes/no> <pass/fail>

2201

8.14.8 Master verifies requested Data Storage size

2202

2203 Table 273 defines the test conditions for this test case.

2204 **Table 273 – Master verifies requested Data Storage size**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0276
Name	TCM_ALIC_STOR_STORAGESIZE
Purpose (short)	Master verifies requested Data Storage size
Equipment under test (EUT)	IO-Link Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)

The numbers 2199 and 2200 appear in the left margin alongside the first table.

2205

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The Master is configured to support the entire Data Storage mechanism comprising directions upload and download. The Master shall detect whether it is able to store the whole parameter set by checking the Data_Storage_Size.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) The Master is configured to support the entire Data Storage mechanism c) Master-Tester ("Device") is in PREOPERATE mode. d) Master-Tester ("Device") Index 3, Subindex 3 is set to the maximum possible memory size (Data_Storage_Size = 0xFFFFFFFF).
Procedure	a) Device sends DS_UPLOAD_REQ Event b) Master reads at least Index 3, Subindex 3 (Data_Storage_Size) c) Master generates an error Event to the upper level system d) Master continues communication
Input parameter	Parameter set 1 and 2 (to be defined by the Master-Tester)
Post condition / next test	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check procedure steps a) to d)
Test passed	a) Master does not process a download b) Master generates error Event to the upper level system c) Master continues communication
Test failed (examples)	a) Master starts download, or b) Master does not generate error Event to the upper level system, or c) Master stops communication
Results	Master generates error Event: <yes/no> <pass/fail> Master continues communication: <yes/no> <pass/fail>

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2208   ### 8.14.9   Master sets port DS ActivationState and executes Upload

2209   Table 274 defines the test conditions for this test case.

2210   **Table 274 – Master sets port DS ActivationState and executes Upload**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0277
Name	TCM_ALIC_STOR_ACTIVATEUPLOAD
Purpose (short)	Master sets port DS ActivationState and executes Upload
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.2.2.6, 11.3, B.2.3, B.2.4, Table B.11
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	After enabling the Data Storage handler of the Master, the Master shall check the Data Storage state of the "Device". The Master shall start Data Storage actions.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) Master is in OPERATE mode. c) Master-Tester ("Device") is in OPERATE mode. d) Master Data Storage ActivationState is "DEACTIVATED" e) Masterconfig Upload/Download is enabled f) Master-Tester ("Device") Data Storage unlocked

2211

TEST CASE	CONDITIONS / PERFORMANCE
Procedure	a) Set Master Datastorage ActivationState to "ACTIVATED" b) Master reads at least Index 3, Subindex 2 (State_Property) c) Master sends DS_UploadStart d) Master reads all parameters listed in Iindex 3, Subindex 5 (Index_List) e) Master reads Index 3, Subindex 4 (Parameter_Checksum) f) Master sends DS_UploadEnd
Input parameter	Parameter set 1 and 2 (to be defined by the Master-Tester)
Post condition / next test	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check procedure steps a) to f)
Test passed	Master processes a correct upload of the parameter set of the "Device"
Test failed (examples)	a) Master does not follow the steps b) to f) of the test case procedure , or b) Master does not fulfill any step of the procedure, or c) Parameter set is not identical to parameter set 1
Results	Master processes correct upload: <yes/no> <pass/fail>

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2214 **8.14.10 DS Upload with Read on unavailable Index**

2215 Table 275 defines the test conditions for this test case.

2216 **Table 275 – DS Upload with Read on unavailable Index**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0278
Name	TCM_ALIC_STOR_ULDINDEXNOTAVAILABLE
Purpose (short)	DS Upload with Read on unavailable Index
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	If a particular Index is not available during an upload sequence, the Master shall send a "DS-Break" to the "Device" and generate an error Event to the upper level system.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) Master is in PREOPERATE mode. c) Master-Tester ("Device") is in PREOPERATE mode. d) Master is configured for Upload/Download enabled (see 11.2.2.6) e) The list of Index 3, Subindex 5 of the Master-Tester ("Device") comprises an un-available index.
Procedure	a) Master-Tester ("Device") sends an DS_UPLOAD_REQ Event b) Master reads at least Index 3, Subindex 3 (Data_Storage_Size) c) Master reads at least Index 3, Subindex 2 (Data_Storage_State) d) Master reads at least Index 3, Subindex 5 (Index_List) e) Master sends DS_UploadStart f) Master detects the unavailable Index g) Master sends DS_Break h) Master generates an error Event to the upper level system
Input parameter	Parameter set 1 and 2 (to be defined by the Master-Tester), Data_Storage_Size, Data_Storage_State, Index_List
Post condition / next test	-

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TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check procedure steps b) to h)
Test passed	a) Master interrupts (break) an active upload sequence, and b) Master generates an error Event to the upper level system.
Test failed (examples)	a) Master does not follow the steps b) to h) of the test case procedure , or b) Master does not fulfill any step of the procedure
Results	Master sends DS_Break: <yes/no> <pass/fail> Master generates an error Event: <yes/no> <pass/fail>

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8.14.11 DS Upload with Read on Index with insufficient length

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2221   Table 276 defines the test conditions for this test case.

2222   **Table 276 – DS Upload with Read on Index with insufficient length**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0279
Name	TCM_ALIC_STOR_ULDINDEXINSUFFLENGTH
Purpose (short)	DS Upload with Read on Index with insufficient length
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	If a particular Index has insufficient length during a download (Write) sequence, the Master shall send a "DS-Break" to the "Device" and generate an error Event to the upper level system.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) Master is in PREOPERATE mode. c) Master-Tester ("Device") is in PREOPERATE mode. d) Master is configured for Upload/Download enabled (see 11.2.2.6) e) The list of Index 3, Subindex5 of the Master-Tester ("Device") comprises an Index with insufficient length (read length <> write length).
Procedure	a) Master-Tester ("Device") sends DataStorage-Request event b) Master reads at least Index 3, Subindex 3 (Data_Storage_Size) c) Master reads at least Index 3, Subindex 2 (Data_Storage_State) d) Master reads at least Index 3, Subindex 5 (Index_List) e) Master sends DS_DownloadStart f) Master detects a negative Write Response of the Index with insufficient length g) Master sends DS_Break h) Master generates an error Event to the upper level system
Input parameter	Parameter set 1 and 2 (to be defined by the Master-Tester), Data_Storage_Size, Data_Storage_State, Index_List
Post condition / next test	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check procedure steps b) to h)
Test passed	a) Master interrupts (break) an active upload sequence, and b) Master generates an error Event to the upper level system.
Test failed (examples)	a) Master does not follow the steps b) to h) of the test case procedure , or b) Master does not fulfill any step of the procedure
Results	Master sends DS_Break: <yes/no> <pass/fail> Master generates an error Event: <yes/no> <pass/fail>

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2226 **8.14.12 DS Upload trial with locked Device Data Storage**

2227 Table 277 defines the test conditions for this test case.

2228 **Table 277 – DS Upload trial with locked Device Data Storage**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0280
Name	TCM_ALIC_STOR_DSLOCKED
Purpose (short)	DS Upload trial with locked Device Data Storage
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master shall detect the locked Data Storage of a Device. In this case the Master shall deny access for all data storage actions from its own data storage handler.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) Master is in OPERATE mode. c) Master-Tester ("Device") is in OPERATE mode. d) Master is configured for Upload/Download enabled (see 11.2.2.6) e) Master DataStorage Activationstate is "OFF" f) Master-Tester ("Device") Data_Storage_State is "LOCKED"
Procedure	a) Set Master DataStorage Activationstate to "ACTIVATED" b) Master reads at least Index 3, Subindex 2 (Data_Storage_State) c) Master detects the locked data storage state of Device d) Master does not send "DS_UploadStart" nor "DS_DownloadStart" e) Master sends an error Event to the upper level system
Input parameter	Parameter set 1 and 2 (to be defined by the Master-Tester), Data_Storage_Size, Data_Storage_State, Index_List
Post condition / next test	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check procedure steps b) to e)
Test passed	a) Master does not continue or start further Data Storage activities, and b) Master generates an error Event to the upper level system.
Test failed (examples)	a) Master starts further activities of Data Storage, or b) Master does not generate an error Event to the upper level system.
Results	Master shows no further DS activities: <yes/no> <pass/fail> Master generates an error Event: <yes/no> <pass/fail>

2231

2232 **8.14.13 DS Upload/Download blocks upper level system request**

2233 Table 278 defines the test conditions for this test case.

2234 **Table 278 – DS Upload/Download blocks upper level system request**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0281
Name	TCM_ALIC_STOR_ULDDLDBLOCKSULS
Purpose (short)	DS Upload/Download blocks higher level system request
Equipment under test (EUT)	Master
Test case version	1.0

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Master shall deny an access of the upper level system to the "Device" during an Upload or Download sequence.
Precondition	a) Data Storage shall be cleared (see 8.14.1) b) Master is in OPERATE mode. c) Master-Tester ("Device") is in OPERATE mode. d) Master is configured for Upload/Download enabled (see 11.2.2.6) e) Master DataStorage Activationstate is "ACTIVATED"
Procedure	a) Master-Tester ("Device") sends an DS_UPLOAD_REQ Event b) Master reads Index 3 and starts Upload/Download sequence c) Upper level system sends first OD request to the "Device" d) Master responds first OD request with negative OD response (see 11.4) e) Master finishes Upload/Download sequence as intended f) Upper level system sends second OD request to the "Device" g) Master supports second OD request of the upper level system to "Device"
Input parameter	Parameter set 1 and 2 (to be defined by the Master-Tester)
Post condition / next test	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check procedure steps b) to g)
Test passed	a) Master blocks OD requests during DS up/download, and b) Master allows OD request access to "Device" after completion of DS up/download
Test failed (examples)	a) Master does not block OD requests during DS up/download, or b) Master does not respond with negative OD response during DS up/download, or c) Master does not complete DS up/download, or d) Master does not support access to "Device" after DS up/download
Results	Master blocks OD request: <yes/no> <pass/fail> Master allows access after DS up/download: <yes/no> <pass/fail>

8.14.14 DS Download overwrites parameter via port DS ActivationState

Table 279 defines the test conditions for this test case.

Table 279 – DS Download overwrites parameter via port DS ActivationState

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0282
Name	TCM_ALIC_STOR_ULDUPONSTATESWITCH
Purpose (short)	DS Download overwrites Device parameter via port DS ActivationState
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	Data Storage mechanism of the Master shall store a parameter set 1 of the "Device" when the Activationstate switches between "ACTIV" and "DEACTIVATED".
Precondition	a) Master is in OPERATE mode. b) Master-Tester ("Device") is in OPERATE mode. c) Masters holds parameter set 1 for download from previous successful upload before Master is configured to upload/download enabled (see 11.2.2.6)

TEST CASE	CONDITIONS / PERFORMANCE
	d) Master DataStorage Activationstate is "ACTIVATED"
Procedure	a) Set Master DS Activationstate to "DEACTIVATED" b) Change parameter set 1 in the "Device" to parameter set 2 without setting DS_UPLOAD_REQ Event flag c) Set Master DS Activationstate to "ACTIVATED" d) Master reads at least Index 3, Subindex 4 (Parameter_Checksum) e) Master sends DS_DownloadStart f) Master writes all parameters of parameter set 1 g) Master sends DS_DownloadEnd
Input parameter	Parameter set 1 and 2 (to be defined by the Master-Tester)
Post condition / next test	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check procedure steps d) to g)
Test passed	If parameter set 1 is downloaded successfully into the "Device"
Test failed (examples)	If parameter set 1 is not restored successfully
Results	Parameter set 1 in the "Device": <yes/no> <pass/fail>

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2243

8.14.15 Master clears DS after changing port configuration

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Table 280 defines the test conditions for this test case.

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2246   **Table 280 – Master clears DS after changing port configuration**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0283
Name	TCM_ALIC_STOR_ULDUPONPORTCONFIG
Purpose (short)	Master clears DS after changing port configuration
Equipment under test (EUT)	Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[9] 11.2, 11.2.2.6, 11.3, B.2.3, B.2.4
Configuration / setup	Master-Tester ("Device")
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	The Data Storage mechanism of the Master shall clear the parameter set after changing the "Device" identification of the Master port.
Precondition	a) Master contains Data Storage data object of a Device with VID / DID (set 1) b) Master is configured for upload/download enabled c) Master DataStorage ActivationState is "ACTIVATED"
Procedure	a) Set port configuration of the Master to VID / DID (set 2). This causes the Master to clear the DS b) Set port configuration of the Master back to VID / DID (set 1) c) Connect the "Device" (Master-Tester) with VID / DID (set 1)
Input parameter	VID / DID (set 1) and VID / DID (set 2)
Post condition / next test	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	Check behavior of the Master at STARTUP / PREOPERATE state in procedure step c) according to the procedure and evaluation steps in SDCI_TC_0277 (Table 274)
Test passed	If the master starts an upload of parameters from the device
Test failed (examples)	If the Master checks only the checksum of the Device Data Storage and does not upload the complete parameters set.

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TEST CASE RESULTS	CHECK / REACTION	
Results	Data Storage data object is empty: <yes/no>	<pass/fail>

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8.14.16 Master checks consistency of Device and stored DS object

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2251 Table 281 defines the test conditions for this test case.

2252 **Table 281 – Master checks consistency of Device and stored DS object**

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TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE	
Identification (ID)	SDCI_TC_0284	
Name	TCM_ALIC_STOR_CONSISTENCYCHECK	
Purpose (short)	Master checks consistency of Device and stored DS object via VID and DID	
Equipment under test (EUT)	Master	
Test case version	1.0	
Category / type	Master protocol test; test to pass (positive testing)	
Specification (clause)	[9] 11.2, 11.3, B.2.3, B.2.4	
Configuration / setup	Master-Tester ("Device")	
TEST CASE	**CONDITIONS / PERFORMANCE**	
Purpose (detailed)	The Master shall check the consistency between the stored "Device" within the data storage data object and the data of the connected "Device". In case of an inconsistency the Master shall stop the Data Storage activities and generate an error Event to the upper level system.	
Precondition	a) Master configured to InpectionLevel "NO_CHECK" b) Master contains Data Storage data object of a "Device" with VID / DID (set 1) c) Master is configured for upload/download enabled (see 11.2.2.6) d) Master DataStorage Activationstate is "ACTIVATED"	
Procedure	a) Stop communication b) Change VID / DID in the "Device" to VID / DID (set 2) c) Start communication d) Master switches to PREOPERATE e) Master detects the inconsistency between the Data Storage data object VID / DID (set 1) and the "Device" VID / DID (set 2) f) Master generates an error Event to the upper level system g) Master continues communication	
Input parameter	VID / DID (set 1) and VID / DID (set 2)	
Post condition / next test	-	
TEST CASE RESULTS	**CHECK / REACTION**	
Evaluation	Check procedure steps d) to g)	
Test passed	a) Master does not perform Data Storage up/download, and b) Master generates an error Event to the upper level system, and c) Master continues communication	
Test failed (examples)	a) Master does not follow the steps d) to g) of the test case procedure , or b) Master does not fulfill any step of the procedure c) Master starts DS up- or download	
Results	Master ignores DS up/download: <yes/no> <pass/fail> Master generates an error Event to the upper level system: <yes/no> <pass/fail> Master continues communication: <yes/no> <pass/fail>	

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2255

8.15 Legacy Device ("V1.0")

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8.15.1 General

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2258 Since a Master designed according to [9] shall support legacy Devices designed according to
2259 [13], it shall pass the following test cases.

2260 **8.15.2 Master detects legacy Device and establishes connection**

2261 Table 282 defines the test conditions for this test case.

2262 **Table 282 – Master detects legacy Device and establishes connection**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0285
Name	TCM_LGCY_MANY_DETECTANDCONNECT
Purpose (short)	Master detects legacy Device and establishes connection
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[13] 7.2.2.1, 9.3.3; [9] 9.2.3.2, A.2.6
Configuration / setup	Master-Tester ("Device" V1.0)
TEST CASE	**CONDITIONS / PERFORMANCE**
Purpose (detailed)	This test checks the compatibility of the startup phase between the V1.1 Master and a V1.0 Device. The Master shall detect that a V1.0 Device is connected, and shall adjust its startup behavior.
Precondition	-
Procedure	a) Initiate Wake_up b) Read Direct Parameter page 1 (address 0x02 to 0x06) c) Do not react to Events from the "Device" (Event handler not started) d) Write the MasterCycleTime e) Write OPERATE f) Change to the target F-sequence type g) Read Serial Number (due to validation)
Input parameter	-
Post condition / next test	-
TEST CASE RESULTS	**CHECK / REACTION**
Evaluation	a) Check for the startup F-sequence types of [13] b) Check the data exchange after startup c) Check Read and Write to parameters within the legacy "Device"
Test passed	If the startup sequence performed according to [13]
Test failed (examples)	If F-sequence types are used outside [13]
Results	Startup according to [13]: <yes/no> <pass/fail>

2265

2266 **8.15.3 Master detects legacy Device and establishes interleave mode**

2267 Table 283 defines the test conditions for this test case.

2268 **Table 283 – Master detects legacy Device and establishes interleave mode**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0286
Name	TCM_LGCY_MANY_DETECTANDINTERLEAVE
Purpose (short)	Master detects legacy Device and establishes interleave mode
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[13] 9.3.3; [9] 9.2.3.5, A.2.6

2269

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Configuration / setup	Master-Tester ("Device" V1.0)

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	This test checks the compatibility of the startup phase between the V1.1 Master and a V1.0 Device which is using F-sequence TYPE_1 in interleave mode. The Master shall detect that a V1.0 Device is connected, and shall adjust its startup behavior.
Precondition	PD with 6 octets
Procedure	a) Initiate Wake_up b) Read Direct Parameter page 1 (address 0x02 to 0x06) c) Do not react to Events from the "Device" (Event handler not started) d) Write the MasterCycleTime e) Write OPERATE f) Change to the target F-sequence TYPE_1 (interleave) g) Read Serial Number (due to validation)
Input parameter	-
Post condition / next test	-

2270

TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check for the startup F-sequence types of [13] b) Check the data exchange after startup c) Check Read and Write to parameters within the legacy "Device"
Test passed	a) If the startup sequence performed according to [13], and b) If interleave F-sequence TYPE_1 is used
Test failed (examples)	If F-sequence types are used outside [13]
Results	Startup according to [13]: <yes/no> <pass/fail> F-sequence TYPE_1 used: <yes/no> <pass/fail>

2271

8.15.4   Master acknowledges an Event with the next ISDU cycle

2272

2273   Table 284 defines the test conditions for this test case.

2274   **Table 284 – Master acknowledges an Event with the next ISDU cycle**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0287
Name	TCM_LGCY_MANY_EVENTACK
Purpose (short)	Master acknowledges an event with the next ISDU cycle
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4.1
Configuration / setup	Master-Tester ("Device" V1.0), Line-Monitor

2275

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	The Master shall acknowledge an Event during the next service data cycle. This is different to [9] where the Master shall wait on the acknowledgement of the upper level system.
Precondition	Connection has been established
Procedure	a) An Event is initiated by the legacy "Device" b) The Master reads out the StatusCode (type 1) c) Within the next cycle the Master shall write back the StatusCode for acknowledge
Input parameter	(legacy) Event
Post condition / next test	-

2276

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check with the help of the Line-Monitor whether the Event acknowledgement (write to the StatusCode (type1) is performed by the Master during the next two cycles
Test passed	If the Write to the StatusCode (type 1) is performed within the next two cycles after reading the StatusCode (type 1)
Test failed (examples)	If there are ISDU Idle messages between the Read access and the acknowledgement
Results	Acknowledgement behavior according to [13]: <yes/no> <pass/fail>

2277

8.15.5 Master sends Idle after an accomplished ISDU service

2278

2279   Table 285 defines the test conditions for this test case.

2280   **Table 285 – Master sends Idle after an accomplished ISDU service**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0288
Name	TCM_LGCY_MANY_IDLEAFTERISDU
Purpose (short)	Master sends ISDU service "Idle" after an accomplished ISDU service
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[13] 7.3.6.3, Figure 47
Configuration / setup	Master-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	After completion of an ISDU command, the Master shall transmit at least one IDLE command to the Device as an acknowledgment of the ISDU service.
Precondition	Connection has been established with a very large MasterCycleTime
Procedure	a) To test this behavior, the MasterCycleTime shall be set to a very large value, e.g. 50 to 100 ms. b) An ISDU request shall be initiated. c) After the response, the application shall initiate the next request as soon as possible (during the next cycle time) d) The Master shall not start the next request without an ISDU IDLE message
Input parameter	ISDU request
Post condition / next test	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check if there is an IDLE message between the two ISDU services
Test passed	If there is an IDLE message
Test failed (examples)	If the next ISDU starts without an IDLE message
Results	IDLE message: <yes/no> <pass/fail>

2283

8.15.6 ISDU Write interrupted by an Event leads to a Write error

2284

2285   Table 286 defines the test conditions for this test case.

2286   **Table 286 – ISDU Write interrupted by an Event leads to a Write error**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0289

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Name	TCM_LGCY_MANY_EVENTINTERRUPTSISDU
Purpose (short)	ISDU Write interrupted by an Event leads to write error
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test; test to pass (positive testing)
Specification (clause)	[13] 7.3.6.3, Figure 47
Configuration / setup	Master-Tester

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	According to [13] the legacy "Device" can cancel an ongoing ISDU transfer via an Event. This Event shall lead to a Read error or Write error on the Master side.
Precondition	Connection has been established
Procedure	a) The Master initiates an ISDU Write with a too large length of data b) The legacy "Device" sends an Event during the ISDU service to abort it. c) The Master shall confirm this conflicting error to the application via Write error
Input parameter	ISDU with lengthy data
Post condition / next test	-

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Check if the Event leads to a Write error on the Master application
Test passed	If the Event is sent to the application and the ISDU service is not aborted
Test failed (examples)	If the Master does not interpret this Event
Results	Event received by the upper level system: <yes/no> <pass/fail> ISDU service is not aborted: <yes/no> <pass/fail>

2287
2288
2289

8.15.7   Master transforms PD_invalid Event into appropriate propagation

2290

2291   Table 287 defines the test conditions for this test case.

2292   **Table 287 – Master transforms PD_invalid Event into appropriate propagation**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0290
Name	TCM_LGCY_MANY_PDINVALIDEVENT
Purpose (short)	Master transforms PD_invalid Event into appropriate propagation
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4; [9] A.6.2, A.6.3
Configuration / setup	Master-Tester ("Device V1.0")

TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Master transforms a "PD invalid" Event from a legacy "Device" into an appropriate propagation form
Precondition	a) Master in communication mode. b) Master-Tester ("Device") is in OPERATE mode and provides valid Process Data values (PD valid).
Procedure	Master-Tester ("Device") is prompted to set the Process Data to invalid.
Input parameter	-
Post condition	-

2293
2294

TEST CASE RESULTS	CHECK / REACTION
Evaluation	Event bit shall be acknowledged in the legacy "Device".
Test passed	a) Master shall define the Process Data in the target system as invalid and the general Event treatment on the SDCI side shall be concluded. b) Event shall be acknowledged; Master-Tester ("Device") shall set its Event bit to 0.
Test failed (examples)	a) Master defines the Process Data in the upper level system as valid or general Event treatment on the SDCI side is not finished. b) Event bit in Master-Tester ("Device") is not acknowledged.
Results	Correct propagation of "PD invalid": <yes/no> <pass/fail> Event acknowledged: <yes/no> <pass/fail>

2295

8.15.8   Master acknowledges PD valid Event and propagates PD

2296

2297   Table 288 defines the test conditions for this test case.

2298   **Table 288 – Master acknowledges PD valid Event and propagates PD**

TEST CASE ATTRIBUTES	IDENTIFICATION / REFERENCE
Identification (ID)	SDCI_TC_0291
Name	TCM_LGCY_MANY_PDVALIDBEHAVIOR
Purpose (short)	Master acknowledges PD_valid Event and propagates PD
Equipment under test (EUT)	Master and Legacy-Master
Test case version	1.0
Category / type	Master protocol test, test to pass (positive testing)
Specification (clause)	[13] 7.2.4.4; [9] A.6.2, A.6.3
Configuration / setup	Master-Tester ("Device V1.0")
TEST CASE	CONDITIONS / PERFORMANCE
Purpose (detailed)	Test if Master acknowledges PD_valid Event and propagates PD correctly.
Precondition	a) Master in communication mode. b) Master-Tester ("Device") is in OPERATE mode and provides invalid Process Data values (PD_invalid).
Procedure	a) Master-Tester ("Device") is prompted to set the Process Data to valid. b) It sets bit 6 (PD_Invalid) of the StatusCode (type 1) octet to 0. c) It then sets the Event bit to 1. d) The Master performs its Event handling. e) The Master acknowledges by writing back the StatusCode octet.
Input parameter	-
Post condition	-
TEST CASE RESULTS	CHECK / REACTION
Evaluation	a) Check if Process Data status is indicating the transition from PD_Invalid to PD_Valid (depending on the upper level system). b) Event bit shall be acknowledged in the Master-Tester ("Device").
Test passed	a) If transition PD_Invalid/PD_Valid is indicated to the upper level system, and b) if Event is acknowledged, and c) if Master-Tester ("Device") set its Event bit to 0.
Test failed (examples)	a) Transition PD_Invalid/PD_Valid is not indicated, or b) Event bit in Master-Tester ("Device") is not acknowledged.
Results	Transition PD_Invalid/PD_Valid is indicated: <yes/no> <pass/fail> Event is acknowledged: <yes/no> <pass/fail>

2299

2300

2301

2302 **8.16 Test report template**

2303 The template is defined by the Master-Tester. The test report shall present at least the results
2304 of the test cases.

2305 **9 Environmental tests**

2306 **9.1 General**

2307 Annex G in [9] defines the environmental tests (EMC) for the SDCI communication part of a
2308 Master/Device system. A passed EMC test is a precondition for a Manufacturer Declaration. It
2309 depends on the particular technology of a Device and the countries of deployment, whether
2310 additional environmental tests are necessary to achieve for example a CE mark for Europe.

2311 **9.2 Product specific standards**

2312 Usually, the product standard for a Master is the IEC 61131-2. For Devices the major product
2313 standard is the IEC 60947-1.

2314 **9.3 EMC tests**

2315 EMC tests in respect to a particular phenomenon are defined in the IEC 61000-4-x series. De-
2316 tails for the execution are described in Annex G.2.4 in [9] and in 4.4 or 4.5 respectively.

2317 **9.4 Test report templates**

2318 **9.4.1 Overview**

2319 Tests are required for the following phenomena:

2320 • Electrostatic discharge (ESD: IEC 61000-4-2)

2321 • Electromagnetic field (HF: IEC 61000-4-3)

2322 • Fast transients (Burst: IEC 61000-4-4)

2323 • Conducted radio frequency (CRF: IEC 61000-4-6)

2324 The SDCI manufacturer declaration of conformity comprises EMC tests according to Annex
2325 G.2.4 in [9]. The following forms or any other document may be used as long as it contains
2326 the same information.

9.4.2 ESD

Figure 14 shows a proposed template for ESD tests.

Project:	
Test Item:	
Responsible Party:	
Tester:	
Applied Standard/Guideline:	
Type of Device:	
Test Location:	
Time Range:	

Test Requirements/Results:				
Type of discharge	Requirement ful-filled?		Achieved ImmunityTest Voltage kV	PerformanceCri-terion
	yes	no		
Contact discharge				
Air discharge				
HCP				
VCP				

Result:

Test requirements are ☐ fulfilled

☐ not fulfilled

Every single requirement must be met.

Remarks:

_____
_____
_____
_____
_____

Enclosures:

_____
_____

_____   _____
Date   Tester's Signature

Figure 14 – Proposed template for ESD tests

2348   **9.4.3   HF**

2349   Figure 15 shows a proposed template for HF tests.

Project:	
Test Item:	
Responsible Party:	
Tester:	
Applied Standard/Guideline:	
Type of Device:	
Test Location:	
Time Range:	

2350

Test Requirements/Results:				
Type of HF Field	Requirement ful-filled?		Achieved Immunity Test Field V/m	Performance Criterion
	yes	no		

2351

Result:
Test requirements are ☐ fulfilled
☐ not fulfilled
Every single requirement must be met.

2352
2353   **Remarks:**
2354   _____
2355   _____
2356   _____
2357   _____
2358   _____
2359
2360   **Enclosures:**
2361   _____
2362   _____
2363
2364
2365   _____   _____
2366   Date   Tester's Signature

2367   **Figure 15 – Proposed template for HF tests**

2368

2369 **9.4.4 Burst**

2370 Figure 16 shows a proposed template for Burst tests.

Project:	
Test Item:	
Responsible Party:	
Tester:	
Applied Standard/Guideline:	
Type of Device:	
Test Location:	
Time Range:	

2371

Test Requirements/Results:				
Type of burst	Requirement ful-filled?		Achieved Immunity Test Voltage kV	Performance Criterion
	yes	no		
power supply lines				
data lines				

2372

Result:
Test requirements are ☐ fulfilled
☐ not fulfilled
Every single requirement must be met.

2373
2374 **Remarks:**
2375 _____
2376 _____
2377 _____
2378 _____
2379 _____
2380
2381 **Enclosures:**
2382 _____
2383 _____
2384
2385
2386
2387 _____   _____
    Date   Tester's Signature

2388 **Figure 16 – Proposed template for Burst tests**

2389

2390   **9.4.5   Conducted RF**

2391   Figure 17 shows a proposed template for conducted RF tests.

Project:	
Test Item:	
Responsible Party:	
Tester:	
Applied Standard/Guideline:	
Type of Device:	
Test Location:	
Time Range:	

2392

Test Requirements/Results:				
Type of Frequency MHz	Requirement fulfilled?		Achieved Immunity Test Voltage V	Performance Criterion
	yes	no		
1326	☐	☐		
2712	☐	☐		
4068	☐	☐		
ISM	☐	☐		

2393

Result:

Test requirements are   ☐   fulfilled

        ☐   not fulfilled

Every single requirement must be met.

2394
2395   **Remarks:**
2396   _____
2397   _____
2398   _____
2399   _____
2400   _____
2401
2402   **Enclosures:**
2403   _____
2404   _____
2405
2406
2407
2408   _____   _____
                 Date   Tester's Signature

2409   **Figure 17 – Proposed template for conducted RF tests**

2410 **9.4.6 Explanation of template terms**

2411 The terms in the templates are defined as follows:

2412 • "Project" means for example the name of an SDCI Device.

2413 • "Test Item" means the name and order number of the particular Device under test.

2414 • "Responsible Party" means the manufacturer or a third party company who takes respon-
2415 sibility for the Device.

2416 • "Tester" means the full name of the test person in charge.

2417 • "Applied standards or guidelines" shall comprise at least [9] and a product standard such
2418 as IEC 60947-1

2419 • "Type of Device" identifies the type of the device thus indicating the appropriate level of
2420 EMC test. Possible types are "open type", "cabinet" or "enclosed type".

2421 • "Test Location" indicates the name and address of the EMC test laboratory.

2422 • "Time Range" indicates the date and the duration of the test.

2423

2424
2425
2426

Annex A
(normative)
Test configurations and test tools

2427 **A.1   Test configurations**

2428 **A.1.1   Overview**

2429 The test cases for the physical layer tests and data link layer tests can be executed with the
2430 help of

2431 • A variable power supply between 20 V and 30 V

2432 • Discrete components such as capacitors and resistors according to the particular test case

2433 • A voltage meter and a current meter

2434 • An oscilloscope for Wake-up pulses and eye-diagrams

2435 • A logic analyzer for message timings

2436 • A line-monitor to record protocol sequences

2437

2438 **A.1.2   Measurement circuits for the physical layer tests**

2439 **A.1.2.1   Measurement of static parameters**

2440 Figure A.1 shows the measurement circuit diagram for static parameters with the help of a
2441 voltage meter.
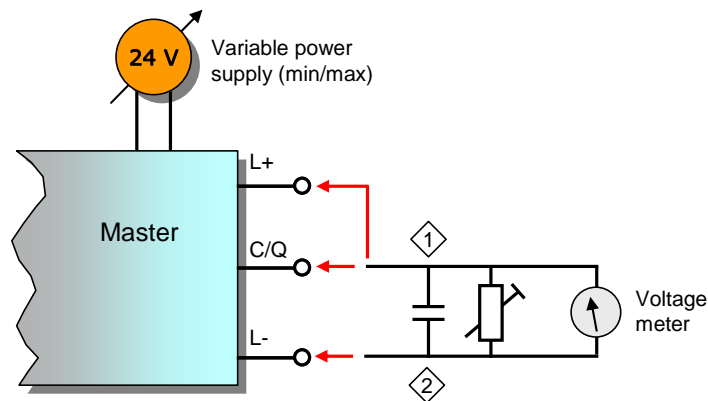
2442

2443 **Figure A.1 – Measurement circuit diagram for static parameters**

2444 **A.1.2.2   Measurement of dynamic parameters**

2445 Figure A. shows the measurement circuit diagram for dynamic parameters with the help of an
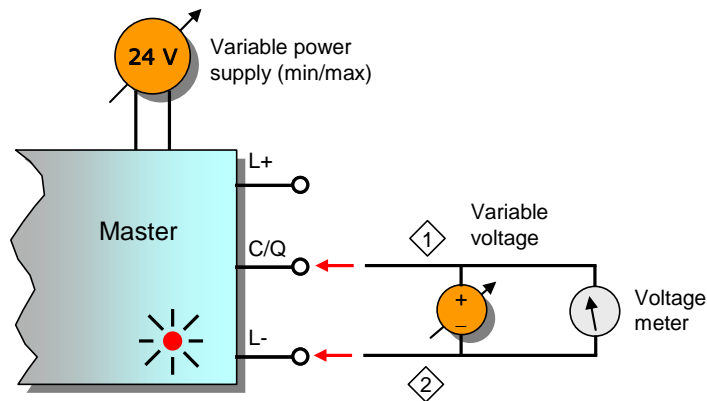2446 oscilloscope.
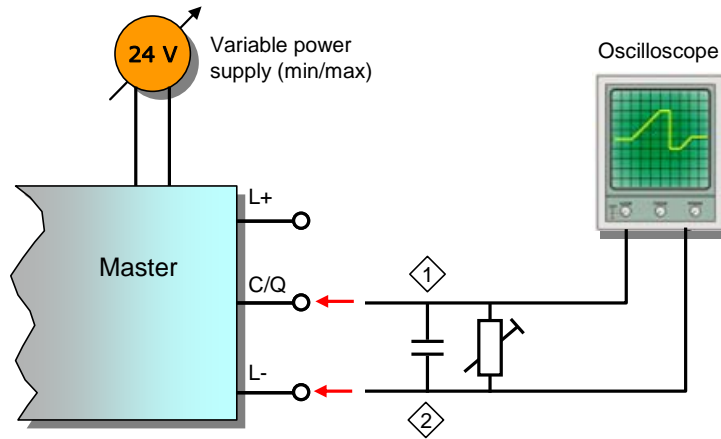
2447

2448 **Figure A.2 – Measurement circuit diagram for dynamic parameters**

2449 **A.1.2.3 Measurement of Master input thresholds**

2450 Figure A.3 shows the measurement circuit diagram for Master input thresholds with the help
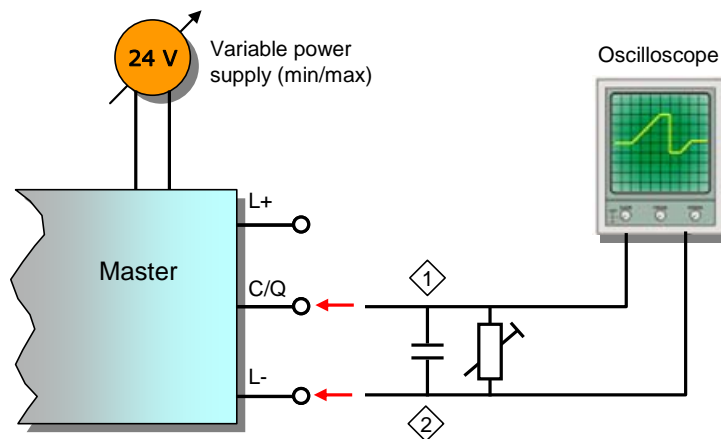2451 of an auxiliary variable voltage and a voltage meter.

2452

2453 **Figure A.3 – Measurement circuit diagram for input thresholds**

2454 **A.1.2.4 Measurement of Wake-up requests (high)**

2455 Figure A.4 shows the measurement circuit diagram for Wak-up requests with the help of an
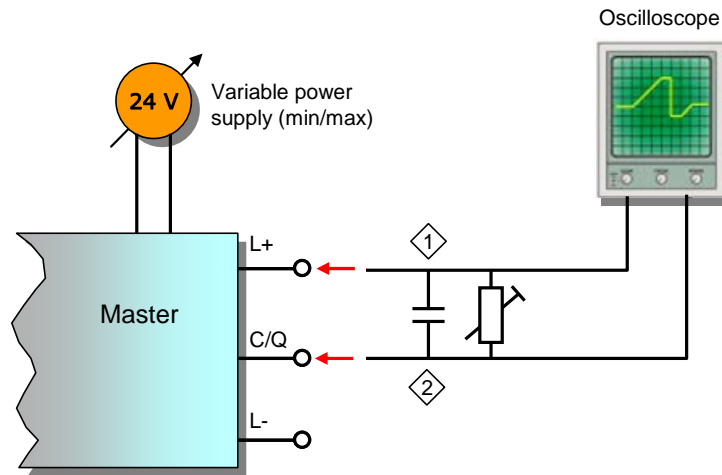2456 oscilloscope if the steady state level (of a Device) is high.

2457

2458 **Figure A.4 – Measurement circuit diagram for Wake-up requests (high)**

A.1.2.5   Measurement of Wake-up requests (low)

Figure A.5 shows the measurement circuit diagram for Wak-up requests with the help of an oscilloscope if the steady state level (of a Device) is low.

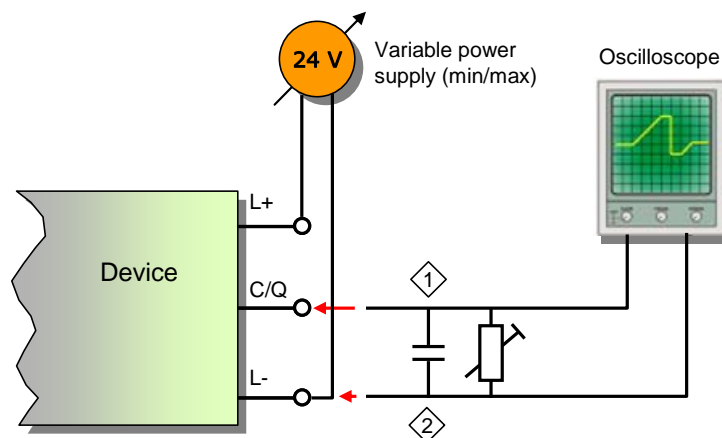**Figure A.5 – Measurement circuit diagram for Wake-up requests (low)**

A.1.2.6   Measurement of dynamic parameters (Device output)

Figure A.6 shows the measurement circuit diagram for Device output signals with the help of an oscilloscope.

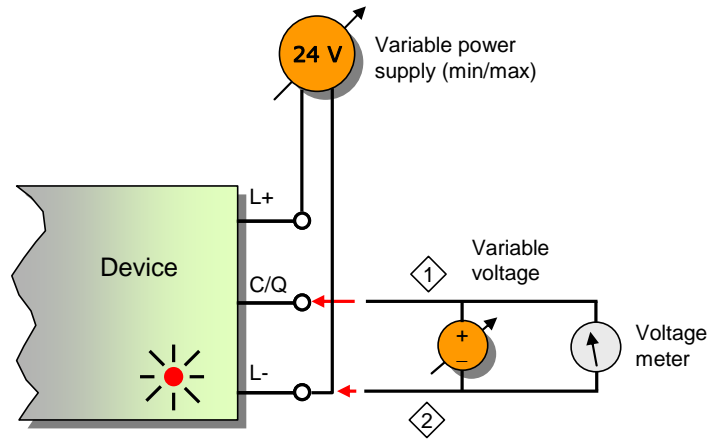**Figure A.6 – Measurement circuit diagram for dynamic parameters (output)**

A.1.2.7   Measurement of dynamic parameters (Device input threshold)

Figure A.7 shows the measurement circuit diagram for Device input thresholds with the help of an auxiliary variable voltage and a voltage meter.
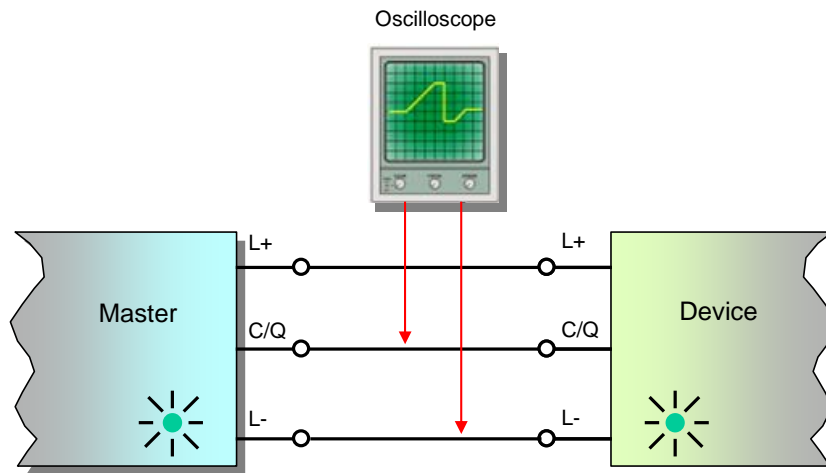
2472

2473   **Figure A.7 – Measurement circuit diagram for input thresholds**

2474   **A.1.2.8   Measurement of Wake-up requests (timing)**

2475   Figure A.8 shows the measurement circuit diagram for the timing of Wake-up requests with
2476   the help of an oscilloscope.
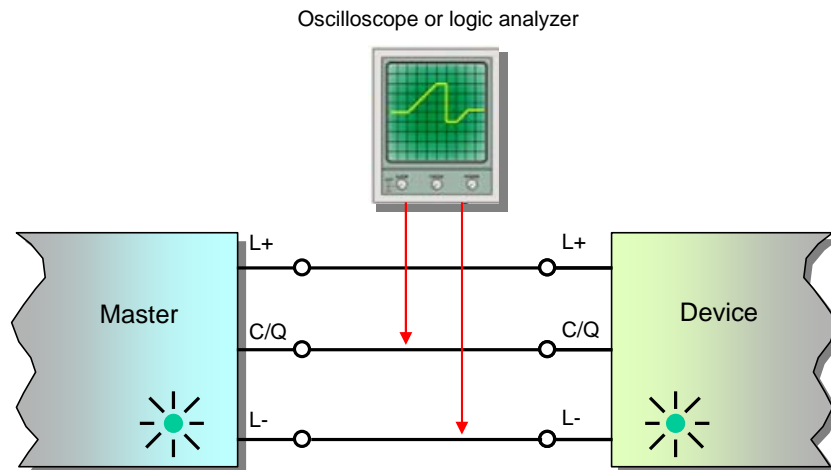
2477

2478   **Figure A.8 – Measurement circuit diagram for Wake-up request timings**

2479   **A.1.2.9   Measurement of message timings**

2480   Figure A.9 shows the measurement circuit diagram for the timing of messages with the help of
2481   an oscilloscope or a logic analyzer.

Oscilloscope or logic analyzer

2482

Figure A.9 – Measurement circuit diagram for message timings

2484

A.1.3   Protocol recording via a Line-Monitor

Usually the test cases assume that a test passed if data are written or read in the expected manner. Sometimes it is easier to observe the protocol steps with the help of a Line-Monitor that lists the Master request messages and the Device response messages in a convenient manner on the screen of a laptop.
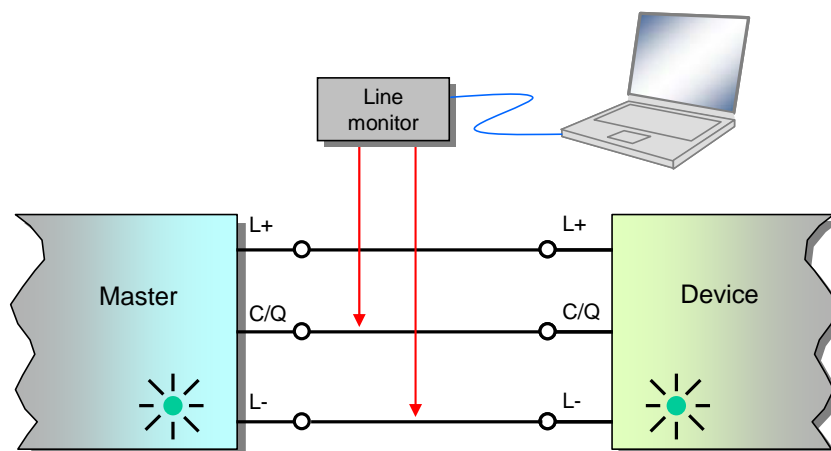
2490

Figure A.10 – Message recording via a Line-Monitor

2492

A.2   Test tools

A.2.1   Overview

In order to facilitate the tests of SDCI Master and Device and to ensure highest levels of con-formity, several tools and the associated requirements are defined. These tools shall be type-approved by the organization mentioned in Annex D prior to any conformity testing for a manufacturer declaration.

A.2.2   Device-Tester

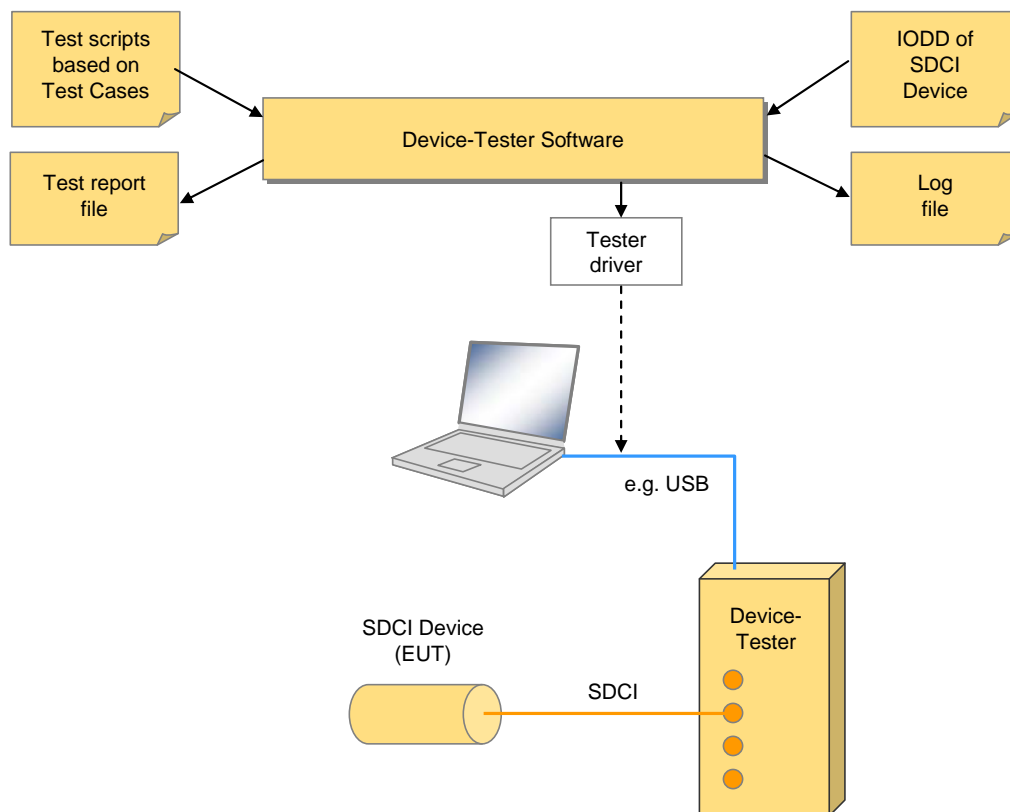Figure A. shows the principle of a Device-Tester system comprising

2501   • A Device-Tester hardware with at least one SDCI port, which can be a modified standard
2502   SDCI Master with an adequate communication interface to a personal computer,

2503   • A personal computer supporting the communication interface of the Device-Tester hard-
2504   ware,

2505   • A Device-Tester software running on that personal computer serving as a control and
2506   monitorring program for the Device-Tester hardware,

2507   • An SDCI Device, the "equipment under test" (EUT) that shall be tested for conformity.

2508

2509   **Table A.1 – System requirements for the Device-Tester**

Requirement	Description
SR1	The Device-Tester system shall execute and evaluate the test cases defined in this specification. This can include some functions or behaviour not defined in the SDCI specification, but is necessary to run the EUT into a specific state, e.g. generation of checksum errors.
SR2	The result of each test case and also additional information about the test execution shall be reported to the user (test report, log file). The user shall be able to store and print this information.
SR3	The conformity test cases shall be secured against manipulation.
SR4	Optional requirement: the Device-Tester can interpret a valid IODD and generate different settings which are required for the conformity test. In case of absence of the IODD file there shall be a possibility to edit the settings manually.

2510

2511

2512   **Figure A.11 – Principle of a Device-Tester system**

2513

2514   **A.2.3   IODD checker**

2515   The IODD checker is a free downloadable software tool for personal computers from the web
2516   server of the organization mentioned in Annex D. It formally checks the IODD for a particular
2517   Device against the XML schema defined in [3].

2518   **A.2.4   Master-Tester**

2519   Figure A.12 shows the principle of a Master-Tester system comprising

2520   • A Master-Tester hardware with any communication interface to a personal computer, e.g.
2521   USB (Universal Serial Bus),

2522   • A personal computer supporting the communication interface of the Device-Tester hard-
2523   ware and a communication interface to an upper level system such as a fieldbus,

2524   • A Master-Tester software running on that personal computer serving as a control and
2525   monitorring program for the Master-Tester hardware,

2526   • An SDCI Master, the "equipment under test" (EUT) that shall be tested for conformity. This
2527   SDCI Master usually provides a communication interface to an upper level system such as
2528   a fieldbus

2529
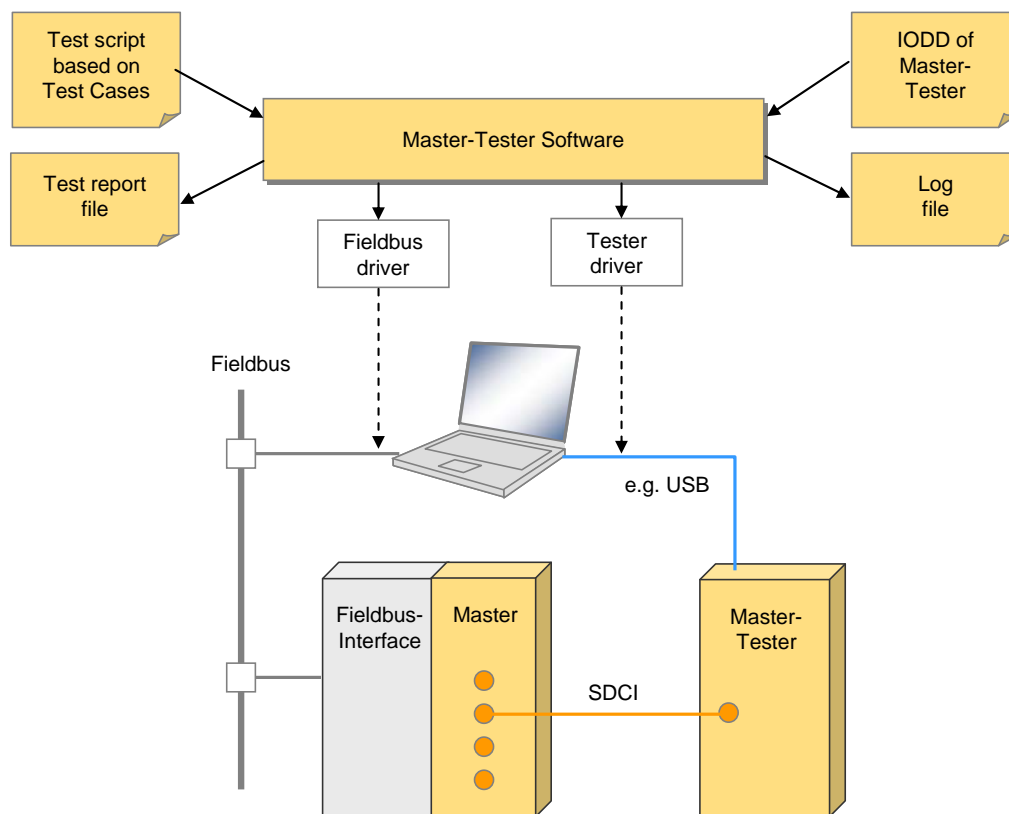
2530

2531   **Figure A.12 – Principle of a Master-Tester system**

2532   Table A.2 lists the system requirements for the approval of a Master-Tester system.

2533   **Table A.2 – System requirements for the Master-Tester**

Requirement	Description
SR1	The test system shall execute and evaluate the test cases defined in this specification
SR2	It should be possible to define, execute and evaluate additional customer specific test cases.

Requirement	Description
SR3	The result of every test case and also additional information about test execution shall be reported to the user (test report, log file). The user shall be able to store and print this information.
SR4	The conformity test cases defined in this specification and also the user defined test cases should be coded in a script file (XML or TCL).
SR5	The conformity test script file shall be provided by test system supplier.
SR6	The conformity test script file shall be secured against manipulation.
SR7	For the sake of an approval of the test system, it shall have a PROFIBUS communication path between EUT (SDCI Master) and the personal computer.
SR8	A user shall be able to adapt the test system by other communication paths (other standard field bus, proprietary communication).
SR9	A user should be able to control and monitor the functionality of the Master-Tester by other applications such as existing test suites.
SR10	The test system manual shall be provided as PDF document. The user shall be able to read this document via freely available Adobe Reader software.
SR11	The Master-Tester software can be used to download new firmware updates to the Master-Tester. The download process can not be interrupted by the user. The software can not verify the content of the downloaded file. The user is responsible to use a valid and correct Master-Tester firmware update file.
SR12	Optional requirement: Master-Tester software can interpret a valid ("Master-Tester") IODD and send some settings to the Master-Tester. The Master-Tester uses these settings and simulates the "Device" described in the IODD.
SR13	The timeout for the time between entering the PREOPERATE state and leaving this state shall be adjustable in the Master tester

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2535   Table A.3 lists the functional requirements for the approval of a Master-Tester system.

2536   **Table A.3 – Functional requirements for the excution of test cases**

Requirement	Description
FR1	Usecase 1: Simulation of an SDCI Device
FR2	Usecase 2: Error behaviour (stack-Errors like checksum errors, invalid timing and application errors such as creation of ErrorCodes)
FR3	Usecase 3: Creation of status information (number of transmitted messages by the master, number erroneous messages)
FR4	Usecase 4: Stand-alone device for EMC tests
FR5	Hardware EMC Requirements: - IEC61000-4-4 (Burst) +/- 2kV Crit. A; +/- 4kV Crit. B - IEC61000-4-6 (RF) 13V Crit. A
FR6	Hardware Requirements: - SDCI interface - Slew Rate > 200ns - Signaling LED or display: error counter (with active reset) - Power LED - SDCI communication LED - USB interface V2.0 (API) - Power supply via SDCI (optional USB or battery or external supply) - Non-volatile storage of configuration (maximum 1024 octets) - Monitoring (optional as independent tool) - Trigger output (24V/10mA)
FR7	Configuration areas: - Device configuration (MinCycleTime, F-sequence Capability, RevisionID, ProcessDataIn, ProcessDataOut, VendorID, DeviceID, FunctionID, transmission rate) - IO data configuration (Input data adjustable, mirror output data onto input data, increment input data) - Event configuration (maximum 6 events, unique, cyclic, depending on output) - ISDU configuration (all Indices) - Stack configuration

Requirement	Description
FR8	SDCI functionality: - all transmission rates (4,8; 38,4; 230,4 kbit/s) - SIO-Mode - All valid F-sequence types (TYPE_0, TYPE_1_1, TYPE_1_2, TYPE_1_V, TYPE_2_1, TYPE_2_2, TYPE_2_3, TYPE_2_4, TYPE_2_5, TYPE_2_6, TYPE_2_V) - All specified IO configurations - All specified ISDU Indices - Direct Parameter page (Index 0 and 1)
FR9	Trigger incidences: - Begin of start-up sequence (Wake-up is detected) - New Process Data cycle started - New SDCI F-sequence detected - Start of a new ISDU request detected - New ISDU response is generated - An Event is generated - Errors (checksum, parity, frame, protocol)

2537

Annex B
(normative)
Supplement to the legacy specification V1.0

B.1   General

The definitions in [9] are more comprehensive than the definitions in the predecessor [13]. In order to establish a reliable interoperation of legacy Master and Devices with their SDCI counterparts it is necessary to supplement the predecessor specification [13] by a few clarifications.

B.2   Legacy-Master power-on driver capability

If the actual power-on driver capability does not meet the requirements defined in [9], the measured value(s) of TC_0002 (5.2.2) shall be documented in the user manual of the Legacy-Master.

B.3   Legacy-Device power-on current consumption

If the actual power-on current consumption does not meet the requirements defined in [9], the measured value(s) of TC_0012 (5.3.2) shall be documented in the user manual of the Legacy-Device.

B.4   ISDU request and response abort

The "abort" feature is not specifically defined in [13]. All Legacy-Devices shall have implemented this behavior, which is tested in TC_0067 (6.5.17) and TC_0068 (6.5.18).

B.5   "Device 1.1" connected to a "Master 1.0"

A manufacturer or vendor of a Device without backward compatibility shall document the behavior of the Device in case it will be connected to a "Master 1.0" (6.8.2.2).

B.6   Maximum MasterCycleTime

The maximum MasterCycleTime for both Master and Legacy-Master is 134 ms. This limit is checked in TC_0089 (6.9.1).

B.7   Maximum MinCycleTime

The maximum MinCycleTime for both Device and Legacy-Device is 134 ms. This limit is checked in TC_0090 (6.9.2).

B.8   Write access to reserved system commands

A Write access to reserved system commands within a Legacy-Device returns a negative response: PAR_VALOUTOFRNG (0x8030). TC_0104 (6.10.2) is affected.

B.9   Time-out for Write access to system commands

Legacy-Devices shall respond within 5 s. TC_0105 (6.10.3) is affected.

2571   **B.10   Text string length for Application Specific Tag**

2572   Existing Legacy-Devices are permitted to have text string length <16 octets. In this case, the
2573   manufacturer or vendor shall document the text string length in the user manual. It is highly
2574   recommended to provide a minimum of 16 octets. TC_0122 (6.10.19) and TC_0123 (6.10.20)
2575   are affected.

2576   **B.11   Write access with invalid length**

2577   A Write access to reserved system commands within a Legacy-Device returns a negative re-
2578   sponse: PAR_VALOUTOFRNG (0x8030). TC_0141 (6.10.33) and TC_0142 (6.10.34) are af-
2579   fected.

2580   **B.12   IODD "reset to factory settings" verification**

2581   It is highly recommended for Legacy-Devices to show the behavior defined in [9]. Deviations
2582   shall be documented in the user manual. TC_0155 (7.3.5) is affected.

2583   **B.13   Fallback in PREOPERATE**

2584   If the Master does not support the Fallback through a command from the upper level system such as a
2585   fieldbus, the manufacturer or vendor of the Device or Legacy-Device respectively shall document the
2586   restriction or behavior in the user manual. TC_0213 (8.8.1) and TC_0214 (8.8.2) are affected.

2587

2588 **Annex C**
2589 (normative)
2590 **Listing of test cases**

2591 **C.1 Listing of test cases sorted by IDs**

2592 Table C.1 shows the Test cases and its references.

2593 **Table C.1 – Test cases sorted by IDs**

SDCI TC ID	TC Name	Reference
TC_0001	TCM_PHYL_INTF_ISM	Table 9
TC_0002	TCM_PHYL_INTF_ISIRM	Table 10
TC_0003	TCM_PHYL_INTF_ILLM	Table 11
TC_0004	TCM_PHYL_INTF_VRESHIGH	Table 12
TC_0005	TCM_PHYL_INTF_VRESLOW	Table 13
TC_0006	TCM_PHYL_INTF_VTHHM	Table 14
TC_0007	TCM_PHYL_INTF_VTHLM	Table 15
TC_0008	TCM_PHYL_INTF_VHYSM	Table 16
TC_0009	TCM_PHYL_INTF_IQPKHM	Table 17
TC_0010	TCM_PHYL_INTF_IQPKLM	Table 18
TC_0011	TCD_PHYL_INTF_ISD	Table 19
TC_0012	TCD_PHYL_INTF_ISIRD	Table 20
TC_0013	TCD_PHYL_INTF_VRESHIGH	Table 21
TC_0014	TCD_PHYL_INTF_VRESLOW	Table 22
TC_0015	TCD_PHYL_INTF_IQQD	Table 23
TC_0016	TCD_PHYL_INTF_VTHHD	Table 24
TC_0017	TCD_PHYL_INTF_VTHLD	Table 25
TC_0018	TCD_PHYL_INTF_VHYSD	Table 26
TC_0019	TCD_PHYL_INTF_IQHD	Table 27
TC_0020	TCD_PHYL_INTF_IQLD	Table 28
TC_0021	TCM_PHYL_INTF_IQWUH	Table 29
TC_0022	TCM_PHYL_INTF_TWUH	Table 30
TC_0023	TCM_PHYL_INTF_IQWUL	Table 31
TC_0024	TCM_PHYL_INTF_TWUL	Table 32
TC_0025	TCD_PHYL_INTF_TWUH	Table 33
TC_0026	TCD_PHYL_INTF_TWUL	Table 34
TC_0027	TCD_PHYL_INTF_TRENHIGH	Table 35
TC_0028	TCD_PHYL_INTF_TRENLOW	Table 36
TC_0029	TCD_PHYL_INTF_TRDL	Table 37
TC_0030	TCM_PHYL_INTF_BITEYEMAXLOAD	Table 38
TC_0031	TCM_PHYL_INTF_BITEYEMINLOAD	Table 40
TC_0032	TCM_PHYL_INTF_UARTEYEMAXLOAD	Table 42
TC_0033	TCM_PHYL_INTF_UARTEYEMINLOAD	Table 44
TC_0034	TCD_DLPC_STUP_CYCTIME	Table 47
TC_0035	TCD_DLPC_STUP_STUPOPER1	Table 48

TC_0036	TCD_DLPC_STUP_STUPOPER2	Table 49
TC_0037	TCD_DLPC_OPER_OPERSTUP1	Table 50
TC_0038	TCD_DLPC_OPER_OPERSTAR2	Table 51
TC_0039	TCD_DLPC_PROP_READDPP1	Table 52
TC_0040	TCD_DLPC_PROP_WRITEDPP1	Table 54
TC_0041	TCD_DLPC_PROP_SHORTMESSAGE	Table 55
TC_0042	TCD_DLPC_PROP_WRITECOLL	Table 56
TC_0043	TCD_DLPC_PROP_SIMRESET	Table 57
TC_0044	TCD_DLPC_PROP_MSEQFAULT	Table 58
TC_0045	TCD_DLPC_OPER_READ	Table 59
TC_0046	TCD_DLPC_OPER_WRITE	Table 60
TC_0047	TCD_DLPC_OPER_NEGWRITE	Table 61
TC_0048	TCD_DLPC_OPER_WRITECOLL	Table 62
TC_0049	TCD_DLPC_OPER_SIMRESET	Table 63
TC_0051	TCD_DLPC_OPER_WRONGMSEQTYPE	Table 64
TC_0052	TCD_DLPC_ISDU_AVAILMSEQCAP	Table 65
TC_0053	TCD_DLIC_ISDU_IDLEBUSYCHECK	Table 66
TC_0054	TCD_DLIC_ISDU_READINDEX8	Table 67
TC_0055	TCD_DLIC_ISDU_READ8EXTLENGTH	Table 68
TC_0056	TCD_DLIC_ISDU_WRITE8	Table 69
TC_0057	TCD_DLIC_ISDU_READ8RESERVED	Table 70
TC_0058	TCD_DLIC_ISDU_READ8NOSUBINDEX	Table 71
TC_0059	TCD_DLIC_ISDU_READ16	Table 72
TC_0060	TCD_DLIC_ISDU_WRITE16	Table 73
TC_0061	TCD_DLIC_ISDU_READ16RESERVED	Table 74
TC_0062	TCD_DLIC_ISDU_READ16NOSUBINDEX	Table 75
TC_0063	TCD_DLIC_ISDU_WRITE8LENOVERRUN	Table 76
TC_0064	TCD_DLIC_ISDU_WRITE8WRONGLEN	Table 77
TC_0065	TCD_DLIC_ISDU_WRITE8WRONGCHECKSUM	Table 78
TC_0066	TCD_DLIC_ISDU_WRITE8ROINDEX	Table 79
TC_0067	TCD_DLIC_ISDU_ABORTREADREQ	Table 80
TC_0068	TCD_DLIC_ISDU_ABORTREADRESP	Table 81
TC_0069	TCD_DLIC_EVNT_OPERSINGLEEVENT	Table 82
TC_0070	TCD_DLIC_EVNT_PROPSINGLEEVENT	Table 83
TC_0071	TCD_DLIC_EVNT_OPEREVENTCLEAR	Table 84
TC_0072	TCD_DLIC_EVNT_OPERCOMMINTERRUPT	Table 85
TC_0073	TCD_DLIC_EVNT_OPERPOWERINTERRUPT	Table 86
TC_0074	TCD_DLIC_EVNT_OPERAPPEARDISAPPEAR	Table 87
TC_0075	TCD_DLIC_EVNT_OPERMULTEVENT	Table 88
TC_0076	TCD_DLIC_EVNT_OPERSHORTEVENT	Table 89
TC_0077	TCD_APPS_DSUP_NOFLAG	Table 90
TC_0078	TCD_APPS_DSUP_VIADOWNLOADSTORE	Table 91
TC_0079	TCD_APPS_DSUP_VIADOWNLOADSTORENOWRITE	Table 92
TC_0080	TCD_APPS_DSUP_VIALOCALCHANGE	Table 93
TC_0081	TCD_APPS_DSUP_PARABREAKABORT	Table 94

TC_0082	TCD_APPS_DSDN_PARAMODIFICATION	Table 95
TC_0083	TCD_APPS_DSDN_FACTORYRESET	Table 96
TC_0084	TCD_APPS_DSDN_PARABREAKABORT	Table 97
TC_0085	TCD_DLIC_COMP_STARTUP	Table 98
TC_0086	TCD_DLIC_COMP_TYPE1INTERLEAVE	Table 99
TC_0087	TCD_DLIC_COMP_PDINVALIDEVENT	Table 100
TC_0089	TCD_DLPC_STDP_MASTERCYCLETIME	Table 101
TC_0090	TCD_DLPC_STDP_MINCYCLETIME	Table 102
TC_0091	TCD_DLPC_STDP_MSEQCAPABILITY	Table 103
TC_0092	TCD_DLPC_STDP_REVISIONID	Table 104
TC_0093	TCD_DLPC_STDP_PDIN	Table 105
TC_0094	TCD_DLPC_STDP_PDOUT	Table 106
TC_0095	TCD_DLPC_STDP_VENDORID	Table 107
TC_0096	TCD_DLPC_STDP_DEVICEID	Table 108
TC_0097	TCD_DLPC_STDP_FUNCTIONID	Table 109
TC_0100	TCD_DLPC_STDP_READRESPAR	Table 110
TC_0101	TCD_DLPC_STDP_WRITERESPAR	Table 111
TC_0104	TCD_DLIC_DEFP_SYSCMDRES	Table 112
TC_0105	TCD_DLIC_DEFP_SYSCMDIMP	Table 113
TC_0107	TCD_DLIC_DEFP_DSINDEX	Table 114
TC_0108	TCD_DLIC_DEFP_DSRECORD	Table 115
TC_0109	TCD_DLIC_DEFP_ACCESSLOCKSVAL	Table 116
TC_0110	TCD_DLIC_DEFP_ACCESSLOCKSINVAL	Table 117
TC_0111	TCD_DLIC_DEFP_PROFILCHARAC	Table 118
TC_0112	TCD_DLIC_DEFP_PDINDESC	Table 119
TC_0113	TCD_DLIC_DEFP_PDOUTDESC	Table 120
TC_0114	TCD_DLIC_DEFP_VENDORNAM	Table 121
TC_0115	TCD_DLIC_DEFP_VENDORTEXT	Table 122
TC_0116	TCD_DLIC_DEFP_PRODUCTNAM	Table 123
TC_0117	TCD_DLIC_DEFP_PRODUCTID	Table 124
TC_0118	TCD_DLIC_DEFP_PRODUCTTEXT	Table 125
TC_0119	TCD_DLIC_DEFP_SERNUM	Table 126
TC_0120	TCD_DLIC_DEFP_HARDREV	Table 127
TC_0121	TCD_DLIC_DEFP_FIRMREV	Table 128
TC_0122	TCD_DLIC_DEFP_TAGVALID	Table 129
TC_0123	TCD_DLIC_DEFP_TAGINVALID	Table 130
TC_0124	TCD_DLIC_DEFP_ERRCOUNT	Table 131
TC_0128	TCD_DLIC_DEFP_DEVSTAT	Table 132
TC_0129	TCD_DLIC_DEFP_DETAILDEVSTAT	Table 133
TC_0130	TCD_DLIC_DEFP_DETAILDEVSTATINACTIVE	Table 134
TC_0131	TCD_DLIC_DEFP_DETAILDEVSTATACTIVE	Table 135
TC_0132	TCD_DLIC_DEFP_PDIN	Table 136
TC_0133	TCD_DLIC_DEFP_PDOUT	Table 137
TC_0134	TCD_DLIC_DEFP_OFFTIMEVALID	Table 138
TC_0135	TCD_DLIC_DEFP_OFFTIMEINVALID	Table 139

TC_0136	TCD_DLIC_DEFP_PROFILEPARREAD	Table 140
TC_0137	TCD_DLIC_DEFP_PROFILEPARWRITE	Table 141
TC_0140	TCD_DLIC_DEFP_WRITETOREADONLY	Table 142
TC_0141	TCD_DLIC_DEFP_WRITETOOSHORT	Table 143
TC_0142	TCD_DLIC_DEFP_WRITETOOLONG	Table 144
TC_0143	TCD_DSBP_APPL_BPDOWNLOAD	Table 145
TC_0144	TCD_DSBP_APPL_BPBREAKCMD	Table 146
TC_0145	TCD_DSBP_APPL_BPBREAKRESET	Table 147
TC_0147	TCD_DSBP_APPL_BPBREAK2DOWNLOADS	Table 148
TC_0148	TCD_DSBP_APPL_BPBREAKLOCALLOCK	Table 149
TC_0149	TCD_IODD_PARV_IDENT	Table 151
TC_0150	TCD_IODD_PARV_COMPROFILE	Table 152
TC_0151	TCD_IODD_PARV_READVERIFY	Table 153
TC_0152	TCD_IODD_PARV_WRITEVERIFY	Table 154
TC_0155	TCD_IODD_PARV_FACTORYSETTINGS	Table 155
TC_0156	TCD_IODD_PARV_ACCESSLOCK	Table 156
TC_0157	TCD_IODD_PARV_INDEXCONSISTENT	Table 157
TC_0158	TCM_ PHYL_TIME_TDMT	Table 158
TC_0159	TCM_ PHYL_TIME_TDWU	Table 159
TC_0160	TCM_ PHYL_TIME_NUMOFWURQS	Table 160
TC_0161	TCM_ PHYL_TIME_TSD	Table 161
TC_0162	TCM_ PHYL_TIME_TINITCYC	Table 162
TC_0163	TCM_ PHYL_TIME_MASTERCYCLETIME	Table 163
TC_0164	TCM_ PHYL_TIME_MASTERCYCLETIMEREAL	Table 164
TC_0165	TCM_ PHYL_TIME_DEVRESPTIMES	Table 165
TC_0166	TCM_ PHYL_TIME_UARTT2	Table 166
TC_0167	TCM_ PHYL_TIME_UARTT1	Table 167
TC_0168	TCM_ DLPD_CYCC_TYPE21BIT8IN	Table 168
TC_0169	TCM_ DLPD_CYCC_TYPE22BIT16IN	Table 169
TC_0170	TCM_ DLPD_CYCC_TYPE23BIT8OUT	Table 170
TC_0171	TCM_ DLPD_CYCC_TYPE24BIT16OUT	Table 171
TC_0172	TCM_ DLPD_CYCC_TYPE25BIT8INBIT8OUT	Table 172
TC_0173	TCM_ DLPD_CYCC_TYPE1BIT256IN	Table 173
TC_0174	TCM_ DLPD_CYCC_WATCHDOG	Table 174
TC_0175	TCM_ DLPD_CYCC_CHECKSUMWRONG	Table 175
TC_0176	TCM_ DLPD_CYCC_MIRROREDPD	Table 176
TC_0177	TCM_ DLPD_CYCC_PDINVALID	Table 177
TC_0178	TCM_ DLPD_CYCC_PDVALID	Table 178
TC_0179	TCM_DLOD_CYCC_TYPE2VPDXOD1	Table 179
TC_0180	TCM_DLOD_CYCC_TYPE2VPDXOD2	Table 180
TC_0181	TCM_DLOD_CYCC_TYPE2VPDXOD8	Table 181
TC_0182	TCM_DLOD_CYCC_TYPE2VPDXOD32	Table 182
TC_0183	TCM_DLST_CHCK_COMPARAM	Table 183
TC_0184	TCM_DLST_CHCK_VIDDID	Table 184
TC_0185	TCM_DLST_CHCK_V10VIDDID	Table 185

TC_0186	TCM_DLST_CHCK_NONCONFVIDDID	Table 186
TC_0187	TCM_DLST_CHCK_CONFVIDDID	Table 187
TC_0188	TCM_DLST_CHCK_OVERDIDOK	Table 188
TC_0189	TCM_DLST_CHCK_OVERDIDNOK	Table 189
TC_0190	TCM_DLST_CHCK_OVERRIDNOK	Table 190
TC_0192	TCM_DLST_CHCK_VIDDIDNONCONFIG	Table 191
TC_0193	TCM_DLST_CHCK_VIDDIDCONFIG	Table 192
TC_0194	TCM_DLST_CHCK_DIDWRONG	Table 193
TC_0195	TCM_DLST_CHCK_SNWRONG	Table 194
TC_0196	TCM_DLST_CHCK_SNRIGHT	Table 195
TC_0198	TCM_DLOD_PREP_SNCORRECT	Table 196
TC_0199	TCM_DLOD_PREP_SNNONCONFIG	Table 197
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TC_0204	TCM_DLOD_PREP_TYPE1VREADOD8	Table 202
TC_0205	TCM_DLOD_PREP_TYPE1VREADOD32	Table 203
TC_0206	TCM_DLOD_PREP_TYPE0WRITEOD1	Table 204
TC_0207	TCM_DLOD_PREP_TYPE12WRITEOD2	Table 205
TC_0208	TCM_DLOD_PREP_TYPE1VWRITEOD8	Table 206
TC_0209	TCM_DLOD_PREP_TYPE1VWRITEOD32	Table 207
TC_0210	TCM_DLOD_OPER_TYPE0READOD1	Table 208
TC_0211	TCM_DLOD_OPER_TYPE0WRITEOD1	Table 209
TC_0212	TCM_DLOD_OPER_TYPE12WRITEOD2	Table 210
TC_0213	TCM_DLFB_PROP_OK	Table 211
TC_0214	TCM_DLFB_PROP_FAILS	Table 212
TC_0215	TCM_DLFB_OPER_OK	Table 213
TC_0216	TCM_DLFB_OPER_FAILS	Table 214
TC_0217	TCM_DLCC_RTRY_CHCKSUMWRONG	Table 215
TC_0218	TCM_DLCC_RTRY_CHCKSUMWRONGRESTART	Table 216
TC_0219	TCM_DLCC_RTRY_NORESPCHCKSUMRIGHT	Table 217
TC_0220	TCM_DLCC_RTRY_NORESPRESTART	Table 218
TC_0221	TCM_DLCC_RTRY_MAXWURQSUCCESS	Table 219
TC_0222	TCM_DLCC_RTRY_MAXWURQNOSUCCESS	Table 220
TC_0223	TCM_ALIC_AERR_WRITEREJECT	Table 221
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TC_0226	TCM_ALIC_AERR_WRITETEMPUNAV	Table 224
TC_0227	TCM_ALIC_AERR_WRITEINDEXTEMPANAVLC	Table 225
TC_0228	TCM_ALIC_AERR_WRITEINDEXTEMPANAVDC	Table 226
TC_0229	TCM_ALIC_AERR_WRITEINDEXRO	Table 227
TC_0230	TCM_ALIC_AERR_WRITEINVALIDLEN	Table 228
TC_0231	TCM_ALIC_AERR_WRITEPARAMOUTOFRNG	Table 229
TC_0232	TCM_ALIC_AERR_WRITEPARAMABOVELIMIT	Table 230

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TC_0234	TCM_ALIC_AERR_WRITEPARAMINVALID	Table 232
TC_0235	TCM_ALIC_AERR_WRITEDEVICEAPPFAULT	Table 233
TC_0236	TCM_ALIC_AERR_WRITEDEVICEAPPNOTREADY	Table 234
TC_0237	TCM_ALIC_AERR_WRITERESERVEDINDEX	Table 235
TC_0238	TCM_ALIC_AERR_WRITERESERVEDINDEXNOISDU	Table 236
TC_0239	TCM_ALIC_DERR_WRITENOBUSY	Table 237
TC_0240	TCM_ALIC_DERR_WRITEAFTERBUSYTIMEOUT	Table 238
TC_0241	TCM_ALIC_DERR_ILLSERVICECODE	Table 239
TC_0242	TCM_ALIC_DERR_WRONGCHECKSUM	Table 240
TC_0244	TCM_ALIC_DERR_WRITERESERVEDDL	Table 241
TC_0245	TCM_ALIC_LIMT_WRITEMINDATALENGTH	Table 243
TC_0246	TCM_ALIC_LIMT_WRITEMAXDATALENGTH	Table 244
TC_0248	TCM_ALIC_LIMT_READMAXDATALENGTH	Table 245
TC_0249	TCM_ALIC_LIMT_WRITEINDEX8NOSUBINDEX	Table 246
TC_0250	TCM_ALIC_LIMT_WRITEINDEX8SUBINDEX8	Table 247
TC_0251	TCM_ALIC_LIMT_WRITEINDEX16SUBINDEX8	Table 248
TC_0252	TCM_ALIC_LIMT_IMMEDIATERESPNOBUSY	Table 249
TC_0253	TCM_ALIC_LIMT_IMMEDIATERESPWITHBUSY	Table 250
TC_0254	TCM_ALIC_LIMT_WRITEMAXSERVICELEN15	Table 251
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TC_0259	TCM_ALIC_EVNT_NODETAILSPARAMERROR	Table 256
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TC_0261	TCM_ALIC_EVNT_WITHDETAILSSINGLEEVENT	Table 258
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TC_0264	TCM_ALIC_EVNT_WRITEISDUWITH EVENT	Table 261
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TC_0266	TCM_ALIC_EVNT_WRITEISDUWITH EVENTDETAILS	Table 263
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TC_0273	TCM_ALIC_STOR_PROPDLDDESPITEULDREQ	Table 270
TC_0274	TCM_ALIC_STOR_OPERDLDDESPITEULDREQ	Table 271
TC_0275	TCM_ALIC_STOR_PROPDLDPARAMMISMATCH	Table 272
TC_0276	TCM_ALIC_STOR_STORAGESIZE	Table 273
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TC_0280	TCM_ALIC_STOR_DSLOCKED	Table 277
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TC_0283	TCM_ALIC_STOR_ULDUPONPORTCONFIG	Table 280
TC_0284	TCM_ALIC_STOR_CONSISTENCYCHECK	Table 281
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2596   **Annex D**
2597   (informative)
2598   **Information on conformity testing of SDCI**

2599   Information about testing Masters and Devices for conformity with IEC 61131-9 and
2600   IEC 61131-9-1 can be obtained from the National Committees of the IEC or from the following
2601   organization:

2602   **IO-Link Consortium**
2603   Haid-und-Neu-Str. 7
2604   76131 Karlsruhe
2605   Germany
2606   Phone: +49 (0) 721 / 96 58 590
2607   Fax: +49 (0) 721 / 96 58 589
2608   E-mail: info@io-link.com
2609   Web site: http://www.io-link.com
2610

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