This version 1.1 of the IO-Link Safety – Test & Assessment specification has been prepared by the IO-Link Safety test team. It covers automated SCL test cases (tier1) and functional test cases (tier2).

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

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can: indicates flexibility of choice with no implied preference (possibility and capability).

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0 Introduction

0.1 General

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

The functional safety extensions for SDCI in [4] provide the necessary technology preconditions for Master and Devices to be turned into functional safety FS-Master and FS-Devices if they are developed according to safety standards such as IEC 61508/ISO13849.

This document specifies the test cases and associated test equipment for such FS-Master and FS-Devices. It provides the necessary preconditions for conformity testing to ensure interoperability and allows manufacturers of FS-Master and FS-Devices to achieve a precondition of an assessment by a safety assessment body.

0.2 Patent declaration

There are no known patents for the technologies specified in this document. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The IO-Link Community shall not be held responsible for identifying any or all such patent rights.

The IO-Link Community maintains on-line data bases of patents relevant to their specifications. Users are encouraged to consult the databases for the most up to date information concerning patents.
1 Scope

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

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. It is also publicly available in [2].

The document "IO-Link Safety System Extensions" (see [4]) provides the necessary extensions to the basic IO-Link interface and system standard for functional safety communication including compatibility to OSSDc based sensors and the necessary configuration management. These extensions modify the architecture and behavior of Masters and thus turn them into FS-Masters. Devices are turned into FS-Devices.

This document specifies the test cases and associated test environments for FS-Master and FS-Devices designed and developed according to [1], or [2], [4], and relevant resolved Change Requests (CRs) within the Change Request Database described in [3]. It provides the necessary preconditions for conformity testing to ensure interoperability and enables manufacturers of FS-Master and FS-Devices to achieve conformity as a precondition of an assessment by a safety assessment body.

This document refers to [9] as the common basis for testing the non-safety-related parts of FS-Master and FS-Device. The common test cases are only referenced in this document. The current status of the Change-Request-Database shall be observed.

The structure of this document is described in clause 4.2.

In cases where conformance tests in accredited Test Centers unveil intentional implementation deviations or unintentional incorrect implementations that may have tremendous commercial effects, the rules in [10] apply.

Conformity with [4] cannot be claimed unless the requirements of this document are met.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60947-5-3, Low-voltage switchgear and controlgear – Part 5-2: Control circuit devices and switching elements – Proximity switches

IEC 61000-1-2, Electromagnetic compatibility (EMC) - Part 1-2: General - Methodology for the achievement of functional safety of electrical and electronic systems including equipment with regard to electromagnetic phenomena

1 IO-Link™ is a trade name of the "IO-Link Community". This information is given for the convenience of users of this specification and does not constitute an endorsement by the IO-Link Community of the trade name holder or any of its products. Compliance to this document does not require use of the registered logos for IO-Link™. Use of the registered logos for IO-Link™ requires permission of the "IO-Link Community".
IEC 61000-6-7, Electromagnetic compatibility (EMC) - Part 6-7: Generic standards - Immunity
requirements for equipment intended to perform functions in a safety-related system (functional
safety) in industrial locations

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

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

IEC 61496-1, Safety of machinery – Electro-sensitive protective equipment – Part 1: General
requirements and tests

related systems - Part 2: Requirements for electrical/electronic/programmable electronic safety-
related systems

IEC 61508-3:2010, Functional safety of electrical/electronic/programmable electronic safety-
related systems - Part 3: Software requirements

fieldbuses - General rules and profile definitions

IEC 62061, Safety of machinery – Functional safety of safety-related electrical, electronic and
programmable electronic control systems

IEC 62453, Field device tool (FDT) interface specification

ISO 12100:2010, Safety of machinery – General principles for design – Risk assessment and
risk reduction

ISO 13849-1:2015, Safety of machinery – Safety-related parts of control systems – Part 1:
General principles for design

ISO 14119:2013, Safety of machinery – Interlocking devices associated with guards –
Principles for design and selection

3 Terms, definitions, symbols, abbreviated terms and conventions

3.1 Common terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61131-1 and IEC
61131-2, as well as the following apply.

3.1.1 address
part of the M-sequence control to reference data within data categories of a communication
channel

3.1.2 application layer
AL
<SDCI>\(^2\) part of the protocol responsible for the transmission of Process Data objects and On-
request Data objects

3.1.3 block parameter
consistent parameter access via multiple Indices or Subindices

\(^2\) Angle brackets indicate validity of the definition for the SDCI (IO-Link) technology
3.1.4 checksum
<SDCI> complementary part of the overall data integrity measures in the data link layer in addition to the UART parity bit

3.1.5 CHKPDU
integrity protection data within an ISDU communication channel generated through XOR processing the octets of a request or response

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

3.1.7 COM1
SDCI communication mode with transmission rate of 4,8 kbit/s

3.1.8 COM2
SDCI communication mode with transmission rate of 38,4 kbit/s

3.1.9 COM3
SDCI communication mode with transmission rate of 230,4 kbit/s

3.1.10 COMx
one out of three possible SDCI communication modes COM1, COM2, or COM3

3.1.11 communication channel
logical connection between Master and Device

Note 1 to entry: Four communication channels are defined: process channel, page and ISDU channel (for parameters), and diagnosis channel.

3.1.12 communication error
unexpected disturbance of the SDCI transmission protocol

3.1.13 cycle time
time to transmit an M-sequence between a Master and its Device including the following idle time

3.1.14 Device
single passive peer to a Master such as a sensor or actuator

Note 1 to entry: Uppercase "Device" is used for SDCI equipment, while lowercase "device" is used in a generic manner.

3.1.15 Direct Parameters
directly (page) addressed parameters transferred acyclically via the page communication channel without acknowledgement

3.1.16 dynamic parameter
part of a Device's parameter set defined by on-board user interfaces such as teach-in buttons or control panels in addition to the static parameters
3.1.17

Event
instance of a change of conditions in a Device

Note 1 to entry: Uppercase “Event” is used for SDCI Events, while lowercase “event” is used in a generic manner.

Note 2 to entry: An Event is indicated via the Event flag within the Device’s status cyclic information, then acyclic transfer of Event data (typically diagnosis information) is conveyed through the diagnosis communication channel.

3.1.18

fallback
transition of a port from coded switching to switching signal mode

3.1.19

inspection level
degree of verification for the Device identity

3.1.20

interleave
segmented cyclic data exchange for Process Data with more than 2 octets through subsequent cycles

3.1.21

ISDU
indexed service data unit used for acyclic acknowledged transmission of parameters that can be segmented in a number of M-sequences

3.1.22

M-sequence
sequence of two messages comprising a Master message and its subsequent Device message

3.1.23

M-sequence control
first octet in a Master message indicating the read/write operation, the type of the communication channel, and the address, for example offset or flow control

3.1.24

M-sequence error
unexpected or wrong message content, or no response

3.1.25

M-sequence type
one particular M-sequence format out of a set of specified M-sequence formats

3.1.26

Master
active peer connected through ports to one up to n Devices and which provides an interface to the gateway to the upper-level communication systems or PLCs

Note 1 to entry: Uppercase “Master” is used for SDCI equipment, while lowercase “master” is used in a generic manner.

3.1.27

message
<SDCI> sequence of UART frames transferred either from a Master to its Device or vice versa following the rules of the SDCI protocol

3.1.28

On-request Data
acyclically transmitted data upon request of the Master application consisting of parameters or Event data
3.1.29  
**physical layer**  
first layer of the ISO-OSI reference model, which provides the mechanical, electrical, functional and procedural means to activate, maintain, and de-activate physical connections for bit transmission between data-link entities

Note 1 to entry: Physical layer also provides means for wake-up and fallback procedures.

[SOURCE: ISO/IEC 7498-1, 7.7.2, modified – text extracted from subclause, note added]

3.1.30  
**port**  
communication medium interface of the Master to one Device

3.1.31  
**port operating mode**  
state of a Master's port that can be either INACTIVE, DO, DI, FIXEDMODE, or SCANMODE

3.1.32  
**Process Data**  
input or output values from or to a discrete or continuous automation process cyclically transferred with high priority and in a configured schedule automatically after start-up of a Master

3.1.33  
**Process Data cycle**  
complete transfer of all Process Data from or to an individual Device that may comprise several cycles in case of segmentation (interleave)

3.1.34  
**single parameter**  
independent parameter access via one single Index or Subindex

3.1.35  
**SIO**  
port operation mode in accordance with digital input and output defined in IEC 61131-2 that is established after power-up or fallback or unsuccessful communication attempts

3.1.36  
**static parameter**  
part of a Device's parameter set to be saved in a Master for the case of replacement without engineering tools

3.1.37  
**switching signal**  
binary signal from or to a Device when in SIO mode (as opposed to the "coded switching" SDCI communication)

3.1.38  
**system management**  
SM  
<SDCI> means to control and coordinate the internal communication layers and the exceptions within the Master and its ports, and within each Device

3.1.39  
**UART frame**  
<SDCI> bit sequence starting with a start bit, followed by eight bits carrying a data octet, followed by an even parity bit and ending with one stop bit

3.1.40  
**wake-up**  
procedure for causing a Device to change its mode from SIO to SDCI
3.1.41

**wake-up request**

physical layer service used by the Master to initiate wake-up of a Device, and put it in a receive ready state

3.2 IO-Link Safety: Additional terms and definitions

For the purposes of this document, the following additional terms and definitions apply.

3.2.1

error

discrepancy between a computed, observed, or measured value or condition and the true, specified or theoretically correct value or condition

Note 1 to entry: Errors may be due to design mistakes within hardware/software and/or corrupted information due to electromagnetic interference and/or other effects.

Note 2 to entry: Errors do not necessarily result in a failure or a fault.

SOURCE: [IEC 61508-4:2010], [IEC 61158]

3.2.2

failure

termination of the ability of a functional unit to perform a required function or operation of a functional unit in any way other than as required

Note 1 to entry: The definition in IEC 61508-4 is the same, with additional notes.

Note 2 to entry: Failure may be due to an error (for example, problem with hardware/software design or message disruption)

SOURCE: [IEC 61508-4:2010, modified], [ISO/IEC 2382-14.01.11, modified]

3.2.3

fault

abnormal condition that may cause a reduction in, or loss of, the capability of a functional unit to perform a required function

Note 1 to entry: IEV 191-05-01 defines “fault” as a state characterized by the inability to perform a required function, excluding the inability during preventive maintenance or other planned actions, or due to lack of external resources.

SOURCE: [IEC 61508-4:2010, modified], [ISO/IEC 2382-14.01.10, modified]

3.2.4

FS-Device

single passive peer such as a functional safety sensor or actuator to a Master with functional safety capabilities

3.2.5

FS-Master

active peer with functional safety capabilities connected through ports to one up to n Devices or FS-Devices and which provides an interface to the gateway to the upper-level communication systems (NSR or SR) or controllers with functional safety capabilities

3.2.6

FSP parameter

parameter set for the administration and operation of the IO-Link Safety protocol

3.2.7

FST parameter

parameter set for the safety-related technology of an FS-Device, for example light curtain
3.2.8 Safety PDU

Safety Protocol Data Unit

PDU transferred through the safety communication channel

[SOURCE: IEC 61784-3:2021, 3.1.47, modified – Notes have been removed and admitted term has been added.]

3.3 Symbols and abbreviated terms

- AL: application layer
- BEP: bit error probability
- C/Q: connection for communication (C) or switching (Q) signal (SIO)
- CRC: cyclic redundancy check
- DDO: Device data object
- DI: digital input
- DL: data link layer
- DO: digital output
- DTI: Device Tool Interface
- FDI: Field Device Integration
- FDT: Field Device Tool
- FS: functional safety
- FSCP: functional safety communication profile (for example IEC 61784-3-x series)
- FS-Device tester
- FS-AI: functional safety analog input
- FS-DI: functional safety digital input
- I/O: input / output
- IODD: IO Device Description
- IOPD: IO-Link Parameterization & Diagnostic tool
- IOL-S: IO-Link Safety
- L-: power supply (-)
- L+: power supply (+)
- N24: 24 V extra power supply (-); Port class B
- NSR: non-safety-related
- OD: On-request Data
- OK: “OK”, values or state correct
- OSSD: output signal switching device (self-testing electronic device with built-in OSSD) [IEC 61496-1]
- OSSDe: output signal switching device (self-testing electronic device with built-in OSSD) [4]
- OSSD1/2e: pin assignment of both OSSDe signals [4]
- OSSDm: output signal switching device (relay and solid state outputs) [IEC 60947-5-5]
- P24: 24 V extra power supply (+); Port class B
- PD: Process Data
- PDin: functional safety input process data (from an FS-Master's view)
- PDout: functional safety output process data (from an FS-Master's view)
- PDCT: port and Device configuration tool
- PFH: (average) probability of a dangerous failure per hour
- PID: program interface description
### 3.4 Conventions

#### 3.4.1 Test case template

This document uses a dedicated template as shown in Table 1 for the particular test cases. It contains explanations on how to use items in the left column.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_nnnn (nnnn = 4-digit consecutive number starting with 0001)</td>
</tr>
<tr>
<td>Name</td>
<td>Characteristic name of the test case (see 0)</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Short description of the purpose of the test case (one line maximum)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS- Master, FS- Device, IODD, DedicatedTool, FS-MasterTool</td>
</tr>
<tr>
<td>Test case version</td>
<td>Starts with 1.0. Incremented first number indicates significant changes due to new functionality, the second one indicates changes within the test case</td>
</tr>
<tr>
<td>Category / type</td>
<td>See 3.4.3</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[Bibliography, nn], clause or subclause, figure, table, chart, etc.</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>For example: Reference-FS-Master and EUT (FS-Device)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE</th>
<th>CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>Comprehensive description of the purpose of the test case (can be several lines). Shall not contain preconditions or instructions.</td>
</tr>
<tr>
<td>Precondition</td>
<td>Initial mode of the test set (both EUT and test environment) to be set prior to testing or ID of previous test. Examples: Tester precondition/Measurement instrument pre-set \ EUT precondition</td>
</tr>
<tr>
<td>Procedure</td>
<td>- Step by step description of the test, each step marked by characters a), b), c), etc. \ - Loops are possible (see [9]) \ - &quot;Test step macros&quot; are possible, shall be named &quot;TS_&lt;domain&gt;_xxxx&quot;, and defined within the general clause. Examples: \ a) Test step macro α \ b) Evaluation 1) \ c) Single instruction</td>
</tr>
</tbody>
</table>
## 3.4.2 Naming of test cases

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

![Figure 1 – Structure of the test case name](image)

### 3.4.3 Categories and types of test cases

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Physical Layer test</td>
<td>Measure port voltages, currents, and timings</td>
</tr>
<tr>
<td>FS-Master OSSD test</td>
<td>Measure specific port voltages, currents, and timings</td>
</tr>
<tr>
<td>Device Physical Layer test</td>
<td>Measure Device voltages, currents, and timings</td>
</tr>
<tr>
<td>FS-Device OSSD test</td>
<td>Measure specific FS-Device voltages, currents, and timings</td>
</tr>
<tr>
<td>Master DL protocol test</td>
<td>Check Master protocol on DL level</td>
</tr>
<tr>
<td>FS-Master DL protocol test</td>
<td>Check FS-Master protocol specifics on DL level (e.g. READY pulse)</td>
</tr>
<tr>
<td>Device DL protocol test</td>
<td>Check Device protocol on DL level</td>
</tr>
<tr>
<td>FS-Device DL protocol test</td>
<td>Check FS-Device protocol specifics on DL level (e.g. READY pulse)</td>
</tr>
<tr>
<td>Category</td>
<td>Definition</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>Master/Device protocol test</td>
<td>Master/Device interaction test on DL level</td>
</tr>
<tr>
<td>FS-Master/Device prot. test</td>
<td>FS-Master and FS-Device interaction test on DL level</td>
</tr>
<tr>
<td>Device PREOPERATE test</td>
<td>Device protocol test in PREOPERATE mode</td>
</tr>
<tr>
<td>FS-Device PREOPERATE test</td>
<td>FS-Device protocol test in PREOPERATE mode</td>
</tr>
<tr>
<td>Device OPERATE test</td>
<td>Device protocol test in OPERATE mode</td>
</tr>
<tr>
<td>FS-Device OPERATE test</td>
<td>FS-Device protocol test in OPERATE mode</td>
</tr>
<tr>
<td>Device ISDU test</td>
<td>Device ISDU protocol test</td>
</tr>
<tr>
<td>FS-Device ISDU test</td>
<td>FS-Device ISDU protocol test: FSP and FST parameterization</td>
</tr>
<tr>
<td>Device Event test</td>
<td>Test of Device Event handling</td>
</tr>
<tr>
<td>Device Direct Parameter test</td>
<td>Test of Device’s Direct Parameter page handling</td>
</tr>
<tr>
<td>Device application test</td>
<td>Test of Device’s application behavior</td>
</tr>
<tr>
<td>IODD safety test</td>
<td>Test whether IODD is conforming to IO-Link Safety Extensions spec.</td>
</tr>
<tr>
<td>IODD verification test</td>
<td>Test whether IODD and the actual FS-Device parameter are matching</td>
</tr>
<tr>
<td>IODD verify test (FSP)</td>
<td>Test whether IODD and the actual FS-Device parameter are matching</td>
</tr>
<tr>
<td>IODD verification test</td>
<td>Test whether IODD and the actual FS-Device parameter are matching</td>
</tr>
<tr>
<td>Master Data Storage test</td>
<td>Test of Master’s Data Storage mechanisms</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test to pass</td>
<td>Positive test. A function shall perform as specified. Usually, the tests of a domain are beginning with these tests, where no stress is applied.</td>
</tr>
<tr>
<td>Test to fail</td>
<td>Negative or stress test. A function shall react with a defined behavior, for example an error indication when boundary conditions are exceeded.</td>
</tr>
</tbody>
</table>

3.4.4 Naming of variables

Due to the possible implementation of the test cases in software, all used symbols and abbreviated terms in this document (see 3.3) are written in upper case letters without superscript or subscript.

3.4.5 Memory and transmission octet order

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

NOTE Existing microcontrollers can differ in the way WORD based data types are stored in memory: “big endian” and “little endian”. If designs are not taking into account this fact, octets can be erroneously permuted for transmission.

Figure 2 – Memory and transmission octet order
3.4.6 Behavioral descriptions

The notations of UML 2 are used, mainly timing diagrams [7].

4 Strategy for testing IO-Link Safety devices

4.1 Purpose of this test specification

This document specifies the test cases and the necessary test equipment for FS-Master and FS-Devices in conjunction with its parent documents [9] and [4]. It covers OSSDe feature tests as well as functional safety communication protocol tests. It covers also relevant test cases out of [9] via references since both FS-Master and FS-Device are based on IO-Link Technology as "black channel".

The functional safety communication protocol tests are derived from a UML state machine simulation engine and automated to a large extent.

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

4.2 Structure of this document

Clause 5 specifies the test cases for the physical layer test of FS-Master and FS-Devices. They mainly require individual manual tests of both signal channels Pin4 and Pin2 (OSSDe) with variable power supplies, voltage and current meters as well as oscilloscopes.

Clause 6 specifies the XML schema and business rules tests for IODDs of FS-Devices using XML snippet files and the IO-Link Checker Tool. Additional test cases verify the consistency of the particular IODD and the actual FSP and FST parameters within the associated Device.

Clause 7 specifies additional test cases for FS-Devices verifying the consistency of the particular IODD and the actual FSP and FST parameters within the associated FS-Device and its operational modes.

Clause 8 specifies additional test cases for FS-Devices regarding safety measures such as the VerifyRecord and the protocol watchdog.

Clause 9 contains the automatically generated test cases via UML modelling, model checking and simulation for the safety communication layer (protocol) of the FS-Device.

Clause 10 specifies additional test cases for an FS-Device in a reference FS-Master system.

Clause 11 specifies the FS-Master Port operations test.

Clause 12 contains the automatically generated test cases via UML modelling, model checking and simulation for the safety communication layer (protocol) of the FS-Master.

Clause 13 specifies additional test cases for an FS-Master with reference FS-Devices.

Clause 14 specifies additional test cases for an FS-Master Tool regarding IODD and Dedicated Tool operations.

Clause 15 provides information on required environmental tests and relevant EMC standards as well as special approaches for functional safety.


4.3 Conformity classes

4.3.1 Overview

All FS-Devices shall support ISDU and thus the rules in Clause 4.3.3 of [9] apply.
4.3.2  FS-Devices with OSSDe

Safety devices with a single stop function such as e-stop buttons, two-hands control, mats, light curtain, etc. are candidates to become an FS-Device with both OSSDe and digital safety communication and thus serving the markets for FS-DI modules in both the classic remote I/Os as well as the extended functionality with identification, parameterization, diagnosis, and Data Storage features to participate in modern automation concepts when connected to an FS-Master.

4.3.3  FS-Devices without OSSDe

Safety devices with measurement capabilities such as for temperature, strain, torque, pressure, object types, distance, position, rotation, or multi-sensing, or actuators such as motor starters, drives, and mechatronics containing sensors and actuators such as door locks, grippers, low voltage witch gears are candidates to become an FS-Device without OSSDe.

FS-Devices without OSSDe can benefit from extra 24 V power via class B.

4.3.4  FS-Master

FS-Master shall support all features specified in [4], which are not marked explicitly as optional. All Ports shall provide power supply ≥ 200 mA, at least one Port shall supply 1000 mA.

4.3.5  FS-Master with FS-DI/OSSDe support

FS-Master can provide FS-DI/OSSDe support to benefit from existing safety devices on the market as long as there are no versions available with SDCI-FS.

4.3.6  FS-Master with Port Class B

An FS-Master with Ports Class B is possible, however without FS-DI/OSSDe support. The rules in Clause 5.4.2 of [2] apply.

4.4 Test of FS-Devices

4.4.1  General

In general, the rules in Clause 5.1 of [9] apply.

4.4.2  Compatibility with non-safety Master (tester) Ports

4.4.2.1  Device properties for the analysis of the test behavior

It may happen that an FS-Device is connected to a Port in the non-safety mode of an FS-Master/Master or a USB-Master. Since some start-up features of the FS-Devices such as ready pulse and OSSDe are "unknown" to a non-safety Master Port, they may impair (test) functionality. It is not possible to avoid completely all possible conflicts due to the huge number of deployments of Masters in the field and fortunately these cases do not occur very often.

However, this cannot be assumed for Device tester ("USB-Master") in general and therefore the possible conflicts have been analyzed with the help of a dummy representing a typical FS-Device and a tester representing a typical Master Port.

Table 4 shows the characteristics of the dummy FS-Device for the analysis.

**Table 4 – Features of the dummy FS-Device**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Characteristic/value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-testing time</td>
<td>3 s</td>
<td>–</td>
</tr>
<tr>
<td>Ready pulse</td>
<td>Implemented as specified</td>
<td>–</td>
</tr>
<tr>
<td>Switching to OSSDe mode</td>
<td>1.1 s after the Ready pulse as specified in [4]</td>
<td>After switching to OSSDe mode, the FS-Device shall not react on any wake-up or other disturbances.</td>
</tr>
<tr>
<td>No OSSDe mode</td>
<td>1. FS-Device is awaiting wake-up pulse</td>
<td>1. Regular behavior</td>
</tr>
<tr>
<td></td>
<td>2. FS-Device reacts on &quot;fallback&quot; command</td>
<td>2. FS-Device switches to SIO mode</td>
</tr>
</tbody>
</table>
Table 5 shows possible conflicts and references the remedies.

Table 5 – Possible conflicts

<table>
<thead>
<tr>
<th>Tester (Master) behavior</th>
<th>FS-Device behavior</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Port starts wake-up after starting time of the FS-Device, which includes self-test and other waiting times (total &gt; 4.2 s).</td>
<td>FS-Device switches automatically to OSSDe mode and does not react on wake-up</td>
<td>R1</td>
</tr>
<tr>
<td>Master Port does not send the VerifyRecord.</td>
<td>FS-Device sends Event 0xB00A</td>
<td>R2</td>
</tr>
<tr>
<td>Test of PDInvalid cannot be performed</td>
<td>FS-Device only provides PDInvalid information if SCL is in SPDU exchange mode</td>
<td>R3</td>
</tr>
<tr>
<td>Test of SystemCommand &quot;Application Reset&quot;</td>
<td>FS-Device requires more unchanged parameters</td>
<td>R4</td>
</tr>
<tr>
<td>Test of other SystemCommands</td>
<td>FS-Device rejects them in armed mode</td>
<td>R5</td>
</tr>
</tbody>
</table>

Table 6 shows the requirements for retrofitting of Device testers. Those modified testers can be used to perform standard tests according to [9].

Table 6 – Retrofitting of Device testers for IO-Link Safety

<table>
<thead>
<tr>
<th>Remedy</th>
<th>Requirements</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Device tester shall support the safety start-up: - Port Power Off/On (&quot;Power cycle&quot;) - Await Ready pulse - Regular wake-up procedure - VerifyRecord not required</td>
<td>All TestCases requiring &quot;Power cycle&quot;</td>
</tr>
<tr>
<td>R2</td>
<td>Event 0xB00A shall be ignored</td>
<td>SDCI_TC_0072 (see Table 9)</td>
</tr>
<tr>
<td>R3</td>
<td>Device tester shall send VerifyRecord and start SCL</td>
<td>SDCI_TC_0312, SDCI_TC_0313 (see Table 9)</td>
</tr>
<tr>
<td>R4</td>
<td>&quot;AuthenticityRecord&quot; shall be treated in the same manner as &quot;ApplicationSpecificTag&quot; or &quot;FunctionTag&quot;</td>
<td>SDCI_TC_0317, SDCI_TC_0318 (see Table 9)</td>
</tr>
<tr>
<td>R5</td>
<td>The Device tester shall support the change to commissioning mode (see Clause G.1 in [4]) and perform the tests subsequently. The Device tester shall ensure the proper parameter set in the FS-Device after the test.</td>
<td>SDCI_TC_0317 (see Table 9)</td>
</tr>
</tbody>
</table>

4.4.3 Physical Layer tests

Figure 3 shows the workflow for physical layer tests. They mainly comprise measurements of the I/Q connection, which is necessary for OSSDe.

Table 7 lists the test cases to be performed during step 1. It contains the non-safety test cases in its first part and the safety-specific test cases within its second part.

Table 7 – Physical layer tests

<table>
<thead>
<tr>
<th>Major feature</th>
<th>Test cases</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power and signal levels (C/Q)</td>
<td>See Clause 5.3 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Wake-up detection</td>
<td>See Clause 5.5 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Waveform and timings</td>
<td>See Clause 5.6 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Signal on I/Q</td>
<td>FSTC_0006 to _0007</td>
<td>Clause 5.3 in this document</td>
</tr>
<tr>
<td>Discrepancy, test pulses, Ready pulse</td>
<td>FSTC_0013 to _0017</td>
<td>Clause 5.5 in this document</td>
</tr>
</tbody>
</table>
4.4.4 IODD and Dedicated Tool tests

The rules in Clause 7.1 of [9] apply. Figure 4 shows the workflow for IODD and Dedicated Tool tests of the FS-Device. Basic IODD tests are specified in [5].
Table 8 lists the test cases to be performed during step 2. It contains the test cases for the non-safety parameters within the first part and the safety-specific within the second part.

**Table 8 – IODD and Dedicated Tool of FS-Device**

<table>
<thead>
<tr>
<th>Major feature</th>
<th>Test cases</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic IODD schema and business rules</td>
<td>See [5]</td>
<td></td>
</tr>
<tr>
<td>IODD (FS) + CRC</td>
<td>FSTC_0018</td>
<td>Clause 6.3 in this document</td>
</tr>
<tr>
<td>Dedicated Tool</td>
<td>FSTC_0019</td>
<td>Clause 6.4 in this document</td>
</tr>
</tbody>
</table>

**4.4.5 FS-Device protocol and functions tests**

Figure 5 shows the workflow for protocol and functions testing. Tests are restricted to FS-Devices with ISDU and Data Storage according to [2] and [3].

![Figure 5 – Step 3 of the FS-Device test sequence (protocol + functions)](image)

Table 9 lists the test cases to be performed during step 3. It contains the test cases for the "black channel" operations of an FS-Device within the first part and the safety-specific within the second part.

**Table 9 – Set of protocol test cases for FS-Devices**

<table>
<thead>
<tr>
<th>Major feature</th>
<th>Test cases</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>STARTUP</td>
<td>See 6.2 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>PREOPERATE</td>
<td>See 6.3 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>OPERATE</td>
<td>See 6.4 in [9]</td>
<td>For SDCI_TC_0312 and SDCI_TC_0313 see Table 6</td>
</tr>
<tr>
<td>ISDU</td>
<td>See 6.5 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Events</td>
<td>See 6.6 in [9]</td>
<td>For SDCI_TC_0072 see Table 6</td>
</tr>
<tr>
<td>Data Storage</td>
<td>See 6.7 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Direct Parameter page 1</td>
<td>See 6.9 in [9]</td>
<td>–</td>
</tr>
</tbody>
</table>
4.4.6 Environment

Figure 6 shows step 4 of the FS-Device test. It contains references to the relevant clauses in this specification and consists of EMC tests according to generic or product-specific standards specified in 15.2. A successfully terminated FS-Device test can be completed by a manufacturer declaration as defined in Annex D.
4.5 Test of FS-Masters

4.5.1 General
The test of FS-Masters consists of four steps: Physical layer test, Port operations and protocol test, FS-Master Tool test, and environmental test. The requirements for FS-Master-Tester are specified in A.2.4 and A.4.

4.5.2 Physical Layer tests
Figure 7 illustrates step 1 of the FS-Master test sequence. It contains references to the relevant clauses in [9] and in this specification and consists of a visual check and manually performed measurements.

If the FS-Master shows specific connectors, cables, or color codings, these deviations shall be documented within the user manual with respect to the original definitions in [2] and [4].

Table 10 – Physical layer tests

<table>
<thead>
<tr>
<th>Major feature</th>
<th>Test cases</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power and signal levels</td>
<td>Clause 5.2 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Wake-up detection</td>
<td>Clause 5.4 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Waveform and timings</td>
<td>Clause 5.6 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Port Power OFF/ON and Signal on I/O</td>
<td>FSTC_0001 to _0005</td>
<td>See 5.2 in this document</td>
</tr>
<tr>
<td>Discrepancy, test pulse resilience and Ready</td>
<td>FSTC_0008 to _0012</td>
<td>See 5.4 in this document</td>
</tr>
</tbody>
</table>
4.5.3 Port operations, protocol, and reference tests

Figure 8 illustrates step 2 of the FS-Master test.

Table 11 lists the FS-Master Port operations and protocol tests. It contains the non-safety test cases in its first part and the safety-specific test cases within its second part.

<table>
<thead>
<tr>
<th>Major feature</th>
<th>Test cases</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timings</td>
<td>Clause 8.2 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>On-request Data (OD)</td>
<td>Clause 8.4 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>STARTUP</td>
<td>Clause 8.5 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>PREOPERATE</td>
<td>Clause 8.6 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>OPERATE</td>
<td>Clause 8.7 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Fallback</td>
<td>Clause 8.8 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Retry</td>
<td>Clause 8.9 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>ISDU (appl. errors)</td>
<td>Clause 8.10 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>ISDU (derived errors)</td>
<td>Clause 8.11 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Events</td>
<td>Clause 8.13 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Data Storage</td>
<td>Clause 8.14 in [9]</td>
<td>–</td>
</tr>
<tr>
<td>Port operations</td>
<td>FSTC_0155 to _0163</td>
<td>See 11 in this document</td>
</tr>
<tr>
<td>Safety protocol (SCL)</td>
<td>FSTC_0164 to _0176</td>
<td>See 12 in this document</td>
</tr>
<tr>
<td>Reference FS-Devices</td>
<td>FSTC_0177 to _0189</td>
<td>See 13 in this document</td>
</tr>
</tbody>
</table>
4.5.4 FS-Master Tool

Figure 9 illustrates step 3 of the FS-Master test. It contains references to the relevant clauses in [9] and in this specification and consists of tests regarding importability (CRC signature check) and display conventions (yellow color), as well as parameter access via DTI and DDO exchange.

![Diagram of Step 3 of the FS-Master test](image)

Figure 9 – Step 3 of the FS-Master test sequence (FS-Master Tool)

4.5.5 Environment

Figure 10 illustrates step 4 of the FS-Master test. It contains references to the relevant clauses in this specification and consists of EMC tests according to generic or product-specific standards specified in 15.2. A successfully terminated FS-Master test can be completed by a manufacturer declaration as defined in Annex D.

![Diagram of Step 4 of the FS-Master test (EMC)](image)

Figure 10 – Step 4 of the FS-Master test (EMC)
5  Physical Layer (PL) tests

5.1  General

The approach, nature and coverage of the FS-Device and FS-Master physical layer tests are described in 4.4.3 and 4.5.2. Figure 3 and Figure 7 illustrate the entire test procedure including the safety part.

The tests of static characteristics of FS-Master Ports comprise Power OFF/ON and the I/Q pin, which is required for OSSDe2 (FS-DI). The tests of dynamic characteristics of FS-Master Ports comprise Ready pulse, discrepancy of OSSDe signals, OSSDe test pulses, and Wake-up delay.

The tests of static characteristics of FS-Devices comprise power consumption and residual voltages at OSSDe2 (I/Q pin). The tests of dynamic characteristics of FS-Devices comprise discrepancy of OSSDe signals, OSSDe test pulses, Ready pulse duration, and delay to OSSDe operation.
5.2 Static characteristics of the FS-Master interface (FS-DI)

5.2.1 Power1 switchable OFF/ON

Table 12 defines the test conditions for this test case.

### Table 12 – Power1 switchable OFF/ON

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0001</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_PHYL_PWR1_SWITCHABLE</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Power1 on any port can be switched OFF and ON</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master Physical Layer test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 4.1.4, 5.9, 10.3.2, Figure 9, [9]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>Variable Master input voltage PSM and variable current sink according to Figure A.1</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

**Purpose (detailed)** Measure voltage VSM at different loads while Power1 = OFF/ON

**Precondition**
- Test setup: Current sink between L+ and L-, voltmeter in parallel.
- EUT: PORT_DI (see A.4.2 in [9])

**Procedure**
1. Identify current capability of tested port (1000 mA or 200 mA) and memorize as ISMmax value; see field “Test parameter”
2. Select first PSM and ISM value; see field “Test parameter”
3. Apply PSM value to Master; see field “Test parameter”
4. Adjust current sink to ISM value; see field “Test parameter”
5. Turn On Power1
6. Measure VSM in ON state
7. Evaluation 1)
8. Wait for 1 s
9. Turn Off Power1
10. Measure VSM in OFF state
11. Evaluation 2)
12. Repeat from d) with next ISM value
13. Repeat from c) with next PSM value.

**Test parameter**
- PSM = \{PSMmin, PSMmax\} : according to user manual
- ISM = \{ISMmax, 0 mA\} : ISMmax according to user manual

**Post condition** –

### TEST CASE RESULTS CHECK / REACTION

**Evaluation**
1. Determine maximum VSM (ON state) compared with value of previous loop
2. Determine minimum VSM (OFF state) compared with value of previous loop

**Test passed**
- Maximum value of VSM ≤ 1 V in OFF state, and
- Minimum value of VSM ≥ 20 V in ON state ;1 V is reasonable practical value

**Test failed**
- Maximum value of VSM > 1 V in OFF state, or
- Minimum value of VSM < 20 V in ON state ;1 V is reasonable practical value

**Report**
- Maximum VSM (ON state): <value> <ok | nok>
- Minimum VSM (OFF state): <value> <ok | nok>
5.2.2 High-level input threshold voltage at I/Q

Table 13 defines the test conditions for this test case.

**Table 13 – High-level input threshold voltage at I/Q**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0002</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_PHYL_OSSD_HIGHVIMIQ</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Test of static input high-level threshold at I/Q</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master PL test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.2.2, Table 5; [2], 11.2.17, Figure 113</td>
</tr>
</tbody>
</table>

**Configuration / setup**
The digital input signal for a rising edge of the I/Q input is being monitored (see Figure A.1)

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                          | a) Set supply voltage of Master to first PSM value \[see field Test parameter\]  
b) Sweep voltage VIMIQ at I/Q from 5 V to 15 V in steps of maximum 0,1 V  
c) Exemplary: Repeat SMI_PDIn until DI_I/Q = 1  
d) Measure VIMIQ Transition  
e) Evaluation 1)  
f) Repeat from b) with next PSM value |
| Test parameter                     | PSM = \{PSMmin, PSMmax\} \[according to user manual\] |
| Post condition                     | Memorize VIMIQ at DI transition 0→1 (all PSM) |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check voltage VIMIQ at DI transition &quot;low&quot; to &quot;high&quot;</td>
</tr>
<tr>
<td>Test passed</td>
<td>All checks: 10,5 V &lt; VIMIQ &lt; 13 V (range of VTHHM)</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any of the checks failed</td>
</tr>
</tbody>
</table>
| Report            | VIMIQ @ Transition 0→1 (PSMmin): <value> \[ok | nok\]  
VIMIQ @ Transition 0→1 (PSMmax): <value> \[ok | nok\] |
5.2.3 Low-level input threshold voltage at I/Q

Table 14 defines the test conditions for this test case.

Table 14 – Low-level input threshold voltage at I/Q

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0003</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_PHYL_OSSD_LOWVIMIQ</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Test of static input low-level threshold at I/Q</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master PL test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.2.2, Table 5; [2], 11.2.17, Figure 113</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>The digital input signal for a falling edge of the I/Q input is being monitored (see Figure A.1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                         | a) Set supply voltage of Master to first PSM value  
                                      | b) Sweep voltage VIMIQ at I/Q from 15 V to 5 V in steps of maximum 0.1 V  
                                      | c) Exemplary: Repeat SMI_PDIn until DI_I/Q = 0  
                                      | d) Measure VIMIQ Transition  
                                      | e) Evaluation 1)  
                                      | f) Repeat from b) with next PSM value |
| Test parameter                    | PSM = {PSMmin, PSMmax}  
                                      | :according to user manual |
| Post condition                    | Memorize VIMIQ at DI transition 1→0 (all PSM) |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check voltage VIMIQ at DI transition &quot;high&quot; to &quot;low&quot;</td>
</tr>
<tr>
<td>Test passed</td>
<td>All checks: 8.0 V &lt; VIMIQ &lt; 11.5 V (range of VTHLM)</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any of the checks failed</td>
</tr>
</tbody>
</table>
| Report            | VIMIQ @ Transition 1→0 (PSMmin): <value> <ok | nok>  
                                      | VIMIQ @ Transition 1→0 (PSMmax): <value> <ok | nok> |
5.2.4 Input hysteresis voltage at I/Q

Table 15 defines the test conditions for this test case.

Table 15 – Input hysteresis voltage at I/Q

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0004</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_PHYL_OSSD_VHYSMCI</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Calculation of input hysteresis at I/Q</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master PL test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.2.2, Table 5</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See FSTC_0002 and FSTC_0003</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>For all PSM values: VHYSMCI = Value VIMIQ(FSTC_0002) – Value VIMIQ(FSTC_0003)</td>
</tr>
<tr>
<td>Test passed</td>
<td>For all PSM values: Voltage VHYSMCI is ≥ 0 V</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>For any PSM value: Voltage VHYSMCI is &lt; 0 V</td>
</tr>
<tr>
<td>Report</td>
<td>VHYSMCI (PSMmin): &lt;value&gt; &lt;ok</td>
</tr>
<tr>
<td></td>
<td>VHYSMCI (PSMmax): &lt;value&gt; &lt;ok</td>
</tr>
</tbody>
</table>
5.2.5 Load current at I/Q

Table 16 defines the test conditions for this test case.

**Table 16 – Load current at I/Q**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0005</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_PHYL_OSSD_LOADIQ</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Load current at I/Q of FS-Master Port</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master PL test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.2.3, Table 6</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>The input current at I/Q of the FS-Master Port is being monitored (see Figure A.1).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td></td>
</tr>
<tr>
<td>Test passed</td>
<td></td>
</tr>
<tr>
<td>Test not passed (examples)</td>
<td></td>
</tr>
<tr>
<td>Report</td>
<td>&lt;value&gt;</td>
</tr>
</tbody>
</table>
5.3 Static characteristics of the FS-Device interface

5.3.1 General

Power consumption of an FS-Device is already tested via NSR tests according to [9]. Warnings in case of current limits > 200 mA are checked via user manual in 7.2.3.

This clause focuses on tests of signal behavior on I/Q pin of an FS-Device.

5.3.2 High-side residual voltage at FS-Device OSSD2

Table 17 defines the test conditions for this test case. It is only applicable for Devices with OSSD.

Table 17 – High-side residual voltage at FS-Device OSSD2

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCL_FSTC_0006</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PHYL_OSSD_HSRESVOLT</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Static high-side driver capability</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device with OSSD output</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PL test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.4</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>The high-side output level of the FS-Device OSSD2 output is measured while connected to a current sink (see Figure A.2, method i)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check VIQ</td>
</tr>
<tr>
<td>Test passed</td>
<td>For all VSD values: VIQ ≤ 3,0 V</td>
</tr>
<tr>
<td>Test not passed (examples)</td>
<td>For any VSD value: VIQ &gt; 3,0 V</td>
</tr>
<tr>
<td>Report</td>
<td>VIQ (VSD = 18 V): &lt;value&gt; &lt;ok</td>
</tr>
<tr>
<td></td>
<td>VIQ (VSD = 30 V): &lt;value&gt; &lt;ok</td>
</tr>
</tbody>
</table>
### 5.3.3 Low-side residual voltage at FS-Device OSSD2

Table 18 defines the test conditions for this test case. It is only applicable for Devices with OSSD.

**Table 18 – Low-side residual voltage at FS-Device OSSD2**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0007</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PHYL_OSSD_LSRESVOLT</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Static low-side driver capability</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device with OSSD output</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PL test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.4</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>The low-side output level of the FS-Device OSSD2 output is measured while connected to a current source (see Figure A.2, method (\theta))</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                          | a) Apply first supply voltage VSD to the FS-Device  
b) Apply current source with 50 mA from I/Q (OSSD2) to L+  
c) Measure voltage VIQ between I/Q (OSSD2) and L-  
d) Evaluation 1)  
e) Repeat from b) with next VSD value |
| Test parameter                     | VSD = \{18 V, 30 V\} |
| Post condition                     | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check VIQ</td>
</tr>
<tr>
<td>Test passed</td>
<td>For all VSD values: VIQ ≤ 3.0 V</td>
</tr>
<tr>
<td>Test not passed</td>
<td>For any VSD value: VIQ &gt; 3.0 V</td>
</tr>
</tbody>
</table>
| Report            | VIQ (VSD = 18 V): <value>     <ok | nok>  
|                   | VIQ (VSD = 30 V): <value>     <ok | nok>  |
5.4 Dynamic characteristics of the FS-Master interface

5.4.1 FS-DI and OSSD sensor with and without READY pulse

Table 19 defines the test conditions for this test case.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0008</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_PHYL_INF_OSSDSENS</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Start-up of FS-Master Port with OSSD sensor with and without READY pulse</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master Physical Layer test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.3, Figure 20, Figure 21; 5.4, Table 7</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>OSSD signal generator (see A.2.2) connected to EUT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                          | a) Select first OSSD-sequence  ;Test parameter  
b) Apply first signal slot of OSSD-sequence 
c) Perform power cycle of FS-Master Port 
d) Read Process Data via SMI_SPDUIn service 
e) Apply next signal slot(s) of OSSD-sequence 
f) Read SR Process Data via SMI_FSPDInOut service  ;returns ArgBlock "FSPDInOut"  ;returns ArgBlock "PortEvent"  
g) If OSSD sequence > OS 3: Wait on SMI_PortEvent 
h) Evaluation 1)  
i) Repeat from b) with next OSSD-sequence  ;Test parameter |

<table>
<thead>
<tr>
<th>Test parameter</th>
<th>OSSD-sequences:</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS 1 = {HH, LL},</td>
<td>OS 4 = {LH, HL},</td>
</tr>
<tr>
<td>OS 2 = {LL, HH},</td>
<td>OS 5 = {HL, HL},</td>
</tr>
<tr>
<td>OS 3 = {LL, HL(1 ms), LL(1 s), HH},</td>
<td>OS 6 = {LL, HL},</td>
</tr>
<tr>
<td>OS 7 = {HH, LH}.</td>
<td>OS 7 = {HH, LH}.</td>
</tr>
</tbody>
</table>

| Post condition | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation | 1) Check Argblock "FSPDInOut.SPDUIn0"  
2) Check ArgBlock "PortEvent" |
| Test passed | OS1: "Low" detected after transition to signal slot 2 <LL>.  
OS2: "High" detected after transition to slot 2 <HH>.  
OS3: "High" detected after transition to slot 4 <HH>.  
OS4: "Low" detected instantly and Port Event = 0x20F0  
OS5: "Low" detected instantly and Port Event = 0x20F0  
OS6: "Low" detected after transition to slot 2 (HL) and Port Event = 0x20F0  
OS7: "Low" detected after transition to slot 2 (LH) and Port Event = 0x20F0 |
| Test failed (examples) | Any incorrect detection(s) during evaluation |
| Report | "Low" (Demand) detected: <yes/no>  <ok | nok>  
"High" (Activation) detected: <yes/no>  <ok | nok>  
"Low" (Antivalent) detected: <yes/no>  <ok | nok>  
Correct Port Event detected: <yes/no>  <ok | nok> |
### 5.4.2 FS-DI and discrepancy evaluation

Table 20 defines the test conditions for this test case.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0009</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_PHYL_intf_DISCREPANCY</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Behavior of Port at tolerable and intolerable discrepancy times (see Figure 11)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master Physical Layer test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 5.4, Table 7</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>OSSD signal generator (see A.2.2) connected to EUT</td>
</tr>
</tbody>
</table>

#### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Behavior of Port at tolerable and intolerable discrepancy times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>Test setup: OSSD signal generator</td>
</tr>
<tr>
<td>EUT: Configured to &quot;OSSDE&quot; Port mode, FS-Master Tool with SMI_PortPowerOffOn and SMI_SPDUint services</td>
<td></td>
</tr>
<tr>
<td>Procedure</td>
<td>a) Select first value of tdis</td>
</tr>
<tr>
<td></td>
<td>b) Power cycle of Master Port</td>
</tr>
<tr>
<td></td>
<td>c) Run &quot;OSSD startup sequence&quot;</td>
</tr>
<tr>
<td></td>
<td>d) Run first &quot;OSSD test sequence&quot;</td>
</tr>
<tr>
<td></td>
<td>e) Read SR Process Data via SMI_FSPDInOut service</td>
</tr>
<tr>
<td></td>
<td>f) If tdis = 4 ms Wait on SMI_PortEvent service</td>
</tr>
<tr>
<td></td>
<td>g) Evaluation 1)</td>
</tr>
<tr>
<td></td>
<td>h) Repeat from b) with next OSSD test sequence</td>
</tr>
<tr>
<td></td>
<td>i) Repeat all OSSD test sequences from b) with next value of tdis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test parameter</th>
<th>OSSD startup sequence:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>{LL(2 s), HL(1 ms), LL(1 s)} ;Startup</td>
</tr>
<tr>
<td></td>
<td>OSSD test sequences</td>
</tr>
<tr>
<td>1:</td>
<td>(LL(2 s), HL(tdis)), HH ;Low–High Transition</td>
</tr>
<tr>
<td>2:</td>
<td>(LL(2 s), LH(tdis)), HH ;Low–High Transition</td>
</tr>
<tr>
<td>3:</td>
<td>(HH(2 s) HL(tdis)), LL ;High–Low Transition</td>
</tr>
<tr>
<td>4:</td>
<td>(HH(2 s) LH(tdis)), LL ;High–Low Transition</td>
</tr>
<tr>
<td>tdis =</td>
<td>{0 ms, 2.5 ms, 4 ms}</td>
</tr>
</tbody>
</table>

#### TEST CASE RESULTS

<table>
<thead>
<tr>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Figure 11 – Discrepancy behavior
5.4.3 Test pulse resilience

Table 21 defines the test conditions for this test case.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0010</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_PHYL_INTF_TESTPULSERES</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Behavior of Port at test pulse skews (time-shift)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master Physical Layer test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.2.2, 5.3.2.3, 5.4, Table 7</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>OSSD signal generator (see A.2.2) connected to EUT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>EUT: Configured to &quot;OSSDE&quot; Port mode, FS-Master Tool with SMI_SPDUIn services</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Argblock &quot;FSPDInOut.SPDUIn0&quot;</td>
</tr>
<tr>
<td>Test passed</td>
<td>For all repetitions and loops: No &quot;Low&quot; and no Port Events</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any &quot;Low&quot; or Events</td>
</tr>
<tr>
<td>Report</td>
<td>No &quot;Low&quot; and no Events: &lt;yes/no&gt; &lt;ok</td>
</tr>
</tbody>
</table>
5.4.4  READY pulse detection

Table 22 defines the test conditions for this test case.

Table 22 – Ready pulse detection

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0011</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_PHYL_INTF_READYDETECT</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Behavior of Port on READY pulse; limits of detection</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master Physical Layer test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.3, Figure 21; 5.4, Table 7; 5.7, Figure 27</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master Tester system</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

**Purpose (detailed)**
FS-Master Port behavior upon variable time-to-Ready-pulse t2R and Ready pulse duration tRP

**Precondition**
SMTU: SMTU_STANDARD_STATE_32

**EUT**: PORT_MIXFSCOM

**Procedure**

a) Choose first values of t2R and tRP
b) Perform SMTU_Ready_Wait(t2R, tRP)
c) Power ON cycle of FS-Device
d) TM_AWAIT (t2R) ; before and beyond Ready pulse
e) Read SR Process Data via SMI_FSPDInOut service : returns ArgBlock "FSPDInOut"
f) Evaluation 1) 
g) Repeat from b) with next t2R 
h) Repeat from b) with next tRP

**Test parameter**

(t2R = \{5 s, (5+1) s\},

\(tRP = \{0, 5\) ms, 1 ms\})

; optional: value from IODD instead of default = 5 s

**Post condition**

--

### TEST CASE RESULTS CHECK / REACTION

**Evaluation**

1) Check Argblock "FSPDInOut.SPDUIn0"

**Test passed**

Safety communication started, and : \(t2R = 5 s\)
Safety communication did not start (timeout) : \(t2R = (5+1) s\)

**Test failed (examples)**

Safety communication did not start, and/or : \(t2R = 5 s\)
Safety communication started : \(t2R = (5+1) s\)

**Report**

Safety communication: <yes/no> <ok | nok>
5.4.5 Wake-up delay after Ready pulse

Table 22 defines the test conditions for this test case

Table 23 – Wake-up delay after Ready pulse

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0012</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_PHYL_INTF_WAKEUPTOREADYDELAY</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>After Ready pulse, FS-Master waits tRW before Wake-up</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master Physical Layer test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.3, Figure 21; 5.4, Table 7; 5.7, Figure 27</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master Tester system</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>After Ready pulse, FS-Master waits a time tRW before Wake-up sequence</td>
</tr>
</tbody>
</table>
| Precondition                      | SMTU: SMTU_STANDARD_STATE_32  
                                    | EUT: PORT_MIXFSCOM |
| Procedure                         | a) Choose first value of tRP  
                                    | b) Perform SMTU_Ready_Wait(2 s, tRP)  
                                    | c) Power ON cycle of "FS-Device"  
                                    | d) Measure time tRW from falling edge of READY-pulse to rising edge of WURQ  
                                    | e) Repeat from b) with next tRP |
| Test parameter                    | tRP = {0, 5 ms, 1 ms} |
| Post condition                    | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check measurement value</td>
</tr>
<tr>
<td>Test passed</td>
<td>tRW ≥ 50 μs</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>tRW &lt; 50 μs</td>
</tr>
<tr>
<td>Report</td>
<td>tRW ≥ 50 μs: &lt;yes/no&gt;  &lt;ok</td>
</tr>
</tbody>
</table>
5.5 Dynamic characteristics of the FS-Device interface

5.5.1 Equivalent switching and discrepancy time

Table 24 defines the test conditions for this test case.

**Table 24 – Equivalent switching and discrepancy time**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0013</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PHYL_OSSD_DISCREP</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Equivalent switching and discrepancy time limits</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device Physical Layer test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.2.2, 5.3.2.3, 5.4, Table 7; [8]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>Measurement circuit of Figure A.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose (detailed)</strong></td>
</tr>
<tr>
<td><strong>Precondition</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Test parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Trigger FS-Device to toggle it’s outputs from low to high</td>
<td></td>
</tr>
<tr>
<td>b) Measure time between rising edges of both OSSD signals</td>
<td></td>
</tr>
<tr>
<td>c) Evaluation 1)</td>
<td></td>
</tr>
<tr>
<td>d) Trigger FS-Device to toggle it’s outputs from high to low</td>
<td></td>
</tr>
<tr>
<td>e) Measure time between falling edges of both OSSD signals</td>
<td></td>
</tr>
<tr>
<td>f) Evaluation 2)</td>
<td></td>
</tr>
<tr>
<td>g) Repeat from a) 100 times</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test parameter</th>
<th>Information on how to change FS-Device’s OSSD states (OFF/ON)</th>
</tr>
</thead>
</table>

| Post condition | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Evaluation</strong></td>
<td>1) Check discrepancy times of rising edges and memorize maximum absolute value</td>
</tr>
<tr>
<td></td>
<td>2) Check discrepancy times of falling edges and memorize maximum absolute value</td>
</tr>
<tr>
<td><strong>Test passed</strong></td>
<td>Absolute value of maximum discrepancy time ≤ 2 ms</td>
</tr>
<tr>
<td><strong>Test failed</strong> (examples)</td>
<td>Absolute value of maximum discrepancy time &gt; 2 ms</td>
</tr>
<tr>
<td><strong>Report</strong></td>
<td>Maximum discrepancy time low to high: &lt;value&gt;</td>
</tr>
<tr>
<td></td>
<td>Maximum discrepancy time high to low: &lt;value&gt;</td>
</tr>
</tbody>
</table>

**NOTE** Maximum discrepancy time = maximum \( t_{\text{disD}} \) + maximum \( t_i \) (possible adjacent test pulse)
5.5.2 Test pulse duration

Table 25 defines the test conditions for this test case.

**Table 25 – Test pulse duration**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0015</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PHYL_INTF_TESTPULSDURATION</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device’s test pulses duration</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device Physical Layer test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.2.2, 5.3.2.3, Figure 19; 5.4, Table 7</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>Measurement circuit of Figure A.4</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

Purpose (detailed) Measurement of an FS-Device’s test pulse duration and conformity check

Precondition EUT: in OSSDe mode (ON state)
Measurement circuit: load = Type 1 input acc. IEC 61131-2

Procedure

1. a) Apply first PSD value
   b) Measure time between falling and rising edge of a test pulse on OSSDe1
   c) Evaluation 1)
   d) Measure time between falling and rising edge of a test pulse on OSSDe2
   e) Evaluation 2)
   f) Repeat from b) 100 times
   g) Repeat from b) with next PSD value

Test parameter PSD = {18 V, 30 V}

Post condition –

**TEST CASE RESULTS CHECK / REACTION**

Evaluation
1) Check duration of test pulse and memorize maximum value $T_{i1max}$
2) Check duration of test pulse and memorize maximum value $T_{i2max}$

Test passed $T_{i1max} \leq 1$ ms, and $T_{i2max} \leq 1$ ms

Test failed (examples) $T_{i1max} > 1$ ms, or $T_{i2max} > 1$ ms

Report Maximum duration of test pulses at OSSDe1: <value> <ok | nok>
Maximum duration of test pulses at OSSDe2: <value> <ok | nok>
5.5.3 Ready pulse duration

Table 26 defines the test conditions for this test case.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0016</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PHYL_INTF_READYPULSDUR</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device's Ready pulse duration</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device Physical Layer test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 5.3.3, Figure 21; 5.4, Table 7; 5.7, Figure 27</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>Measurement circuit of Figure A.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check and memorize tRP @ PSD = 18 V and 30 V</td>
</tr>
<tr>
<td>Test passed</td>
<td>For both supply voltages: 500 µs ≤ tRP ≤ 1000 µs</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any of the values of tRP &lt; 500 µs or &gt; 1000 µs</td>
</tr>
<tr>
<td>Report</td>
<td>tRP @ 18V: &lt;value&gt;</td>
</tr>
<tr>
<td></td>
<td>tRP @ 30V: &lt;value&gt;</td>
</tr>
</tbody>
</table>
5.5.4 End of Ready pulse to OSSD

Table 27 defines the test conditions for this test case.

Table 27 – End of Ready pulse to OSSD

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0017</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PHYL_INTF_READY2OSSD</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device's end of Ready pulse to OSSDe operation</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device with OSSDe capability</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device Physical Layer test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 5.3.3, Figure 21; clause 5.4, Table 7; clause 5.7, Figure 27</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>Measurement circuit of Figure A.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                          | a) Prepare FS-Device for outputs "high" immediately after OSSDe start  
b) Apply PSD = 24 V to EUT  
c) Wait until end of Ready pulse  
d) Measure time t1  
e) Wait until OSSDe1 or OSSDe2 change to ON state ("high")  
f) Measure time t2  
g) Evaluation 1) |
| Test parameter                     | – |
| Post condition                     | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Determine ( t_{RO} = t_2 - t_1 )</td>
</tr>
<tr>
<td>Test passed</td>
<td>( t_{RO} \geq 700 , \mu s )</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>( t_{RO} &lt; 700 , \mu s )</td>
</tr>
<tr>
<td>Report</td>
<td>( t_{RO} \leq \text{&lt;value&gt;} ) &lt;ok</td>
</tr>
</tbody>
</table>
### 5.6 Test report templates

#### 5.6.1 Template for the test report of PL tests

Table 28 shows the template for the test reports of PL tests.

<table>
<thead>
<tr>
<th>Test Case ID</th>
<th>Test report</th>
<th>ok/nok</th>
<th>Statement/Exception</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDCI_FSTC_0001</td>
<td>Maximum VSM (ON state): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum VSM (OFF state): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0002</td>
<td>VIMIQ @ Transition 0→1 (PSMmin): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VIMIQ @ Transition 0→1 (PSMmax): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0003</td>
<td>VIMIQ @ Transition 1→0 (PSMmin): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VIMIQ @ Transition 1→0 (PSMmax): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0004</td>
<td>VHYSMCI (PSMmin): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VHYSMCI (PSMmax): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0005</td>
<td>ILLM (VIMIQ = 5 V, PSMmin): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ILLM (VIMIQ = 5.1 V, PSMmin): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ILLM (VIMIQ = measured value of VSM, PSMmin): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ILLM (VIMIQ = 5 V, PSMmax): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ILLM (VIMIQ = 5.1 V, PSMmax): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ILLM (VIMIQ = measured value of VSM, PSMmax): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0006</td>
<td>VIQ (VSD = 18 V): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VIQ (VSD = 30 V): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0007</td>
<td>VIQ (VSD = 18 V): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VIQ (VSD = 30 V): &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0008</td>
<td>&quot;Low&quot; (Demand) detected: &lt;yes/no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot;High&quot; (Activation) detected: &lt;yes/no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot;Low&quot; (Antivalent) detected: &lt;yes/no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correct Port Event detected: &lt;yes/no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0009</td>
<td>&quot;Low&quot; detected: &lt;yes/no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot;Low&quot; detected: &lt;yes/no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correct Port Event detected: &lt;yes/no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0010</td>
<td>No &quot;Low&quot; and no Events: &lt;yes/no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0011</td>
<td>Safety communication: &lt;yes/no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0012</td>
<td>tRW ≥ 50 μs: &lt;yes/no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0013</td>
<td>Maximum discrepancy time low to high: &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum discrepancy time high to low: &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0015</td>
<td>Maximum duration of test pulses at OSSDe1: &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum duration of test pulses at OSSDe2: &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0016</td>
<td>tRP @ 18V: &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>tRP @ 30V: &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDCI_FSTC_0017</td>
<td>tRO: &lt;value&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 5.6.2 Test report summaries of automated test cases

Templates are defined by the particular tester equipments. The complete test reports shall present at least the information of the report fields of the test cases.
6 IODD and Dedicated Tool tests

6.1 Overview

Any FS-Device comes with an IODD including FSP parameters for functional safe communication and usually FST parameters for the possibility of adjusting the particular technology (e.g. optical sensor) to user automation applications and optionally a Dedicated Tool.

Tests of an IODD shall be performed using the IODD Checker Tool, which can be downloaded from the website indicated in Annex C. The extra requirements for the IODD Checker Tool due to the safety extensions are specified in 6.2. These requirements include XML-Snippets for the Common Profile and for IO-Link Safety. XML-Snippets support the presentation of user interfaces and the automated IODD testing.

IODD test cases are specified in 6.3.

For FS-Devices without parameters for their individual technology (so-called FST parameter) no other tool is required besides the IODD. FS-Devices with FST parameter also come with a Dedicated Tool at least for the calculation of the TechParCRC value to be transferred into the FSP_TechParCRC field of the FS-Master Tool.

Dedicated Tool test cases are specified in 10.2.

6.2 Requirements for the IODD Checker (expanded schema test for safety)

6.2.1 Basic requirements and business rules for FS-Devices

Basically, the requirements defined in [5] apply. Additional business rules for IODDs of FS-Devices to be checked are defined in 6.3.

6.2.2 XML snippets for the Common Profile

The XML snippets for the Common Profile are contained in its .zip file downloadable from the website indicated in Annex C. The name of the corresponding draft XML file is IODD-CommonProfile_Snippets_V0.99.000.xml.

6.2.3 XML snippets for safety extensions

The XML snippets for safety extensions are specified in [4] and contained in an extra file named IODD-SafetyProfile_Snippets0.90.xml. Both can be downloaded in a .zip file from the website indicated in Annex C.
### 6.3 IODD test via Checker Tool (conformity and CRC signatures)

Table 29 defines the test conditions for this test case.

#### Table 29 – IODD test via Checker Tool (conformity and CRC signatures)

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0018</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCI_IODD_FSPD_IODDPARAMDESC_CRC</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Conformity of IODD of FS-Device and correct CRC signatures</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>IODD of FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>IODD verify test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause A.1, E.5.6; [6]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>IODD Checker Tool + XML snippets</td>
</tr>
</tbody>
</table>

#### TEST CASE CONDITIONS / PERFORMANCE

- **Purpose (detailed)**: Check conformity of IODD of FS-Device with the help of the Checker Tool downloadable from the official IO-Link website. Base checks are supplemented by extensions from Common Profile specification and IO-Link Safety specification (XML snippets). CRC signature across the entire IODD is checked as well as the CRC signature "FSP_ParamDescCRC". The IODD Checker Tool provides correct CRC signature values if found values have been identified as incorrect.
- **Precondition**: Up to date IODD Checker Tool downloaded from the Internet and XML snippet files
- **Procedure**:
  1. Perform conformance testing with the help of standard IODD Checker Tool using IODD XML schema based on IODD specification V1.1.3
  2. Evaluation 1)
  3. Perform extended test on Common Profile parameters using the file "IODD-CommonProfile_Snippets_V1.1.0.xml"
  4. Evaluation 2)
  5. Perform extended test on Safety parameters using the file "IODD-SafetyProfile-Snippets1.1.3.xml"
  6. Evaluation 3)
  7. Perform extended test on Protocol Mode "Input/Output length" using ProcessData Collection (see [5])
  8. Evaluation 4)
  9. Replace CRC signature value of FSP_ParamDescCRC in IODD with suggested value of the Tool if value was incorrect
  10. Perform IODD check again
  11. Evaluation 5)
- **Test parameter**: –
- **Post condition**: Value of FSP_ParamDescCRC

#### TEST CASE RESULTS CHECK / REACTION

- **Evaluation**:
  1. Check Tool report
  2. Check report on Common Profile parameters
  3. Check report on Safety parameters
  4. Check report on Protocol Mode
  5. Check Tool report and value of "FSP_ParamDescCRC"
- **Test passed**: All reports OK and value correct
- **Test failed (examples)**: Any report NOK and/or value incorrect
- **Report**: IODD with correct "FSP_ParamDescCRC" parameter: <yes/no> <ok | nok>
6.4 Availability of the Dedicated Tool

Table 30 defines the test conditions for this test case.

**Table 30 – Availability of the Dedicated Tool**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0019</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCI_IODD_FSPD_DEDICTOOL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Availability of Dedicated Tool or adequate means for TechParCRC determination</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device with FST parameter</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>IODD verify test: Dedicated Tool</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause A.1, E.5.6</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>IODD Finder, user manual</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

Purpose (detailed)  
An FS-Device with FST parameters shall provide either a Dedicated Tool for the calculation of the TechParCRC value corresponding to the parameter setting or other adequate means such as a table within the user manual.

Precondition –

Procedure
a) User manual: Dedicated Tool suitable for FS-Device?
   - .exe program
   - designation,
   - version,
   - relation to FS-Device
b) Evaluation 1)
c) If no Dedicated Tool: Adequate means available
d) Evaluation 2)

Test parameter –

Post condition Usable Dedicated Tool or adequate means available

**TEST CASE RESULTS**

Evaluation  
1) Check items
2) Optional: adequate means sufficient and mentioned in assessment report

Test passed All checks correct

Test failed (examples) Any check incorrect

Report Dedicated Tool OK: <yes/no> <ok | nok>
7 FS-Device configuration and parameterization tests

7.1 Overview

The FS-Device configuration and parameterization tests comprise the necessary information about the product to test, the FSP protocol parameter availability and limits including securing via CRC signature, the FST technology parameter availability and limits including securing via CRC signature, and setup of operational modes such as "Commissioning" and "Armed".

7.2 FS-Device meta data

7.2.1 Manuals and safety assessment certificate

Table 31 defines the test conditions for this test case.

Table 31 – Manuals and safety assessment certificate

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0020</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_INFODOCUMENTS</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check user/safety manuals for exceptions, properties, and certificates</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>User/safety manual of FS-Device and Dedicated Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], &quot;highly recommended&quot; feature status, Table 8, Annex H.6</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                          | a) Identify in user manual not implemented "highly recommended" features  
|                                    | b) Identify information in safety manual according to Annex H.6 in [4]  
|                                    | c) Identify functional safety assessment report (certificate) |
| Test parameter                     | –                          |
| Post condition                     | –                          |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation                        | 1) Check exceptions in user manual  
|                                    | 2) Check required parameters in safety manual  
|                                    | 3) Check statements for relevant aspects of the particular standard (IEC 61508 /ISO13849), the assessment body, and the certificate number |
| Test passed                       | Exceptions permitted, and  
|                                    | Safety Manual correct (at least WCDT, OFDT), and  
|                                    | Certificate accepted and noted in test report |
| Test failed (examples)            | Any check incorrect |
| Report                            | Documents OK: <yes/no>       | <ok | nok> |
### 7.2.2 Connector and cable information

Table 32 defines the test conditions for this test case.

#### Table 32 – Connector and cable information

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0021</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_INFO_CONNECTCABLE</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check user/safety manuals for connector and cable information (OSSDe)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>User/safety manual of FS-Device and Dedicated Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 4.1.4, Figure 9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                         | a) Identify in user manual connector Pin layout in case of M type connector  
b) Identify cable recommendations with respect to robustness and loop resistance |
| Test parameter                    | –                           |
| Post condition                    | –                           |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation                         | 1) Check Pin layout  
2) Check recommendations on robustness and loop resistance |
| Test passed                        | Pin layouts are correct, and  
Robustness recommendations for cable coating such as "tear proof" and "cut resistant" as well as for loop resistance such that minimum supply voltages are guaranteed at maximum supply current are available |
| Test failed (examples)             | Any check incorrect |
| Report                             | Documents OK: <yes/no>       |
|                                   | <ok | nok>                     |
### 7.2.3 FS-Device default behavior

Table 33 defines the test conditions for this test case.

**Table 33 – FS-Device default behavior**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
<th>CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0022</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_INFO_DEFAULTBEHAVIOR</td>
<td></td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device information: Consumption, Ready pulse, test pulses, watchdog</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>User manual of FS-Device</td>
<td></td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test</td>
<td></td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Table 7, Table 8</td>
<td></td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

- **Purpose (detailed)**: FS-Device information: Power consumption, Ready pulse, test pulses, watchdog
- **Precondition**: –
- **Procedure**:
  - a) Identify parameter "Power consumption" in safety/user manual
  - b) Identify parameter "Time delay before availability" in safety/user manual
  - c) Identify parameter "Test pulse duration (t_i)" in safety/user manual
  - d) Identify parameter "Period of test pulses (T_P)" in safety/user manual
  - e) Identify "Watchdog" value recommendations
- **Test parameter**: –
- **Post condition**: Memorize power consumption, Ready pulse, test pulses, watchdog

**TEST CASE RESULTS**

<table>
<thead>
<tr>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>1) Check &quot;Power consumption&quot; information</td>
</tr>
<tr>
<td>2) Check parameter &quot;Time delay before availability&quot; and &quot;FSP_Time2Ready&quot; in IODD</td>
</tr>
<tr>
<td>3) Check parameter &quot;Test pulse duration (t_i)&quot;</td>
</tr>
<tr>
<td>4) Check parameter &quot;Period of test pulses (T_P)&quot;</td>
</tr>
<tr>
<td>5) Check values of &quot;Watchdog&quot; and default &quot;FSP_Watchdog&quot; in IODD</td>
</tr>
</tbody>
</table>

- **Test passed**: Values and recommendations are indicated if > 200 mA and ≤ 1000 mA, and Parameter value corresponds to value of FSP_Time2Ready in IODD, and Parameter value within specified borders, and Parameter value within specified borders, and Parameter value corresponds to value of "FSP_Watchdog" in IODD

- **Test failed (examples)**: Values are not indicated in case of > 200 mA or > 1000 mA, or any other check incorrect

- **Report**: Documents OK: <yes/no> <ok | nok>
### 7.3 FSP parameter range limits and invalid values

#### 7.3.1 Invalid value of parameter "FSP_Port"

Table 34 defines the test conditions for this test case.

**Table 34 – Invalid value of parameter "FSP_Port"**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0023</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_FSPD_PORTINVAL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Detection of invalid value of parameter &quot;FSP_Port&quot;</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to fail</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Annex A</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester-Unit</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

**Purpose (detailed)**
Detection of invalid value of parameter "FSP_Port" (outside specified range)

**Precondition**
- EUT in OPERATE (configured for commissioning operation)
- FSĐT in OPERATE (configured for commissioning operation)

**Procedure**
- a) Write FSP authenticity parameter record (0x4200), e.g. via SMI_DeviceWrite
- b) Evaluation 1)
- c) Evaluation 2)

**Test parameter**
- FSP authenticity parameter record:
  - FSCP_Authenticity_1 = 1,
  - FSCP_Authenticity_2 = 2,
  - FSP_Port = 0,
  - FSP_AuthentCRC = 25195

**Post condition**
-

**TEST CASE RESULTS**

<table>
<thead>
<tr>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>1) Check Write response</td>
</tr>
<tr>
<td>2) Check Events</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Negative Write response 0x8030, and No Events</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Incorrect Write response, and/or Unexpected Events</td>
</tr>
<tr>
<td>Report</td>
</tr>
<tr>
<td>Correct negative Write response: &lt;yes/no&gt;</td>
</tr>
<tr>
<td>No Events received: &lt;yes/no&gt;</td>
</tr>
</tbody>
</table>

---

### Footnote:
- See field test parameter
### Table 35 – Invalid value of signature "FSP_AuthentCRC"

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0024</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_FSPD_AUTHENTCRCINVAL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Detection of invalid value of signature &quot;FSP_AuthentCRC&quot;</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to fail</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Annex A</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester-Unit</td>
</tr>
</tbody>
</table>

#### TEST CASE CONDITIONS / PERFORMANCE

**Purpose (detailed)**
Detection of invalid value of signature "FSP_AuthentCRC" (outside specified range)

**Precondition**
EUT in OPERATE (commissioning operation, FSP_TechParCRC = 0)
FSDT in OPERATE (commissioning operation)

**Procedure**
- a) Write FSP authenticity parameter record (0x4200), e.g. via SMI_DeviceWrite
- b) Evaluation 1)
- c) Evaluation 2)

**Test parameter**
FSP authenticity parameter record:
- FSCP_Authenticity_1 = 1,
- FSCP_Authenticity_2 = 2,
- FSP_Port = 1,
- FSP_AuthentCRC = 11457

**Post condition**
-

#### TEST CASE RESULTS

**Evaluation**
1) Check Write response
2) Check Events

**Test passed**
Negative Write response 0x8030, and No Events

**Test failed (examples)**
Incorrect Write response, and/or Unexpected Events

**Report**
Correct negative Write response: <yes/no> <ok | nok>
No Events received: <yes/no> <ok | nok>
### 7.3.3 Invalid value of parameter "FSPProtVersion"

Table 36 defines the test conditions for this test case.

**Table 36 – Invalid value of parameter "FSPProtVersion"**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0025</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_FSPD_PROTVINVAL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Detection of invalid value of parameter &quot;FSP ProtVersion&quot;</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to fail</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Annex A</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester-Unit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
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<tr>
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<td></td>
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<tr>
<td>Test parameter</td>
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<tr>
<td>Test passed</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>
7.3.4 Invalid value of parameter "FSP_ProtMode"

Table 37 defines the test conditions for this test case.

Table 37 – Invalid value of parameter "FSP_ProtMode"

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0026</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_FSPD_PMODEINVAL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Detection of invalid value of parameter &quot;FSP_ProtMode&quot;</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to fail</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Annex A</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester-Unit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>FSP_ProtVersion = defaultValue in IODD;</td>
</tr>
<tr>
<td>FSP_ProtMode = A), B), C), or D);</td>
</tr>
<tr>
<td>FSP_Watchdog = defaultValue in IODD;</td>
</tr>
<tr>
<td>FSP_IOStructCRC = defaultValue in IODD;</td>
</tr>
<tr>
<td>FSP_TechParCRC = 0,</td>
</tr>
<tr>
<td>FSP_ProtParCRC = valid CRC</td>
</tr>
<tr>
<td>A) FSP_ProtMode = defaultValue in IODD - 1</td>
</tr>
<tr>
<td>B) FSP_ProtMode = defaultValue in IODD + 1</td>
</tr>
<tr>
<td>C) FSP_ProtMode = 0xF9</td>
</tr>
<tr>
<td>D) FSP_ProtMode = 0xFA</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Write response</td>
</tr>
<tr>
<td></td>
<td>2) Check Write response</td>
</tr>
<tr>
<td></td>
<td>3) Check Write response</td>
</tr>
<tr>
<td></td>
<td>4) Check Write response</td>
</tr>
<tr>
<td>Test passed</td>
<td>Negative Write responses for Write attempts:</td>
</tr>
<tr>
<td></td>
<td>In case of 1): 0x8030 (out of range)</td>
</tr>
<tr>
<td></td>
<td>In case of 2): 0x8030 (out of range)</td>
</tr>
<tr>
<td></td>
<td>In case of 3): 0x8030 (out of range)</td>
</tr>
<tr>
<td></td>
<td>In case of 4): 0x8030 (out of range)</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Incorrect or no negative Write responses</td>
</tr>
<tr>
<td>Report</td>
<td>Correct negative Write responses: &lt;yes/no&gt;</td>
</tr>
</tbody>
</table>
### 7.3.5 Invalid range of parameter "FSP_Watchdog"

Table 38 defines the test conditions for this test case.

**Table 38 – Invalid range of parameter "FSP_Watchdog"**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0027</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_FSPD_WDOGRANGE</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Detection of invalid range of parameter &quot;FSP Watchdog&quot;</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to fail</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Annex A</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester-Unit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                         | a) Write FSP protocol parameter record (0x4201), e.g. via SMI_DeviceWrite ;see field test parameter with A)  
b) Evaluation 1)  
c) Write FSP protocol parameter record (0x4201), e.g. via SMI_DeviceWrite ;see field test parameter with B)  
d) Evaluation 2)  
e) Write FSP protocol parameter record (0x4201), e.g. via SMI_DeviceWrite ;see field test parameter with C)  
f) Evaluation 3) |
| Test parameter                    | FSP protocol parameter record for cases A), B), and optionally C):  
FSP_ProtVersion = defaultValue in IODD,  
FSP_ProtMode = defaultValue in IODD,  
FSP_Watchdog = A), B), or C),  
FSP_IOStructCRC = defaultValue in IODD,  
FSP_TechParCRC = 0,  
FSP_ProtParCRC = valid CRC ;values for case A), B), C) or D)  
A) FSP_Watchdog = 0  
B) FSP_Watchdog = lowerValue in IODD - 1 ;only if lowerValue in IODD < 65535  
C) FSP_Watchdog = upperValue in IODD +1 |
| Post condition                    | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation        | 1) Check Write response and Event  
2) Check Write response and Event  
3) Check Write response and Event |
| Test passed       | Negative Write responses for Write attempts:  
In case of 1): 0x8030 (out of range)  
In case of 2): 0x8032 (below limit)  
In case of 3): 0x8031 (above limit) |
| Test failed (examples) | Incorrect or no negative Write responses |
| Report             | Correct negative Write responses: <yes/no> <ok | nok> |
7.3.6 Invalid value of signature "FSP_ProtParCRC"

Table 39 defines the test conditions for this test case.

Table 39 – Invalid value of signature "FSP_ProtParCRC"

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0028</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_FSPD_PRCRCINVAL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Detection of invalid value of signature &quot;FSP_ProtParCRC&quot;</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Annex A</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester-Unit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>Detection of invalid value of signature &quot;FSP_ProtParCRC&quot; based on calculation</td>
</tr>
<tr>
<td>Precondition</td>
<td>EUT in OPERATE (commissioning operation, FSP_TechParCRC = 0) FSDT in OPERATE (commissioning operation)</td>
</tr>
<tr>
<td>Procedure</td>
<td>a) Write FSP protocol parameter record (0x4201), e.g. via SMI_DeviceWrite</td>
</tr>
<tr>
<td>Test parameter</td>
<td>FSP protocol parameter record: FSP_ProtVersion = defaultValue in IODD; FSP_ProtMode = defaultValue in IODD; FSP_Watchdog = defaultValue in IODD; FSP_IOStructCRC = defaultValue in IODD; FSP_TechParCRC = 0, FSP_ProtParCRC = invalid CRC</td>
</tr>
<tr>
<td>Post condition</td>
<td></td>
</tr>
</tbody>
</table>

| TEST CASE RESULTS CHECK / REACTION   |                               |
| Evaluation                           | 1) Check Write response 2) Check Events |
| Test passed                          | Negative Write response 0x8030, and No Events |
| Test failed (examples)               | Incorrect Write response, and/or Unexpected Events |
| Report                               | Correct negative Write response: <yes/no> | <ok | nok> |
|                                      | No Events received: <yes/no> | <ok | nok> |
### 7.4 FST parameterization

#### 7.4.1 Default FST parameter (for OSSDe operation)

Table 40 defines the test conditions for this test case.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0029</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_DEFAULTFST</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FST parameter of FS-Device in delivery state retrieved as indicated in IODD</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4],</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester-Unit</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

Purpose (detailed) FST parameter of FS-Device in delivery state retrieved as indicated in IODD. FSP_TechParCRC from FS-Device matches calculation performed by Test Tool.

Precondition EUT in delivery state

Procedure
- a) Read parameter in fst_param (start with first value) [see IODD]
- b) Evaluation 1)
- c) Repeat with next parameter from a) [see field test parameter]
- d) Calculate FSP_TechParCRC for all fst_param using Dedicated Tool / User manual
- e) Read parameter FSP_TechParCRC
- f) Evaluation 2)

Test parameter fst_param = {all FST parameter in IODD}

Post condition –

**TEST CASE RESULTS**

Evaluation
- 1) Compare value "defaultValue" of FST parameter in IODD with read parameter from EUT
- 2) Compare calculated FSP_TechParCRC with FSP_TechParCRC read from EUT

Test passed All comparisons show equal values

Test failed (examples) Any comparison is showing not equal values

Report Comparison equal: <yes/no> <ok | nok>
### 7.4.2 IODD versus FST parameters in FS-Device

Table 41 defines the test conditions for this test case.

#### Table 41 – IODD versus FST parameters in FS-Device

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0030</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_IODDFSTPAR</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FST parameter in IODD accessible in FS-Device as indicated</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester-Unit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>
Table 42 defines the test conditions for this test case.

### Table 42 – TechParCRC via Dedicated Tool

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0031</td>
</tr>
<tr>
<td>Name</td>
<td>FSTC_CONF_CRCDED TOOL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>CRC signature calculation of &quot;Dedicated Tool&quot; fits to calculation of FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device and Dedicated Tool or alternative method</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4],</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                          | a) Set some FST parameter of EUT and retrieve FSP_TechParCR
                                           ;see user manual for method
                                           b) Write FST parameter to EUT
                                           c) Evaluation 1)
                                           d) Write valid FSP_AuthRecord and FSP_ProtocolRecord to EUT
                                           e) Evaluation 2)
                                           f) Set valid SetPortConfig with FSP_VerifyRecord
                                             e.g. via SMI_PortConfiguration using ArgBlock 0x8100
                                           g) Port power Off/On
                                             e.g. via SMI_PortPowerOffOn
                                           h) Wait for Port state "SCL_ENABLED"
                                             e.g. via ArgBlock FSPortStatusList
                                           i) Evaluation 3) |
| Test parameter                    | –                          |
| Post condition                    | –                          |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation        | 1) Check Write responses
                                           2) Check Write responses
                                           3) Check Port state |
| Test passed       | All checks correct |
| Test failed (examples) | Any check incorrect |
| Report            | Values OK: <yes/no> <ok | nok> |
7.4.4 Switch to OSSDe operation after parameterization

Table 43 defines the test conditions for this test case.

### Table 43 – Switch to OSSDe operation after parameterization

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0032</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_SWTOOSSD</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FST parameterization cycle: COM → OSSDe → COM</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) FSP protocol parameter record: FSP_ProtVersion = defaultValue in IODD, FSP_ProtMode = defaultValue in IODD, FSP_Watchdog = defaultValue in IODD, FSP_IOStructCRC = defaultValue in IODD, FSP_TechParCRC = valid CRC signature, FSP_ProtParCRC = valid CRC signature</td>
</tr>
</tbody>
</table>

| Post condition | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Write response 2) Check Write response 3) Check Port state 4) Check OSSDe input (e.g. via ArgBlock FSPDInOut,SPDUIn0) 5) Check Port state</td>
</tr>
<tr>
<td>Test passed</td>
<td>All checks correct</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Values OK: &lt;yes/no&gt; &lt;ok</td>
</tr>
</tbody>
</table>
7.5 Setup operational modes (Annex G)

7.5.1 Setup "commissioning test"

Table 45 defines the test conditions for this test case.

Table 44 – Setup "commissioning test"

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0033</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_SETUPCOMMI</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Setup &quot;commissioning test&quot; as described in Annex G</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4],</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester (FSDT)</td>
</tr>
</tbody>
</table>

TEST CASE CONDITIONS / PERFORMANCE

Purpose (detailed) Setup "commissioning test" as described in Annex G

Precondition EUT: in out-of-box configuration

Procedure

a) Set PortConfig with FSP_VerifyRecord with values of A) and B)
   e.g. via SMI_PortConfiguration using ArgBlock 0x8100 ;see field test parameter
b) Wait for port state OPERATE
c) Write FSP protocol parameter record (0x4201) ;see A)
d) Evaluation 1)
e) Write FSP authenticity parameter record (0x4200) ;see B)
f) Evaluation 2)
g) Port power Off/On
   e.g. via SMI_PortPowerOffOn
h) Wait for Port state "SCL_ENABLED"
   e.g. via ArgBlock FSPortStatusList
i) Evaluation 3)

Test parameter

A) FSP protocol parameter record:
   FSP_ProtVersion = defaultValue in IODD,
   FSP_ProtMode = defaultValue in IODD,
   FSP_Watchdog = defaultValue in IODD,
   FSP_IOStructCRC = defaultValue in IODD,
   FSP_TechParCRC = 0,
   FSP_ProtParCRC = valid CRC signature ;responsibility of tester

B) FSP authenticity parameter record:
   FSCP_Authenticity_1 = 1,
   FSCP_Authenticity_2 = 2,
   FSP_Port = 1,
   FSP_AuthentCRC = 11456

Post condition

TEST CASE RESULTS CHECK / REACTION

Evaluation
1) Check Write response
2) Check Write response
3) Check Port state

Test passed All checks correct

Test failed (examples) Any check incorrect

Report Values OK: <yes/no> <ok | nok>
7.5.2 Setup "armed"

Table 45 defines the test conditions for this test case.

### Table 45 – Setup "armed"

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0034</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_CONF_SETUPARMED</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Setup &quot;armed&quot; as described in Annex G</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test: test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4],</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester-Unit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
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<tr>
<td>Procedure</td>
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<tr>
<td>Test parameter</td>
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<td></td>
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<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Write response</td>
</tr>
<tr>
<td></td>
<td>2) Check Write response</td>
</tr>
<tr>
<td></td>
<td>3) Check Port state</td>
</tr>
<tr>
<td>Test passed</td>
<td>All checks correct</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Values OK: &lt;yes/no&gt; ;&lt;ok</td>
</tr>
</tbody>
</table>
8 FS-Device safety measure tests

8.1 Overview
The FS-Device protocol tests comprise the various constellations of the VerifyRecord prior to start of the Safety Communication Layer (SCL). It also comprises special tests such as the protocol watchdog timer and evidence of correct implementation of the watchdog trigger as well as the exceptional handling whenever a CRC signature calculation results in "0".

8.2 Verification (VerifyRecord)

8.2.1 Correct VerifyRecord and FSP_TechParCRC ("armed")
Table 46 defines the test conditions for this test case. It checks whether an FS-Device starts SCL communication in "armed" mode (operation not monitored) after reception of a valid VerifyRecord and FSP_TechParCRC ≠ 0.

Table 46 – Correct VerifyRecord and FSP_TechParCRC ("armed")

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0035</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_ARMED</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Correct VerifyRecord and FSP_TechParCRC (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Make sure that an FS Device is going to start SCL communication (&quot;armed&quot;) after reception of a valid VerifyRecord with FSP_TechParCRC ≠ 0.</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>EUT: Configured for armed operation</td>
</tr>
<tr>
<td>FS-DT: Port config DEACTIVATED</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>a) Set PortConfig with FSP_VerifyRecord with values of A) and B) e.g. via SMI_PortConfiguration using ArgBlock 0x8100 see field test parameter</td>
</tr>
<tr>
<td>b) Wait for Port state &quot;SCL_ENABLED&quot; e.g. via ArgBlock FSPortStatusList</td>
</tr>
<tr>
<td>c) Repeat SMI_FSPDInOut until change (observe &lt;timeout&gt;) see ArgBlock FSPDInOut</td>
</tr>
<tr>
<td>d) Evaluation 1)</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>A) FSP protocol parameter record:</td>
</tr>
<tr>
<td>FSP_ProtVersion = defaultValue in IODD,</td>
</tr>
<tr>
<td>FSP_ProtMode = defaultValue in IODD,</td>
</tr>
<tr>
<td>FSP_Watchdog = defaultValue in IODD,</td>
</tr>
<tr>
<td>FSP_IOSStructCRC = defaultValue in IODD,</td>
</tr>
<tr>
<td>FSP_TechParCRC = valid CRC signature</td>
</tr>
<tr>
<td>FSP_ProtParCRC = valid CRC signature</td>
</tr>
<tr>
<td>B) FSP authenticity parameter record:</td>
</tr>
<tr>
<td>FSCP_Authenticity_1 = 1,</td>
</tr>
<tr>
<td>FSCP_Authenticity_2 = 2,</td>
</tr>
<tr>
<td>FSP_Port = 1,</td>
</tr>
<tr>
<td>FSP_AuthentCRC = 11456</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
<tr>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>1) Check change</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>No &lt;timeout&gt;</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>&lt;timeout&gt;</td>
</tr>
<tr>
<td>Report</td>
</tr>
<tr>
<td>SPDU exchange: &lt;negative/positive&gt;  &lt;ok</td>
</tr>
</tbody>
</table>
8.2.2 Correct VerifyRecord and FSP_TechParCRC ("commissioning")

Table 47 defines the test conditions for this test case. It checks whether an FS-Device starts SCL communication in "commissioning - test" mode (operation monitored by personnel) after receiving a valid VerifyRecord and FSP_TechParCRC = 0.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0036</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_COMMISTEST</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Correct VerifyRecord and FSP_TechParCRC (&quot;commissioning test&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
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<td>Test parameter</td>
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<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check change</td>
</tr>
<tr>
<td>Test passed</td>
<td>No &lt;timeout&gt;</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>&lt;timeout&gt;</td>
</tr>
<tr>
<td>Report</td>
<td>SPDU exchange: &lt;negative/positive&gt;</td>
</tr>
</tbody>
</table>
8.2.3 Missing VerifyRecord at start-up ("armed")

Table 48 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication when VerifyRecord is missing in "armed" mode (operation not monitored).

**Table 48 – Missing VerifyRecord at start-up ("armed")**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0037</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_ARMEDNOVFY</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Missing VerifyRecord at start-up (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

| Purpose (detailed)          | Make sure that an FS-Device is not going to start SCL communication without receiving a valid and matching VerifyRecord within twice the time required for regular start-up. |
| Precondition                | EUT configured for armed operation; see field test parameter FSDT Port config DEACTIVATED |
| Procedure                   | a) Set PortConfig with FSP_VerifyRecord with values of A) and B) e.g. via SMI_PortConfiguration using ArgBlock 0x8100; see field test parameter FSDT: Do NOT send FSP_VerifyRecord b) Wait for Port state "OPERATE" e.g. via ArgBlock FSPortStatusList c) Evaluation 1) d) Evaluation 2) |
| Test parameter              | A) FSP protocol parameter record: FSP_ProtVersion = defaultValue in IODD, FSP_ProtMode = defaultValue in IODD, FSP_Watchdog = defaultValue in IODD, FSP_IOStrucCRC = defaultValue in IODD, FSP_TechParCRC = valid CRC signature ;responsibility of tester FSP_ProtParCRC = valid CRC signature ;responsibility of tester B) FSP authenticity parameter record: FSCP_Authenticity_1 = 1, FSCP_Authenticity_2 = 2, FSP_Port = 1, FSP_AuthentCRC = 11456 |

| Post condition             | – |

**TEST CASE RESULTS CHECK / REACTION**

| Evaluation                 | 1) Check Port state 2) Check Events |
| Test passed                | Port state is "OPERATE", and Event 0xB00A received |
| Test failed (examples)     | Any check incorrect |
| Report                     | Port state OPERATE: <negative/positive> <ok | nok> Event 0xB00A received: <yes/no> <ok | nok> |
8.2.4 Missing VerifyRecord at start-up ("commissioning")

Table 49 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication when VerifyRecord is missing in "commissioning – test" mode (monitored operation).

Table 49 – Missing VerifyRecord at start-up ("commissioning")

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0038</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_TESTNOVFY</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Missing VerifyRecord at start-up (&quot;commissioning test&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Port state 2) Check Events</td>
</tr>
<tr>
<td>Test passed</td>
<td>Port state is &quot;OPERATE&quot;, and Event 0xB00A received</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Port state OPERATE: &lt;negative/positive&gt; &lt;ok</td>
</tr>
</tbody>
</table>
### 8.2.5 Incorrect FSP_TechParCRC ("commissioning")

Table 50 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication when FSP_TechParCRC ≠ 0 in "commissioning – test" mode (monitored operation). An Event shall be raised.

**Table 50 – Incorrect FSP_TechParCRC ("commissioning")**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0039</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_TECHPPAR0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Incorrect FSP_TechParCRC when &quot;commissioning test&quot;</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
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<tr>
<td></td>
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<td></td>
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</tbody>
</table>

| Post condition                   | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation                        | 1) Check Port state  
2) Check Events |
| Test passed                       | Port state is "OPERATE", and Event 0xB007 received |
| Test failed (examples)            | Any check incorrect |
| Report                            | Port state OPERATE: \(<\text{negative/positive}>\) \(\text{ok} | \text{nok}\)  
Event 0xB007 received: \(<\text{yes/no}>\) \(\text{ok} | \text{nok}\) |
8.2.6 Incorrect FSP_TechParCRC ("armed")

Table 51 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication when FSP_TechParCRC = 0 in "armed" mode (operation not monitored). An Event shall be raised.

Table 51 – Incorrect FSP_TechParCRC ("armed")

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0040</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_TECHPAR0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Incorrect FSP_TechParCRC (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                           | a) Set PortConfig with FSP_VerifyRecord with values of C) and B) e.g. via SMI_PortConfiguration using ArgBlock 0x8100 ;see field test parameter  
  b) Wait for Port state "OPERATE" e.g. via ArgBlock FSPortStatusList  
  c) Evaluation 1)  
  d) Evaluation 2) |
| Test parameter                      | A) FSP protocol parameter record:  
  FSP_ProtVersion = defaultValue in IODD,  
  FSP_ProtMode = defaultValue in IODD,  
  FSP_Watchdog = defaultValue in IODD,  
  FSP_IOStructCRC = defaultValue in IODD,  
  FSP_TechParCRC = valid CRC signature  
  FSP_ProtParCRC = valid CRC signature ;responsibility of tester  
  B) FSP authenticity parameter record:  
  FSCP_Authenticity_1 = 1,  
  FSCP_Authenticity_2 = 2,  
  FSP_Port = 1,  
  FSP_AuthentCRC = 11456  
  C) FSP protocol parameter record:  
  FSP_ProtVersion = defaultValue in IODD,  
  FSP_ProtMode = defaultValue in IODD,  
  FSP_Watchdog = defaultValue in IODD,  
  FSP_IOStructCRC = defaultValue in IODD,  
  FSP_TechParCRC = valid CRC signature + 1,  
  FSP_ProtParCRC = valid CRC signature ;responsibility of tester |
| Post condition                     | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation                         | 1) Check Port state  
  2) Check Events |
| Test passed                        | Port state is "OPERATE", and  
  Event 0xB007 received |
| Test failed (examples)             | Any check incorrect |
| Report                             | Port state OPERATE: <negative/positive>  
  Event 0xB007 received: <yes/no>  
  <ok | nok>  
  <ok | nok> |
8.2.7 Unexpected authenticity 1 ("armed")

Table 52 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication in case of VerifyRecord with unexpected authenticity 1 in "armed" mode (operation not monitored). This corresponds to the use case of a misconnected FS-Device to a correct Port but to an incorrect FS-Master. In this case an Event shall be raised.

Table 52 – Unexpected authenticity 1 ("armed")

<table>
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<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
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<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0041</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_AUTH1WRONG</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Unexpected authenticity 1 (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1, clause B.1</td>
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<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
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<th>TEST CASE CONDITIONS / PERFORMANCE</th>
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<tbody>
<tr>
<td>Purpose (detailed)</td>
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<td>Precondition</td>
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<tr>
<td>Post condition</td>
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<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Port state</td>
</tr>
<tr>
<td></td>
<td>2) Check Events</td>
</tr>
<tr>
<td>Test passed</td>
<td>Port state is &quot;OPERATE&quot;, and Event 0xB003 received</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Port state OPERATE: &lt;negative/positive&gt; &lt;ok</td>
</tr>
<tr>
<td></td>
<td>Event 0xB003 received: &lt;yes/no&gt; &lt;ok</td>
</tr>
</tbody>
</table>
8.2.8 Unexpected authenticity 2 ("armed")

Table 53 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication in case of VerifyRecord with unexpected authenticity 2 in "armed" mode (operation not monitored). This corresponds to the use case of a misconnected FS-Device to a correct Port but to an incorrect FS-Master. In this case an Event shall be raised.

Table 53 – Unexpected authenticity 2 ("armed")

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0042</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_AUTH2WRONG</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Unexpected authenticity 2 (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1, clause B.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
| Procedure                           | a) Set PortConfig with FSP_VerifyRecord with values of A) and C)  
|                                    | e.g. via SMI_PortConfiguration using ArgBlock 0x8100 ;see field test parameter |
|                                    | b) Wait for Port state "OPERATE"  
|                                    | e.g. via ArgBlock FSPortStatusList |
|                                    | c) Evaluation 1)  
|                                    | d) Evaluation 2) |
| Test parameter                      | A) FSP protocol parameter record:  
|                                    | FSP_ProtVersion = defaultValue in IODD,  
|                                    | FSP_ProtMode = defaultValue in IODD,  
|                                    | FSP_Watchdog = defaultValue in IODD,  
|                                    | FSP_IOStructCRC = defaultValue in IODD,  
|                                    | FSP_TechParCRC = valid CRC signature  
|                                    | FSP_ProtParCRC = valid CRC signature ;responsibility of tester |
|                                    | B) FSP authenticity parameter record:  
|                                    | FSCP_Authenticity_1 = 1,  
|                                    | FSCP_Authenticity_2 = 2,  
|                                    | FSP_Port = 1,  
|                                    | FSP_AuthentCRC = 11456 |
|                                    | C) FSP authenticity parameter record:  
|                                    | FSCP_Authenticity_1 = 1,  
|                                    | FSCP_Authenticity_2 = 3,  
|                                    | FSP_Port = 1,  
|                                    | FSP_AuthentCRC = 24853 |
| Post condition                     | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation        | 1) Check Port state  
|                    | 2) Check Events |
| Test passed       | Port state is "OPERATE", and  
|                    | Event 0xB003 received |
| Test failed (examples) | Any check incorrect |
| Report            | Port state OPERATE: <negative/positive>  
|                    | Event 0xB003 received: <yes/no> <ok | nok> |
|                    | <ok | nok> |
8.2.9 Unexpected Port ("armed")

Table 54 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication in case of VerifyRecord with unexpected Port in "armed" mode (operation not monitored). This corresponds to the use case of a misconnected FS-Device to an incorrect Port but to a correct FS-Master. In this case an Event shall be raised.

<table>
<thead>
<tr>
<th>Test Case Attributes</th>
<th>Identification / Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0043</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_PORTWRONG</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Unexpected Port (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1, clause B.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Case Conditions / Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
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</tr>
</tbody>
</table>

| Test parameter                   | A) FSP protocol parameter record: |
|                                   | FSP_ProtVersion = defaultValue in IODD, |
|                                   | FSP_ProtMode = defaultValue in IODD, |
|                                   | FSP_Watchdog = defaultValue in IODD, |
|                                   | FSP_IOStructCRC = defaultValue in IODD, |
|                                   | FSP_TechParCRC = valid CRC signature |
|                                   | FSP_ProtParCRC = valid CRC signature; responsibility of tester |
| B) FSP authenticity parameter record: | |
|                                   | FSCP_Authenticity_1 = 1, |
|                                   | FSCP_Authenticity_2 = 2, |
|                                   | FSP_Port = 1, |
|                                   | FSP_AuthentCRC = 11456 |
| C) FSP authenticity parameter record: | |
|                                   | FSCP_Authenticity_1 = 1, |
|                                   | FSCP_Authenticity_2 = 2, |
|                                   | FSP_Port = 2, |
|                                   | FSP_AuthentCRC = 65341 |

| Post condition                   | – |

<table>
<thead>
<tr>
<th>Test Case Results</th>
<th>Check / Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Port state</td>
</tr>
<tr>
<td></td>
<td>2) Check Events</td>
</tr>
<tr>
<td>Test passed</td>
<td>Port state is &quot;OPERATE&quot;, and</td>
</tr>
<tr>
<td></td>
<td>Event 0xB004 received</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Port state OPERATE: &lt;negative/positive&gt;</td>
</tr>
<tr>
<td></td>
<td>Event 0xB004 received: &lt;yes/no&gt;</td>
</tr>
</tbody>
</table>

Table 54 – Unexpected Port ("armed")
### 8.2.10 Incorrect authenticity CRC signature ("armed")

Table 55 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication in case of VerifyRecord with incorrect authenticity CRC signature in "armed" mode (operation not monitored). In this case an Event shall be raised.

<table>
<thead>
<tr>
<th>Identification (ID)</th>
<th>SDCI_FSTC_0044</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_AUTHCRCWRG</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Incorrect authenticity CRC signature (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1, clause B.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

#### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed) | Make sure that an FS Device is not going to start SCL communication ("armed") when receiving VerifyRecord with incorrect FSP_AuthentCRC parameter. |
| Precondition       | EUT configured for armed operation; see A) and B) FSDT Port config DEACTIVATED |
| Procedure          | a) Set PortConfig with FSP_VerifyRecord with values of A) and C) e.g. via SMI_PortConfiguration using ArgBlock 0x8100; see field test parameter b) Wait for Port state "OPERATE" e.g. via ArgBlock FSPortStatusList c) Evaluation 1) d) Evaluation 2) |
| Test parameter     | A) FSP protocol parameter record: FSP_ProtVersion = defaultValue in IODD, FSP_ProtMode = defaultValue in IODD, FSP_Watchdog = defaultValue in IODD, FSP_IOS structCRC = defaultValue in IODD, FSP_TechParCRC = valid CRC signature FSP_ProtParCRC = valid CRC signature B) FSP authenticity parameter record: FSCP_Authenticity_1 = 1, FSCP_Authenticity_2 = 2, FSP_Port = 1, FSP_AuthentCRC = 11456 C) FSP authenticity parameter record: FSCP_Authenticity_1 = 1, FSCP_Authenticity_2 = 2, FSP_Port = 1, FSP_AuthentCRC = 11457 |
| Post condition     | – |

#### TEST CASE RESULTS CHECK / REACTION

| Evaluation | 1) Check Port state 2) Check Events |
| Test passed | Port state is "OPERATE", and Event 0xB005 received |
| Test failed (examples) | Any check incorrect |
| Report | Port state OPERATE: <negative/positive> Event 0xB005 received: <yes/no> |
8.2.11 Incorrect protocol parameter CRC signature ("armed")

Table 55 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication in case of VerifyRecord with incorrect protocol parameter CRC signature in "armed" mode (operation not monitored). In this case an Event shall be raised.

Table 56 – Incorrect protocol parameter CRC signature ("armed")

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0045</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_PPARCRCWRG</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Incorrect protocol parameter CRC signature (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1, clause B.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Port state 2) Check Events</td>
</tr>
<tr>
<td>Test passed</td>
<td>Port state is &quot;OPERATE&quot;, and Event 0xB006 received</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Port state OPERATE: &lt;negative/positive&gt; &lt;ok</td>
</tr>
</tbody>
</table>
8.2.12 Incorrect technology parameter CRC signature ("armed")

Table 55 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication in case of VerifyRecord with incorrect technology parameter CRC signature in "armed" mode (operation not monitored). In this case an Event shall be raised.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0046</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_TPARCRCWGRG</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Incorrect technology parameter CRC signature (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1, clause B.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Port state 2) Check Events</td>
</tr>
<tr>
<td>Test passed</td>
<td>Port state is &quot;OPERATE&quot;, and Event 0xB007 received</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Port state OPERATE: &lt;negative/positive&gt; &lt;ok</td>
</tr>
</tbody>
</table>
**8.2.13 Incorrect IO structure CRC signature ("armed")**

Table 58 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication in case of VerifyRecord with incorrect technology parameter CRC signature in "armed" mode (operation not monitored). In this case an Event shall be raised.

### Table 58 – Incorrect IO structure CRC signature ("armed")

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0047</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_IOSTCRCWRG</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Incorrect IO structure CRC signature (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1, clause B.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Make sure that an FS Device is not going to start SCL communication (&quot;armed&quot;) when receiving VerifyRecord with incorrect FSP_IO_StructCRC parameter.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>EUT configured for armed operation; FSDT Port config DEACTIVATED</td>
</tr>
<tr>
<td>Procedure</td>
<td>a) Set PortConfig with FSP_VerifyRecord with values of C) and B) e.g. via SMI_PortConfiguration using ArgBlock 0x8100 ;see field test parameter</td>
</tr>
<tr>
<td></td>
<td>b) Wait for Port state &quot;OPERATE&quot; e.g. via ArgBlock FSPortStatusList</td>
</tr>
<tr>
<td></td>
<td>c) Evaluation 1)</td>
</tr>
<tr>
<td></td>
<td>d) Evaluation 2)</td>
</tr>
</tbody>
</table>

| Test parameter      | A) FSP protocol parameter record: FSP_ProtVersion = defaultValue in IODD, FSP_ProtMode = defaultValue in IODD, FSP_Watchdog = defaultValue in IODD, FSP_IOStructCRC = valid CRC signature, FSP_TechParCRC = valid CRC signature, FSP_ProtParCRC = valid CRC signature ;responsibility of tester |
|                    | B) FSP authenticity parameter record: FSCP_Authenticity_1 = 1, FSCP_Authenticity_2 = 2, FSP_Port = 1, FSP_AuthentCRC = 11456 |
|                    | C) FSP protocol parameter record: FSP_ProtVersion = defaultValue in IODD, FSP_ProtMode = defaultValue in IODD, FSP_Watchdog = defaultValue in IODD, FSP_IOStructCRC = valid CRC signature, FSP_TechParCRC = valid CRC signature, FSP_ProtParCRC = valid CRC signature ;responsibility of tester |
| Post condition      | –                                                                        |

### TEST CASE RESULTS

| Evaluation          | 1) Check Port state  
|                    | 2) Check Events       |
| Test passed         | Port state is "OPERATE", and Event 0xB008 received                         |
| Test failed (examples) | Any check incorrect       |
| Report              | Port state OPERATE: <negative/positive> <ok | nok> 
|                     | Event 0xB008 received: <yes/no> <ok | nok> |
8.2.14 Invalid watchdog time ("armed")

Table 59 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication in case of VerifyRecord with invalid watchdog time in "armed" mode (operation not monitored). In this case an Event shall be raised.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0048</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_WDTIMEINVL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Invalid watchdog time (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1, clause B.1, A.2.6</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation                         | 1) Check Port state  
|                                   | 2) Check Events      |
| Test passed                        | Port state is "OPERATE", and Event 0xB009 received |
| Test failed (examples)             | Any check incorrect  |
| Report                             | Port state OPERATE: <negative/positive> | ok | nok |
|                                   | Event 0xB009 received: <yes/no>          | ok | nok |
8.2.15 Invalid protocol version ("armed")

Table 60 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication in case of VerifyRecord with incorrect protocol version in "armed" mode (operation not monitored). In this case no Event shall be raised.

Table 60 – Invalid protocol version ("armed")

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0049</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_PVERSINVL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Invalid protocol version (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Port state</td>
</tr>
<tr>
<td>Test passed</td>
<td>Port state is &quot;OPERATE&quot;</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Port state OPERATE: &lt;negative/positive&gt; &lt;ok</td>
</tr>
</tbody>
</table>
8.2.16 Invalid protocol mode ("armed")

Table 61 defines the test conditions for this test case. It checks whether an FS-Device refuses to start SCL communication in case of VerifyRecord with incorrect protocol mode in "armed" mode (operation not monitored). In this case no Event shall be raised.

Table 61 – Invalid protocol mode ("armed")

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0050</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_PARM_VRFY_PMODEINVNL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Invalid protocol mode (&quot;armed&quot;)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device PREOPERATE test: test-to-pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 10.4.1, clause 10.4.3.1, clause 11.7.6, clause G.1</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                           | a) Set PortConfig with FSP_VerifyRecord with values of C) and B) e.g. via SMI_PortConfiguration using ArgBlock 0x8100 ; see field test parameter  
b) Wait for Port state "OPERATE" e.g. via ArgBlock FSPortStatusList  
c) Evaluation 1) |
| Test parameter                      | A) FSP protocol parameter record: FSP_ProtVersion = defaultValue in IODD, FSP_ProtMode = defaultValue in IODD, FSP_Watchdog = defaultValue in IODD, FSP_IOSstructCRC = valid CRC signature, FSP_ProtParCRC = valid CRC signature ; responsibility of tester  
B) FSP authenticity parameter record: FSCP_Authenticity_1 = 1, FSCP_Authenticity_2 = 2, FSP_Port = 1, FSP_AuthentCRC = 11456  
C) FSP protocol parameter record: FSP_ProtVersion = defaultValue in IODD + 1, FSP_ProtMode = 10, FSP_Watchdog = defaultValue in IODD, FSP_IOSstructCRC = valid CRC signature, FSP_TechParCRC = valid CRC signature, FSP_ProtParCRC = valid CRC signature ; responsibility of tester |
| Post condition                      | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>
8.3 Special SCL tests

8.3.1 Principle of FS-Device watchdog timer test

In 13.6.1, the general concepts on worst-case delay times (WCDT) and one fault delay times (OFDT) as well as watchdog timer testing for FS-Master are explained. The test case for FS-Devices follows a similar concept.

Figure 12 illustrates, how the watchdog timer of an FS-Device is tested. The FS-Device Tester controls the FS-Device in such a way that the FS-Master SPDU ("MCount = 4") is delayed through artificial repetitions. For details see 8.3.2.

Figure 12 – Principle of FS-Device watchdog timer test

Usually, the SCL software is triggered by the IO-Link communication, which is determined by the Master cycle time. Thus, the reaction of the SCL on expiration of the watchdog depends on how the SCL software samples the IO-Link messages with SPDU as shown in Figure 13.

Figure 13 – Influence of SCL sampling effects

In best case, the expiration of the watchdog coincides with the sampling. In worst case, the expiration is just behind sampling and the safety reaction is delayed correspondingly.

It is highly recommended for the designer of an FS-Device to choose the default value of the parameter FSP_Watchdog in IODD such that one extra SCL cycle time is included.
8.3.2 FS-Device watchdog timer test

Table 62 defines the test conditions for this test case. The base protocol watchdog function of the SCL is tested in 9.2.

### Table 62 – FS-Device watchdog timer test

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0051</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_WATCHDOGANDIODD</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether FS-Device watchdog timeout coincides with IODD value</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device and IODD</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>Check whether FS-Device's safety reaction time upon watchdog timeout coincides with the FSP_Watchdog value in the IODD.</td>
</tr>
<tr>
<td>Precondition</td>
<td>EUT: Configured for armed operation ;see field test parameter</td>
</tr>
<tr>
<td></td>
<td>FSDT: Port config DEACTIVATED</td>
</tr>
<tr>
<td>Procedure</td>
<td>a) Set PortConfig with FSP_VerifyRecord with values of A) and B) ;see field test parameter</td>
</tr>
<tr>
<td></td>
<td>e.g. via SMI_PortConfiguration using ArgBlock 0x9100 ;see field test parameter</td>
</tr>
<tr>
<td></td>
<td>b) Line monitor to measure timeouts for 1 min (Status Bit0 = 0, DTimeout)</td>
</tr>
<tr>
<td></td>
<td>c) Evaluation 1)</td>
</tr>
<tr>
<td></td>
<td>d) Reduce FSP_Watchdog value by 10 % and set PortConfig again</td>
</tr>
<tr>
<td></td>
<td>e) Line monitor to measure timeouts for 1 min (Status Bit0 = 0, DTimeout)</td>
</tr>
<tr>
<td></td>
<td>f) Evaluation 2)</td>
</tr>
<tr>
<td>Test parameter</td>
<td>A) FSP protocol parameter record:</td>
</tr>
<tr>
<td></td>
<td>FSP_ProtVersion = defaultValue in IODD,</td>
</tr>
<tr>
<td></td>
<td>FSP_ProtMode = defaultValue in IODD,</td>
</tr>
<tr>
<td></td>
<td>FSP_Watchdog = defaultValue in IODD,</td>
</tr>
<tr>
<td></td>
<td>FSP_IOSstructCRC = defaultValue in IODD,</td>
</tr>
<tr>
<td></td>
<td>FSP_TechParCRC = valid CRC signature</td>
</tr>
<tr>
<td></td>
<td>FSP_ProtParCRC = valid CRC signature</td>
</tr>
<tr>
<td></td>
<td>;responsibility of tester</td>
</tr>
<tr>
<td></td>
<td>B) FSP authenticity parameter record:</td>
</tr>
<tr>
<td></td>
<td>FSCP_Authenticity_1 = 1,</td>
</tr>
<tr>
<td></td>
<td>FSCP_Authenticity_2 = 2,</td>
</tr>
<tr>
<td></td>
<td>FSP_Port = 1,</td>
</tr>
<tr>
<td></td>
<td>FSP_AuthentCRC = 11456</td>
</tr>
<tr>
<td></td>
<td>;responsibility of tester</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check timeouts (default)</td>
</tr>
<tr>
<td></td>
<td>2) Check timeouts (-10%)</td>
</tr>
<tr>
<td>Test passed</td>
<td>No timeouts occurred, and</td>
</tr>
<tr>
<td></td>
<td>Timeouts can occur</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Values OK: &lt;yes/no&gt; &lt;ok</td>
</tr>
</tbody>
</table>
8.3.3  Watchdog retrigger and CRC exception (0 → 1)

8.3.1 defines the conditions for this test case. Some critical safety features cannot be tested by IO-Link on-board equipment and shall be assessed during the development process via verification and validation activities according to appropriate clauses in IEC 61508-3 as also mentioned in 13.6.1.

Manufacturer to prove that the SCL watchdog timer is only retriggered when MCount has been incremented and a calculated SPDU CRC signature of "0" will be changed to "1".
9 FS-Device safety communication layer tests

9.1 Interface for the FS-Device SCL test scripts

The test scripts for the automated safety layer test are encoded as XML files. Each and every test script ("FSDeviceSclTestCaseSteps") consists of test step instructions as described in Table 63. The XML Schema of the interface parameters for the FS-Device automated safety layer test is illustrated in Figure 14. It is similar to the XML format of the message types for the FS-Master (see 12.1).

However, the test scripts for the FS-Device do not contain test data for the "technology" interface. An upper tester is not intended for the FS-Device test. During the execution of the test scripts, the "technology" data has always its configured initial value.

NOTE The general concept of SCL protocol conformance testing is described in A.2.3. The automated safety layer tester for FS-Devices is described in A.2.5.

Figure 14 – Schema of steps and parameters/attributes

Table 63 defines the FS-Device interface parameters.

<table>
<thead>
<tr>
<th>Test step instructions</th>
<th>Parameter</th>
<th>Value range</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSDeviceSend (FS-Device → Test System)</td>
<td>PDin</td>
<td>SD – Test System expects SD values (= 0) PD – Test System expects PD values (&gt; 0)</td>
</tr>
<tr>
<td></td>
<td>PortNum</td>
<td>valid – Test System expects configured port number</td>
</tr>
<tr>
<td></td>
<td>DCOUNT</td>
<td>0 to 7</td>
</tr>
<tr>
<td></td>
<td>SDset</td>
<td>0, 1</td>
</tr>
<tr>
<td>Test step instructions</td>
<td>Parameter</td>
<td>Value range</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>DCommErr</td>
<td>0, 1</td>
<td></td>
</tr>
<tr>
<td>DTimeout</td>
<td>0, 1</td>
<td></td>
</tr>
<tr>
<td>CRC</td>
<td>valid – Test System expects correct CRC-Signature</td>
<td></td>
</tr>
<tr>
<td>FSDeviceReceive</td>
<td>PDout</td>
<td>PD – Test System sends PD values (&gt; 0)</td>
</tr>
<tr>
<td>(Test System → FS-Device)</td>
<td>PortNum</td>
<td>valid – Test System sends configured port number</td>
</tr>
<tr>
<td></td>
<td></td>
<td>invalid – Test System sends not configured port number</td>
</tr>
<tr>
<td></td>
<td>MCount</td>
<td>0 to 7</td>
</tr>
<tr>
<td></td>
<td>setSD</td>
<td>0, 1</td>
</tr>
<tr>
<td></td>
<td>ChFAckReq</td>
<td>0, 1</td>
</tr>
<tr>
<td>CRC</td>
<td>valid – Test System sends correct CRC-Signature</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>invalid – Test System sends incorrect CRC-Signature</td>
</tr>
<tr>
<td>Timeout</td>
<td></td>
<td>Test System sends no new message within a time delay ≥ DTime. See for example 9.2.3.</td>
</tr>
<tr>
<td>(Test System → FS-Device)</td>
<td>SourceState</td>
<td>This parameter is informative and will be inserted only in test logging from test system</td>
</tr>
<tr>
<td>Transition</td>
<td>TargetState</td>
<td>This parameter is informative and will be inserted only in test logging from test system</td>
</tr>
</tbody>
</table>

The test step instructions comprise test messages from and to the FS-Device, Timeout, and Transition tags.

Test messages sent by the FS-Device test object (EUT) are specified with the message type "FSDeviceSend". The test message type "FSDeviceReceive" describes test messages that are received by the FS-Device in a test scenario. Both messages are defining test data that are received from or sent to the IO-Link communication Port.

The test step instruction "Timeout" specifies for how long the test system shall not send a response. This time shall be greater than the watchdog time of the EUT (DTime).

The XML tag "Transition" is used for traceability of test messages with respect to the expected transition of the state machine specified in [4]. This information is only descriptive and has no impact on the test flow of the test tool.
9.2 FS-Device SCL test suite

9.2.1 Test script 1

Table 64 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

Table 64 – FS-Device test script 1

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0052</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_NOERRMC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

TEST CASE CONDITIONS / PERFORMANCE

Purpose (detailed) Protocol flow in case of distinct error
Precondition FS-Device waiting for the first message
Procedure See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_1.xml"
Test parameter See Table 63 and XML file
Post condition –

TEST CASE RESULTS CHECK / REACTION

Evaluation Comparison of expected and received values according to the XML file
Test passed Comparison OK
Test failed (examples) Comparison not OK
Report Printout of the automated SCL protocol tester <pass/fail>
1019  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
1020  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
1021  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
1022  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="1" ChFAckReq="0" CRC="valid"/>
1023  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
1024  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
1025  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
1026  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
1027  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
1028  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
1029  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
1030  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
1031  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="1" ChFAckReq="0" CRC="valid"/>
1032  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
1033  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
1034  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
1035  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
1036  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="1" ChFAckReq="0" CRC="valid"/>
1037  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
1038  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
1039  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
1040  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
1041  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="1" ChFAckReq="0" CRC="valid"/>
1042  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
1043  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
1044  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
1045  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
1046  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="1" ChFAckReq="0" CRC="valid"/>
1047  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
1048  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
1049  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
1050  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
Table 65 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error and MCount = 0.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0053</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

| Purpose (detailed) | Protocol flow in case of distinct error |
| Precondition       | FS-Device waiting for the first message |
| Procedure          | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_2.xml" |
| Test parameter     | See Table 63 and XML file |
| Post condition     | – |

**TEST CASE RESULTS CHECK / REACTION**

| Evaluation         | Comparison of expected and received values according to the XML file |
| Test passed        | Comparison OK |
| Test failed (examples) | Comparison not OK |
| Report             | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_2.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_2" date="20.11.2018: 14:01:13.942">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
1074  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
1075  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFackReq="0" CRC="valid"/>
1076  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
1077  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
1078  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
1079  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
1080  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFackReq="0" CRC="valid"/>
1081  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
1082  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
1083  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
1084  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
1085  </FSDeviceSclTestCaseSteps>
1086  </Testroot>
1087
9.2.3 Test script 3

Table 66 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 5, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0054</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC5TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_3.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<xTestroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_3" date="20.11.2018: 14:01:13.942">  
<FSDeviceScfTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceScfTestCaseSteps>
</xTestroot>
```
9.2.4 Test script 4

Table 67 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

**Table 67 – FS-Device test script 4**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0055</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_4.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="PrepareResponse_25"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="PrepareResponse_25" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSendTestCaseSteps>
</Testroot>
### 9.2.5 Test script 5

Table 68 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error and MCount = 0.

#### Table 68 – FS-Device test script 5

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0056</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

#### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed)      | Protocol flow in case of distinct error |
| Precondition            | FS-Device waiting for the first message |
| Procedure               | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_5.xml" |
| Test parameter          | See Table 63 and XML file               |
| Post condition          | –                                          |

#### TEST CASE RESULTS CHECK / REACTION

| Evaluation               | Comparison of expected and received values according to the XML file |
| Test passed              | Comparison OK                                                                |
| Test failed (examples)   | Comparison not OK                                                            |
| Report                   | Printout of the automated SCL protocol tester <pass/fail>                   |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_5.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_5" date="20.11.2018: 14:01:13.943">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setID="" setSD="" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setID="" setSD="" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setID="" setSD="" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.6  Test script 6

Table 69 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 2, and Timeout.

**Table 69 – FS-Device test script 6**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0057</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

| Purpose (detailed) | Protocol flow in case of distinct error |
| Precondition       | FS-Device waiting for the first message |
| Procedure          | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_6.xml" |
| Test parameter     | See Table 63 and XML file |
| Post condition     | – |

**TEST CASE RESULTS CHECK / REACTION**

| Evaluation         | Comparison of expected and received values according to the XML file |
| Test passed        | Comparison OK |
| Test failed (examples) | Comparison not OK |
| Report             | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_6.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_6" date="20.11.2018: 14:01:13.943">  
  <FSDeviceScTestCaseSteps>  
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  </FSDeviceScTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="1" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_22"/>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
9.2.7 Test script 7

Table 70 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

<table>
<thead>
<tr>
<th>Table 70 – FS-Device test script 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEST CASE ATTRIBUTES</strong></td>
</tr>
<tr>
<td>Identification (ID)</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Purpose (short)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
</tr>
<tr>
<td>Test case version</td>
</tr>
<tr>
<td>Category / type</td>
</tr>
<tr>
<td>Specification (clause)</td>
</tr>
<tr>
<td>Configuration / setup</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>TEST CASE CONDITIONS / PERFORMANCE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>TEST CASE RESULTS CHECK / REACTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_7.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_7" date="2011.11.20: 14:01:13.943">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
### 9.2.8 Test script 8

Table 71 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 7, and Timeout.

<table>
<thead>
<tr>
<th>Table 71 – FS-Device test script 8</th>
</tr>
</thead>
</table>

#### TEST CASE ATTRIBUTES

<table>
<thead>
<tr>
<th>Identification (ID)</th>
<th>SDCI_FSTC_0059</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>FSTD_SCLD_FLOW_SETSD0MC7TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>-</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
</tbody>
</table>

| Configuration / setup | See Table 63 |

#### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_8.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>-</td>
</tr>
</tbody>
</table>

#### TEST CASE RESULTS CHECK / REACTION

| Evaluation          | Comparison of expected and received values according to the XML file |
| Report              | Printout of the automated SCL protocol tester <pass/fail> |

### Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_8.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_8" date="20.11.2018: 14:01:13.943">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
## Test script 9

Table 72 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a CRC error and MCount = 0, and Timeout.

<table>
<thead>
<tr>
<th><strong>TEST CASE ATTRIBUTES</strong></th>
<th><strong>IDENTIFICATION / REFERENCE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDI_FSTC_0060</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_CRC1MC0TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_9.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

### TEST CASE RESULTS CHECK / REACTION

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Comparison of expected and received values according to the XML file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_9.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_9" date="20.11.2018: 14:01:13.943">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Timeout/>  
    <Transition SourceState="WaitOnSPDU_26" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Timeout/>  
    <Transition SourceState="WaitOnSPDU_26" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
## 9.2.10 Test script 10

Table 73 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and Timeout.

### Table 73 – FS-Device test script 10

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0061</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

### TEST CASE RESULTS CHECK / REACTION

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Comparison of expected and received values according to the XML file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_10.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_10" date="20.11.2018: 14:01:13.943">  
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Timeout/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="1" CRC="valid"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="1" DTimeout="0" CRC="invalid"/>
  <Transition SourceState="WaitOnSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
### 9.2.11  Test script 11

Table 74 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error and MCount = 0.

#### Table 74 – FS-Device test script 11

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0062</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_11.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

### TEST CASE RESULTS

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Comparison of expected and received values according to the XML file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_11.xml":

```xml
<xml version="1.0" encoding="UTF-8">""
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_11" date="20.11.2018: 14:01:13.944">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFActReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="11" setSD="0" ChFActReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFActReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="11" setSD="0" ChFActReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFActReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
### 9.2.12 Test script 12

Table 75 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

#### Table 75 – FS-Device test script 12

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0063</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_12.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.13 Test script 13

Table 76 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

Table 76 – FS-Device test script 13

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCL_SFTC_0064</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_13.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_13" date="20.11.2018: 14:01:13.944">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="PrepareResponse_27"/>
  <Transition SourceState="PrepareResponse_27" TargetState="WaitOnSPDU_28"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.14 Test script 14

Table 77 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 2, and DCommErr.

Table 77 – FS-Device test script 14

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0065</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC2DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_14.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_14" date="20.11.2018: 14:01:13.944">  
<FSDeviceSclTestCaseSteps>  
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDSet="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDSet="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDSet="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>  
</Testroot>
```
9.2.15 Test script 15

Table 78 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

Table 78 – FS-Device test script 15

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0066</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_15.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<root xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_15" date="20.11.2018: 14:01:13.944">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="8" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
</FSDeviceSclTestCaseSteps>
</root>
```
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.16 Test script 16

Table 79 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0067</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester</td>
</tr>
</tbody>
</table>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>

<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>

<FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>

<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>

<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>

<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>

<Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_22"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>

<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>

</FSDeviceSclTestCaseSteps>

</Testroot>
9.2.17 Test script 17

Table 80 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a PortNum error and MCount = 0.

**Table 80 – FS-Device test script 17**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0068</td>
</tr>
<tr>
<td>Name</td>
<td>FSTC_SCLD_FLOW_PNERRMC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_17.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_17" date="20.11.2018: 14:01:13.944">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
Table 81 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 2, and Timeout.

Table 81 – FS-Device test script 18

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0069</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

Purpose (detailed) Protocol flow in case of distinct error
Precondition FS-Device waiting for the first message
Procedure See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_18.xml"
Test parameter See Table 63 and XML file
Post condition –

TEST CASE RESULTS CHECK / REACTION

Evaluation Comparison of expected and received values according to the XML file
Test passed Comparison OK
Test failed (examples) Comparison not OK
Report Printout of the automated SCL protocol tester <pass/fail>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_18.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_18" date="20.11.2018: 14:01:13.944">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.19 Test script 19

Table 82 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

Table 82 – FS-Device test script 19

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0070</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_19.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_19" date="20.11.2018: 14:01:13.944">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="invalid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="invalid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="invalid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="PrepareResponse_27"/>
  <Transition SourceState="PrepareResponse_27" TargetState="WaitOnSPDU_28"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.20 Test script 20

Table 83 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

### Table 83 – FS-Device test script 20

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0071</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_20.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Tstroot xsi:NoNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_20" date="20.11.2018: 14:01:13.944">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive POut="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <FSDeviceSend PIn="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive POut="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PIn="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive POut="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PIn="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive POut="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  </FSDeviceSclTestCaseSteps>
</Tstroot>
```
Table 84 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

### Table 84 – FS-Device test script 21

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0072</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed)      | Protocol flow in case of distinct error |
| Precondition            | FS-Device waiting for the first message |
| Procedure               | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_21.xml" |
| Test parameter          | See Table 63 and XML file             |
| Post condition          | –                                   |

### TEST CASE RESULTS / CHECK / REACTION

| Evaluation          | Comparison of expected and received values according to the XML file |
| Test passed         | Comparison OK                                                            |
| Test failed (examples) | Comparison not OK                                                        |
| Report              | Printout of the automated SCL protocol tester <pass/fail>                |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_21.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_21" date="20.11.2018: 14:01:13.944">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="PrepareResponse_27"/>
    <Transition SourceState="PrepareResponse_27" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_27" TargetState="PrepareResponse_25"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.22 Test script 22

Table 85 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

### Table 85 – FS-Device test script 22

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0073</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD FLOW_SETSD1MC0DCE</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_22.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_22" date="20.11.2018: 14:01:13.945">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.23 Test script 23

Table 86 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 1, and DCommErr.

Table 86 – FS-Device test script 23

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0074</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC1DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_23.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_23" date="20.11.2018: 14:01:13.945">
    <FSDeviceSclTestCaseSteps>
        <Transition SourceState="Init" TargetState="SystemStart_20"/>
        <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
        <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="0" DCommErr="1" DTimeout="1" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
        <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
        <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="WaitOnSPDU_26"/>
    </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.24 Test script 24

Table 87 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 1, and DCommErr.

Table 87 – FS-Device test script 24

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0075</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC1DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_24.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_24" date="20.11.2018: 14:01:13.945">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.25 Test script 25

Table 88 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

### Table 88 – FS-Device test script 25

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0076</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_25.xml":

```
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_25" date="20.11.2018: 14:01:13.945">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="WaitOnSPDU_26"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.26 Test script 26

Table 89 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

### Table 89 – FS-Device test script 26

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0077</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_26.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.27 Test script 27

Table 90 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

**Table 90 – FS-Device test script 27**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0078</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_27.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

**TEST CASE RESULTS CHECK / REACTION**

| Evaluation          | Comparison of expected and received values according to the XML file |
| TEST CASE           |                                                              |
| Test passed         | Comparison OK                                               |
| Test failed (examples) | Comparison not OK                                      |
| Report              | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_27.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_27" date="20.11.2018: 14:01:13.945">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
### Table 91 – FS-Device test script 28

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0079</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD FLOW_SETSD0MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed)     | Protocol flow in case of distinct error |
| Precondition           | FS-Device waiting for the first message |
| Procedure              | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_28.xml" |
| Test parameter         | See Table 63 and XML file |
| Post condition         | –                                        |

### TEST CASE RESULTS CHECK / REACTION

| Evaluation             | Comparison of expected and received values according to the XML file |
| Test passed            | Comparison OK                                                          |
| Test failed (examples) | Comparison not OK                                                      |
| Report                 | Printout of the automated SCL protocol tester <pass/fail>              |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_28.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_28" date="20.11.2018: 14:01:13.945">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20" />
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21" />
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid" />
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22" />
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25" />
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26" />
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid" />
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid" />
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27" />
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25" />
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26" />
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid" />
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid" />
  <Transition SourceState="WaitOnSPDU_26" TargetState="WaitOnSPDU_26" />
  <Transition SourceState="WaitOnSPDU_26" TargetState="WaitOnSPDU_26" />
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.29 Test script 29

Table 92 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 2, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0080</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETS0D2MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_29.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_29" date="20.11.2018: 14:01:13.945">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.30 Test script 30

Table 92 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 2, and Timeout.

Table 93 – FS-Device test script 30

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0081</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification ( clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_30.xml":

```xml
<TestRoot xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_30" date="20.11.2018: 14:01:13.945">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</TestRoot>
```
9.2.31 Test script 31

Table 94 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 3, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0082</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC3TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_31.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_31" date="20.11.2018: 14:01:13.945">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="WaitOnSPDU_26"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.32 Test script 32

Table 95 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 3, and Timeout.

Table 95 – FS-Device test script 32

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCl_FSTC_0083</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC3TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_32.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_32" date="20.11.2018: 14:01:13.945">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.33 Test script 33

Table 96 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 3, and Timeout.

**Table 96 – FS-Device test script 33**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0084</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC3TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_33.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_33" date="20.11.2018: 14:01:13.945">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.34 Test script 34

Table 97 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 4, and Timeout.

Table 97 – FS-Device test script 34

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0085</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC4TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_34.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_34" date="20.11.2018: 14:01:13.945">
    <FSDeviceSclTestCaseSteps>
        <Transition SourceState="Init" TargetState="SystemStart_20"/>
        <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
        <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
        <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChF AckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
        <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
        <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChF AckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="WaitOnSPDU_26"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="WaitOnSPDU_26"/>
    </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.35 Test script 35

Table 98 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 4, and Timeout.

Table 98 – FS-Device test script 35

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0086</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC4TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_35.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" version="1.2" name="tc_35" date="20.11.2018: 14:01:13.946">  
<FSDeviceSclTestCaseSteps>  
<Transition SourceState="Init" TargetState="SystemStart_20"/>  
<Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>  
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>  
<Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>  
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>  
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>  
<FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>  
<Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>  
<Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>  
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>  
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>  
<Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>  
<Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>  
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>  
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>  
</FSDeviceSclTestCaseSteps>  
</Testroot>
```
Table 99 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 4, and Timeout.

**Table 99 – FS-Device test script 36**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0087</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC4TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_36.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_36" date="20.11.2018: 14:01:13.946">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.37  Test script 37

Table 100 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 5, and Timeout.

<table>
<thead>
<tr>
<th>Test Case Attributes</th>
<th>Identification / Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0088</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC5TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Case Conditions / Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Case Results Check / Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_37.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_37" date="20.11.2018: 14:01:13.946">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="WaitOnSPDU_26"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.38 Test script 38

Table 101 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 5, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0089</td>
</tr>
<tr>
<td>Name</td>
<td>FS_DCLD_FLOW_SETS0MCST0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_38.xml":

```xml
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFActReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFActReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="1" setSD="0" ChFActReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFActReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFActReq="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
```
9.2.39 Test script 39

Table 102 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 5, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0090</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC5TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_39.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_39" date="201111.20:14:01:13.946">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.40 Test script 40

Table 103 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 6, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0091</td>
</tr>
<tr>
<td>Name</td>
<td>FSTC_SCLUD_FLOW_SETSD0MC6TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_40.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_40" date="20.11.2018: 14:01:13.946">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="WaitOnSPDU_26"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.41 Test script 41

Table 104 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 6, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0092</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC6TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_41.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

### TEST CASE RESULTS CHECK / REACTION

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Comparison of expected and received values according to the XML file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_41.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_41" date="20.11.2018: 14:01:13.946">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
Table 105 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 7, and Timeout.

Table 105 – FS-Device test script 42

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0093</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETS0MC7TO</td>
</tr>
<tr>
<td>Purpose</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_42.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_42" date="20.11.2018: 14:01:13.946">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="WaitOnSPDU_26"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.43 Test script 43

Table 106 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 7, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0094</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC7TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_43.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_43" date="20.11.2018: 14:01:13.946">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.44 Test script 44

Table 107 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 7, and Timeout.

### Table 107 – FS-Device test script 44

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0095</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC7TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_44.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_44" date="20.11.2018: 14:01:13.946">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDtoOut="PD" PortNum="valid" MCount="7" setSD="0" ChFackReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDtoIn="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDtoOut="PD" PortNum="valid" MCount="1" setSD="0" ChFackReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.45 Test script 45

Table 108 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

Table 108 – FS-Device test script 45

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0096</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_45.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_45" date="20.11.2018: 14:01:13.946">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
Table 109 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0097</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

- **Purpose (detailed)**: Protocol flow in case of distinct error
- **Precondition**: FS-Device waiting for the first message
- **Procedure**: See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_46.xml"
- **Test parameter**: See Table 63 and XML file
- **Post condition**: –

**TEST CASE RESULTS**

- **Evaluation**: Comparison of expected and received values according to the XML file
- **Test passed**: Comparison OK
- **Test failed (examples)**: Comparison not OK
- **Report**: Printout of the automated SCL protocol tester <pass/fail>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_46.xml":

```
<xml version="1.0" encoding="UTF-8"/>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_46" date="20.11.2018: 14:01:13.946">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.47  Test script 47

Table 110 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

Table 110 – FS-Device test script 47

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0098</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_47.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_47" date="20.11.2018: 14:01:13.946">  
<FSDeviceSclTestCaseSteps>  
<Transition SourceState="Init" TargetState="SystemStart_20"/>  
<Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>  
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>  
<Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>  
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>  
<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>  
<FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>  
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="invalid"/>  
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>  
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>  
<FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>  
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>  
<Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>  
<Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>  
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>  
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>  
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>  
</FSDeviceSclTestCaseSteps>  
</Testroot>  ```
9.2.48 Test script 48

Table 111 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

Table 111 – FS-Device test script 48

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0099</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Purpose (detailed) Protocol flow in case of distinct error
Precondition FS-Device waiting for the first message
Procedure See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_48.xml"
Test parameter See Table 63 and XML file
Post condition –

Evaluation Comparison of expected and received values according to the XML file
Test passed Comparison OK
Test failed (examples) Comparison not OK
Report Printout of the automated SCL protocol tester <pass/fail>
Table 112 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

**Table 112 – FS-Device test script 49**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0100</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Test case version 1.0</td>
<td></td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed) Protocol flow in case of distinct error</td>
</tr>
<tr>
<td>Precondition FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_49.xml&quot;</td>
</tr>
<tr>
<td>Test parameter See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition –</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation Comparison of expected and received values according to the XML file</td>
<td></td>
</tr>
<tr>
<td>Test passed Comparison OK</td>
<td></td>
</tr>
<tr>
<td>Test failed (examples) Comparison not OK</td>
<td></td>
</tr>
<tr>
<td>Report Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_49.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_49" date="20.11.2018: 14:01:13.947">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="invalid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="PrepareResponse_27"/>
  <Transition SourceState="PrepareResponse_27" TargetState="WaitOnSPDU_28"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_28" TargetState="PrepareResponse_29"/>
  <Transition SourceState="PrepareResponse_29" TargetState="WaitOnSPDU_30"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_30" TargetState="PrepareResponse_31"/>
  <Transition SourceState="PrepareResponse_31" TargetState="WaitOnSPDU_32"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_32" TargetState="PrepareResponse_33"/>
  <Transition SourceState="PrepareResponse_33" TargetState="WaitOnSPDU_34"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_34" TargetState="PrepareResponse_35"/>
  <Transition SourceState="PrepareResponse_35" TargetState="WaitOnSPDU_36"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_36" TargetState="PrepareResponse_37"/>
  <Transition SourceState="PrepareResponse_37" TargetState="WaitOnSPDU_38"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_38" TargetState="PrepareResponse_39"/>
  <Transition SourceState="PrepareResponse_39" TargetState="WaitOnSPDU_40"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_40" TargetState="PrepareResponse_41"/>
  <Transition SourceState="PrepareResponse_41" TargetState="WaitOnSPDU_42"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_42" TargetState="PrepareResponse_43"/>
  <Transition SourceState="PrepareResponse_43" TargetState="WaitOnSPDU_44"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_44" TargetState="PrepareResponse_45"/>
  <Transition SourceState="PrepareResponse_45" TargetState="WaitOnSPDU_46"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_46" TargetState="PrepareResponse_47"/>
  <Transition SourceState="PrepareResponse_47" TargetState="WaitOnSPDU_48"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_48" TargetState="PrepareResponse_49"/>
  <Transition SourceState="PrepareResponse_49" TargetState="WaitOnSPDU_50"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_50" TargetState="PrepareResponse_51"/>
  <Transition SourceState="PrepareResponse_51" TargetState="WaitOnSPDU_52"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_52" TargetState="PrepareResponse_53"/>
  <Transition SourceState="PrepareResponse_53" TargetState="WaitOnSPDU_54"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_54" TargetState="PrepareResponse_55"/>
  <Transition SourceState="PrepareResponse_55" TargetState="WaitOnSPDU_56"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>  
</Testroot>
```
### Table 113 – FS-Device test script 50

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0101</td>
</tr>
<tr>
<td>Name</td>
<td>FSTC_D_SCLD_FLOW_SETSD0MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_50.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

### TEST CASE RESULTS CHECK / REACTION

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Comparison of expected and received values according to the XML file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_50.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_50" date="20.11.2018: 14:01:13.947">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="WaitOnSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="WaitOnSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.51 Test script 51

Table 114 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 2, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0102</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETS0D2DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_51.xml":

```xml
<FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
```
9.2.52 Test script 52

Table 115 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 3, and Timeout.

Table 115 – FS-Device test script 52

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0103</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC3TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_52.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_52" date="20.11.2018: 14:01:13.947">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.53 Test script 53

Table 116 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 3, and Timeout.

### Table 116 – FS-Device test script 53

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0104</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETS0MC3TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Purpose (detailed)</td>
<td>Protocol flow in case of distinct error</td>
</tr>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_53.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed)   | Protocol flow in case of distinct error |
| Precondition         | FS-Device waiting for the first message |
| Procedure            | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_53.xml" |
| Test parameter       | See Table 63 and XML file |
| Post condition       | –                          |

### TEST CASE RESULTS CHECK / REACTION

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Comparison of expected and received values according to the XML file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_53.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_53" date="20.11.2018: 14:01:13.947">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="0" ChFAckReq="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.54 Test script 54

Table 117 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 4, and Timeout.

**Table 117 – FS-Device test script 54**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0105</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC4TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

| Purpose (detailed)   | Protocol flow in case of distinct error |
| Precondition         | FS-Device waiting for the first message |
| Procedure            | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_54.xml" |
| Test parameter       | See Table 63 and XML file               |
| Post condition       | –                                         |

**TEST CASE RESULTS CHECK / REACTION**

| Evaluation           | Comparison of expected and received values according to the XML file |
| Test passed          | Comparison OK                       |
| Test failed (examples)| Comparison not OK                   |
| Report               | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_54.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_54" date="20.11.2018: 14:01:13.947">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.55 Test script 55

Table 118 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

Table 118 – FS-Device test script 55

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0106</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_55.xml":

```xml
<FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
```
Table 119 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error and MCount = 0.

### Table 119 – FS-Device test script 56

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0107</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_56.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

### TEST CASE RESULTS CHECK / REACTION

| Evaluation | Comparison of expected and received values according to the XML file |
| Test passed | Comparison OK |
| Test failed (examples) | Comparison not OK |
| Report     | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_56.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_56" date="20.11.2018: 14:01:13.947">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="WaitOnSPDU_24"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="WaitOnSPDU_24"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
Table 120 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

Table 120 – FS-Device test script 57

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0108</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_57.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_57" date="20.11.2018: 14:01:13.947">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
**9.2.58 Test script 58**

Table 121 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0109</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

**Table 121 – FS-Device test script 58**

<table>
<thead>
<tr>
<th>Test parameter</th>
<th>See Table 63 and XML file</th>
</tr>
</thead>
</table>

**Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_58.xml"**:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_58" date="20.11.2018: 14:01:13.947">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_22"/>
  <Transition SourceState="PrepareResponse_22" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <Transition SourceState="PrepareResponse_26" TargetState="WaitOnSPDU_26"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.59 Test script 59

Table 122 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0110</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_59.xml":

```xml
<xml version="1.0" encoding="UTF-8"/>
<Testroot xsi:noNamespacemSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_59" date="20.11.2018: 14:01:13.947">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="CreateSPDU_22"/>
    <Transition SourceState="CreateSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="CreateSPDU_22"/>
    <Transition SourceState="CreateSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.60  Test script 60

Table 123 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

### Table 123 – FS-Device test script 60

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0111</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE</th>
<th>CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>Protocol flow in case of distinct error</td>
</tr>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_60.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

### TEST CASE RESULTS

<table>
<thead>
<tr>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_60.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_60" date="20.11.2018: 14:01:13.948">  
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive POut="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PIn="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive POut="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PIn="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive POut="PD" PortNum="valid" MCount="2" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PIn="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive POut="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="invalid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PIn="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="11" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.61 Test script 61

Table 124 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error and MCount = 0.

Table 124 – FS-Device test script 61

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0112</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed)                  | Protocol flow in case of distinct error |
| Precondition                        | FS-Device waiting for the first message |
| Procedure                           | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_61.xml" |
| Test parameter                      | See Table 63 and XML file |
| Post condition                      | – |

TEST CASE RESULTS CHECK / REACTION

| Evaluation                        | Comparison of expected and received values according to the XML file |
| Test passed                        | Comparison OK |
| Test failed (examples)             | Comparison not OK |
| Report                             | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_61.xml":

```xml
<xml version="1.0" encoding="UTF-8"/>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_61" date="20.11.2018: 14:01:13.948">
  <FSDeviceScTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  </FSDeviceScTestCaseSteps>
</Testroot>
```
Table 124 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

Table 125 – FS-Device test script 62

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0113</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

| Purpose (detailed) | Protocol flow in case of distinct error |
| Precondition       | FS-Device waiting for the first message |
| Procedure          | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_62.xml" |
| Test parameter     | See Table 63 and XML file |
| Post condition     | – |

**TEST CASE RESULTS CHECK / REACTION**

| Evaluation          | Comparison of expected and received values according to the XML file |
| Test passed         | Comparison OK |
| Test failed (examples) | Comparison not OK |
| Report              | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_62.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_62" date="20.11.2018: 14:01:13.948">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" Dset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" Dset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" Dset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" Dset="1" DCommErr="11" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.63 Test script 63

Table 126 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

Table 126 – FS-Device test script 63

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCl_FSTC_0114</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
</tbody>
</table>

| Category / type       | FS-Device automated SCL protocol test |
| Specification (clause)| [4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart) |

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_63.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_63" date="20.11.2018: 14:01:13.948">  
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
### Table 127 – FS-Device test script 64

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0115</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_64.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_64" date="20.11.2018: 14:01:13.948">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.65 Test script 65

Table 128 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error and MCount = 0.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0116</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_65.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_65" date="20.11.2018: 14:01:13.948">
    <FSDeviceSclTestCaseSteps>
        <Transition SourceState="Init" TargetState="SystemStart_20"/>
        <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    </FSDeviceSclTestCaseSteps>
</Testroot>
```
Table 129 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error and MCount = 0.

### Table 129 – FS-Device test script 66

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0117</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
</tbody>
</table>

#### TEST CASE CONDITIONS / PERFORMANCE

**Purpose (detailed)**
Protocol flow in case of distinct error

**Precondition**
FS-Device waiting for the first message

**Procedure**
See XML file "IO-Link-Spec_device_final_testsuite_testcase_66.xml"

**Test parameter**
See Table 63 and XML file

**Post condition**
-

#### TEST CASE RESULTS CHECK / REACTION

**Evaluation**
Comparison of expected and received values according to the XML file

**Test passed**
Comparison OK

**Test failed (examples)**
Comparison not OK

**Report**
Printout of the automated SCL protocol tester

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_66" date="20.11.2018: 14:01:13.948">  
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
3266   </FSDeviceSciTestCaseSteps>
3267   </Testroot>
3268
Table 130 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

### Table 130 – FS-Device test script 67

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0118</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

**Purpose (detailed)**: Protocol flow in case of distinct error

**Precondition**: FS-Device waiting for the first message

**Procedure**: See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_67.xml"

**Post condition**: –

### TEST CASE RESULTS CHECK / REACTION

**Evaluation**: Comparison of expected and received values according to the XML file

**Test passed**: Comparison OK

**Test failed (examples)**: Comparison not OK

**Report**: Printout of the automated SCL protocol tester  <pass/fail>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>

<FSDeviceSciTestCaseSteps>

</Testroot>
### 9.2.68 Test script 68

Table 131 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error and MCount = 0.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0119</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed)   | Protocol flow in case of distinct error |
| Precondition         | FS-Device waiting for the first message |
| Procedure            | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_68.xml" |
| Test parameter       | See Table 63 and XML file               |
| Post condition       | –                                         |

### TEST CASE RESULTS CHECK / REACTION

| Evaluation           | Comparison of expected and received values according to the XML file |
| Test passed          | Comparison OK |
| Test failed (examples)| Comparison not OK |
| Report               | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_68.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2"
    name="tc_68" date="20.11.2018: 14:01:13.948">
    <FSDeviceSclTestCaseSteps>
        <Transition SourceState="Init" TargetState="SystemStart_20"/>
        <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    </FSDeviceSclTestCaseSteps>
</Testroot>
```
9.2.69 Test script 69

Table 132 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0120</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETS1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_69.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_69" date="20.11.2018: 14:01:13.948">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFackReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFackReq="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFackReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFackReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="0" setSD="0" ChFackReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_23"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>

</FSDeviceSclTestCaseSteps>

</Testroot>
### 9.2.70 Test script 70

Table 133 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

#### Table 133 – FS-Device test script 70

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0121</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_70.xml":

```xml
<xml version="1.0" encoding="UTF-8"?" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_70" date="2011.11.18: 14:01:13.949">  
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_70" date="20.11.2018: 14:01:13.949">  
<FSDDeviceSclTestCaseSteps>  
<Transition SourceState="Init" TargetState="SystemStart_20"/>
<Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="invalid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
</Testroot>
</xml>
```
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.71 Test script 71

Table 134 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0122</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_71.xml"
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceScTestCaseSteps>
</Testroot>
## Table 135 – FS-Device test script 72

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0123</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_72.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

**TEST CASE RESULTS / CHECK / REACTION**

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Comparison of expected and received values according to the XML file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.73 Test script 73

Table 136 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0124</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_73.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_73" date="20.11.2018: 14:01:13.949">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="9" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="8" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.74 Test script 74

Table 137 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0125</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

TEST CASE CONDITIONS / PERFORMANCE

Purpose (detailed) Protocol flow in case of distinct error
Precondition FS-Device waiting for the first message
Procedure See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_74.xml"
Test parameter See Table 63 and XML file
Post condition –

TEST CASE RESULTS CHECK / REACTION

Evaluation Comparison of expected and received values according to the XML file
Test passed Comparison OK
Test failed (examples) Comparison not OK
Report Printout of the automated SCL protocol tester <pass/fail>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.75 Test script 75

Table 138 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

**Table 138 – FS-Device test script 75**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0126</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLDFLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

| Purpose (detailed)                    | Protocol flow in case of distinct error |
| Precondition                          | FS-Device waiting for the first message |
| Procedure                             | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_75.xml" |
| Test parameter                        | See Table 63 and XML file             |
| Post condition                        | –                                    |

**TEST CASE RESULTS**

| Evaluation                           | Comparison of expected and received values according to the XML file |
| Test passed                          | Comparison OK                     |
| Test failed (examples)               | Comparison not OK                 |
| Report                               | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_75.xml":

```xml
<xml version="1.0" encoding="UTF-8"?>
  <Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd">
    <xsi:schemaLocation="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_75" date="20.11.2018: 14:01:13.950">
      <FSDeviceSclTestCaseSteps>
        <Transition SourceState="Init" TargetState="SystemStart_20"/>
        <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>  
      </FSDeviceSclTestCaseSteps>
    </xsi:schemaLocation>
  </Testroot>
</xml>
```
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>

<FsDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>

</FsDeviceSclTestCaseSteps>
</Testroot>
Table 139 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error and MCount = 0.

---

### Table 139 – FS-Device test script 76

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0127</td>
</tr>
<tr>
<td>Name</td>
<td>FSTC_D_SCLD_FLOW_SETSD1MC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed) | Protocol flow in case of distinct error |
| Precondition       | FS-Device waiting for the first message |
| Procedure          | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_76.xml" |
| Test parameter     | See Table 63 and XML file |
| Post condition     | – |

### TEST CASE RESULTS CHECK / REACTION

| Evaluation          | Comparison of expected and received values according to the XML file |
| Test passed         | Comparison OK |
| Test failed (examples) | Comparison not OK |
| Report              | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_76.xml":

```xml
<!--This root xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_76" date="20.11.2018: 14:01:13.950">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  …
</FSDeviceSclTestCaseSteps>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="WaitOnSPDU_24"/>
<FSDeviceSclTestCaseSteps>
</Testroot>
9.2.77 Test script 77

Table 140 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

Table 140 – FS-Device test script 77

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0128</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

TEST CASE CONDITIONS / PERFORMANCE

Purpose (detailed) Protocol flow in case of distinct error
Precondition FS-Device waiting for the first message
Procedure See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_77.xml"
Test parameter See Table 63 and XML file
Post condition –

TEST CASE RESULTS CHECK / REACTION

Evaluation Comparison of expected and received values according to the XML file
Test passed Comparison OK
Test failed (examples) Comparison not OK
Report Printout of the automated SCL protocol tester <pass/fail>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_77.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_77" date="20.11.2018: 14:01:13.950">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="invalid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
Table 141 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

**Table 141 – FS-Device test script 78**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0129</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_78.xml":

```xml
<xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_78" date="20.11.2018: 14:01:13.950">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="-1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
3777  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
3778  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
3779  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
3780  <FSDeviceReceive PDout="PD" PortNum="invalid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
3781  <Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
3782  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
3783  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
3784  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
3785  </FSDeviceSclTestCaseSteps>
3786  </Testroot>
3787
### Test script 79

Table 142 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0130</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed)         | Protocol flow in case of distinct error           |
| Precondition               | FS-Device waiting for the first message          |
| Procedure                  | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_79.xml" |
| Test parameter             | See Table 63 and XML file                        |
| Post condition             | –                                                 |

### TEST CASE RESULTS CHECK / REACTION

| Evaluation                  | Comparison of expected and received values according to the XML file |
| Test passed                 | Comparison OK                                                   |
| Test failed (examples)      | Comparison not OK                                                |
| Report                      | Printout of the automated SCL protocol tester <pass/fail>         |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_79.xml":

```xml
<xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_79" date="20.11.2018: 14:01:13.951">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0"CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSendTestCaseSteps>
</Testroot>

3835
9.2.80 Test script 80

Table 143 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

### Table 143 – FS-Device test script 80

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0131</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_80.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

**TEST CASE RESULTS CHECK / REACTION**

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Comparison of expected and received values according to the XML file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
</tbody>
</table>

Report Printout of the automated SCL protocol tester <pass/fail>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_80.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_80" date="20.11.2018: 14:01:13.951">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="invalid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/
<FSDeviceSendPDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
### 9.2.81 Test script 81

Table 144 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

**Table 144 – FS-Device test script 81**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0132</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services): clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_81.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

**TEST CASE RESULTS CHECK / REACTION**

| Evaluation          | Comparison of expected and received values according to the XML file |
| Test passed         | Comparison OK                                                            |
| Test failed (examples) | Comparison not OK                                                        |
| Report              | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_81.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_81" date="20.11.2018: 14:01:13.951">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceSend PDin="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>

<FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>

<Transition SourceState="WaitOnSPDU_24" TargetState="WaitOnSPDU_24"/>

<FSDeviceSclTestCaseSteps>

</Testroot>
9.2.82 Test script 82

Table 145 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

Table 145 – FS-Device test script 82

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0133</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Spec_device_final_testsuite_testcase_82.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_82" date="20.11.2018: 14:01:13.951">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="invalid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.83  Test script 83

Table 146 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0134</td>
</tr>
<tr>
<td>Name</td>
<td>FSTC_SCLD_FLOW_SETSD0MC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_83.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_83" date="20.11.2018: 14:01:13.952">
  <FSDeviceScTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  </FSDeviceScTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="invalid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.84 Test script 84

Table 147 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 2, and Timeout.

Table 147 – FS-Device test script 84

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0135</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS  CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
</tbody>
</table>
| Report                              | Printout of the automated SCL protocol tester  
  \(<pass/fail>\) |

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_84.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.1.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  version="1.2"
  name="tc_84"
  date="20.11.2018: 14:01:13.952">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20"
                TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21"
                TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22"
                TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25"
                TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26"
                TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27"
                TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25"
                TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26"
                TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27"
                TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25"
                TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26"
                TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27"
                TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25"
                TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26"
                TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27"
                TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23"
                TargetState="WaitOnSPDU_24"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="WaitOnSPDU_24"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
Table 148 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 2, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0136</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

TEST CASE CONDITIONS / PERFORMANCE

Purpose (detailed) Protocol flow in case of distinct error
Precondition FS-Device waiting for the first message
Procedure See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_85.xml"
Test parameter See Table 63 and XML file
Post condition –

TEST CASE RESULTS CHECK / REACTION

Evaluation Comparison of expected and received values according to the XML file
Test passed Comparison OK
Test failed (examples) Comparison not OK
Report Printout of the automated SCL protocol tester <pass/fail>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_85.xml":

```
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_85" date="20.11.2018: 14:01:13.952">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="invalid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.86 Test script 86

Table 149 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 2, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0137</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_86.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td></td>
</tr>
</tbody>
</table>

**TEST CASE RESULTS CHECK / REACTION**

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Comparison of expected and received values according to the XML file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester</td>
</tr>
<tr>
<td></td>
<td>&lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_86.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_86" date="20.11.2018: 14:01:13.952">
    <FSDeviceSclTestCaseSteps>
        <Transition SourceState="Init" TargetState="SystemStart_20"/>
        <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
        <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
        <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
        <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
        <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
        <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
        <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
        <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
        <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
        <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
        <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
        <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
        <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
        <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
        <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
        <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
        <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
        <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
    </FSDeviceSclTestCaseSteps>
</Testroot>
```


<FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="invalid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceScTestCaseSteps>
</Testroot>
9.2.87 Test script 87

Table 150 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 3, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0138</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC3TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_87.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_87" date="20.11.2018: 14:01:13.952">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
```

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_87" date="20.11.2018: 14:01:13.952">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
```

<FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="WaitOnSPDU_24"/>
</FSDeviceTestCaseSteps>
</Testroot>
Table 151 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 3, and Timeout.

### Table 151 – FS-Device test script 88

<table>
<thead>
<tr>
<th>Identification (ID)</th>
<th>SDCI_FSTC_0139</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETS0MC3TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### Purpose (detailed)
Protocol flow in case of distinct error

### Precondition
FS-Device waiting for the first message

### Procedure
See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_88.xml"

### Test parameter
See Table 63 and XML file

### Post condition
-

### Evaluation
Comparison of expected and received values according to the XML file

### Test passed
Comparison OK

### Test failed (examples)
Comparison not OK

### Report
Printout of the automated SCL protocol tester  <pass/fail>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_88.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_88" date="20.11.2018: 14:01:13.953">
<FSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="invalid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.89 Test script 89
Table 152 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state check in case of setSD error, MCount = 0, and DCommErr.

Table 152 – FS-Device test script 89

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0140</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

TEST CASE CONDITIONS / PERFORMANCE

Purpose (detailed) Protocol flow in case of distinct error
Precondition FS-Device waiting for the first message
Procedure See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_89.xml"
Test parameter See Table 63 and XML file
Post condition –

TEST CASE RESULTS CHECK / REACTION

Evaluation Comparison of expected and received values according to the XML file
Test passed Comparison OK
Test failed (examples) Comparison not OK
Report Printout of the automated SCL protocol tester <pass/fail>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_89.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_89" date="20.11.2018: 14:01:13.953">
<TFSDeviceSclTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
</TFSDeviceSclTestCaseSteps>
</Testroot>
```
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>

<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>

<FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="valid"/>

<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>

<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>

<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>

<FSDeviceSclTestCaseSteps>

</Testroot>
9.2.90 Test script 90

Table 153 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 2, and Timeout.

### Table 153 – FS-Device test script 90

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0141</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Device waiting for the first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_device_final_testsuite_testcase_90.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 63 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

### TEST CASE RESULTS CHECK / REACTION

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Comparison of expected and received values according to the XML file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_90.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_90" date="20.11.2018: 14:01:13.953">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.91 Test script 91

Table 154 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

Table 154 – FS-Device test script 91

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0142</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSDMC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_91.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<xTestroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd">
  <Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd">
    <Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd">
      <Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd">
        <FSDeviceScTestCaseSteps>
          <Transition SourceState="Init" TargetState="SystemStart_20"/>
          <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
          <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
          <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
          <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
          <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
          <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
          <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
          <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
          <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
          <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
          <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
          <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
          <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
          <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
          <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
          <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
          <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
          <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
          <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
          <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
          <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
          <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="0" ChFAckReq="0" CRC="valid"/>
          <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
          <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
          <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
        </FSDeviceScTestCaseSteps>
      </Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd">
    </Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd">
  </Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd">
</xTestroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd">
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.92 Test script 92

Table 155 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

Table 155 – FS-Device test script 92

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0143</td>
</tr>
<tr>
<td>Name</td>
<td>FSTD_SCLD_FLOW_SETSD0MC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_92.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
  
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="6" setSD="0" ChFAckReq="0" CRC="invalid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.93 Test script 93

Table 156 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 3, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0144</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETS00MC3</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

Purpose (detailed) Protocol flow in case of distinct error
Precondition FS-Device waiting for the first message
Procedure See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_93.xml"
Test parameter See Table 63 and XML file
Post condition –

Evaluation Comparison of expected and received values according to the XML file
Test passed Comparison OK
Test failed (examples) Comparison not OK
Report Printout of the automated SCL protocol tester <pass/fail>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_93.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_93" date="20.11.2018: 14:01:13.954">  
<FSDeviceScTestCaseSteps>
  <Transition SourceState="Init" TargetState="SystemStart_20"/>
  <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
  <FSDeviceReceive PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
  <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
  <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
  <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
  <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
  <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
  <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
</FSDeviceScTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>

<FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" SDset="0" ChFAckReq="0" CRC="valid"/>

<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>

<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_23"/>

<Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>

</FSDeviceSclTestCaseSteps>

</Testroot>
9.2.94 Test script 94

Table 157 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 1, and Timeout.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0145</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETS0MC1TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparision of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparision OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_94.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_94" date="20.11.2018: 14:01:13.954">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
    <Transition SourceState="PrepareResponse_23" TargetState="WaitOnSPDU_24"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFAckReq="0" CRC="valid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="CheckSPDU_22"/>
<Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
9.2.95 Test script 95

Table 158 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 3, and Timeout.

Table 158 – FS-Device test script 95

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0146</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETSD0MC3TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

Purpose (detailed) Protocol flow in case of distinct error
Precondition FS-Device waiting for the first message
Procedure See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_95.xml"
Test parameter See Table 63 and XML file
Post condition –

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_95.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_95" date="20.11.2018: 14:01:13.954">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState=" Init" TargetState=" SystemStart_20"/>
    <Transition SourceState=" SystemStart_20" TargetState=" WaitForSPDU_21"/>
    <FSDeviceReceive PDout=" PD" PortNum=" valid" MCount=" 3" setSD=" 0" ChFAckReq=" 0" CRC=" valid"/>
    <Transition SourceState=" WaitForSPDU_21" TargetState=" CheckSPDU_22"/>
    <Transition SourceState=" CheckSPDU_22" TargetState=" PrepareResponse_25"/>
    <Transition SourceState=" PrepareResponse_25" TargetState=" WaitForSPDU_26"/>
    <FSDeviceSend PDin=" PD" PortNum=" valid" DCount=" 4" SDset=" 1" DCommErr=" 1" DTimeout=" 1" CRC=" valid"/>
    <Transition SourceState=" WaitForSPDU_26" TargetState=" CheckSPDU_27"/>
    <Transition SourceState=" CheckSPDU_27" TargetState=" PrepareResponse_25"/>
    <Transition SourceState=" PrepareResponse_25" TargetState=" WaitForSPDU_26"/>
    <FSDeviceSend PDin=" PD" PortNum=" valid" DCount=" 3" SDset=" 1" DCommErr=" 1" DTimeout=" 0" CRC=" valid"/>
    <Transition SourceState=" WaitForSPDU_26" TargetState=" CheckSPDU_27"/>
    <Transition SourceState=" CheckSPDU_27" TargetState=" PrepareResponse_25"/>
    <Transition SourceState=" PrepareResponse_25" TargetState=" WaitForSPDU_26"/>
    <FSDeviceSend PDin=" PD" PortNum=" valid" DCount=" 2" SDset=" 1" DCommErr=" 0" DTimeout=" 0" CRC=" valid"/>
    <Transition SourceState=" WaitForSPDU_26" TargetState=" CheckSPDU_27"/>
    <Transition SourceState=" CheckSPDU_27" TargetState=" PrepareResponse_25"/>
    <FSDeviceSend PDin=" PD" PortNum=" valid" DCount=" 1" SDset=" 1" DCommErr=" 0" DTimeout=" 0" CRC=" valid"/>
    <Transition SourceState=" WaitForSPDU_26" TargetState=" CheckSPDU_27"/>
    <Transition SourceState=" CheckSPDU_27" TargetState=" PrepareResponse_23"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>

<FSDeviceReceive PDout="PD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>

<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>

<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>

<FSDeviceSend PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>

</FSDeviceSclTestCaseSteps>

</Testroot>
9.2.96  Test script 96

Table 159 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of no error, MCount = 2, and Timeout.

### Table 159 – FS-Device test script 96

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0147</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_SCLD_FLOW_SETS0MC2TO</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.3, Figure 42 (services); clause 11.5.3, Figure 47 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table 63</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed)            | Protocol flow in case of distinct error |
| Precondition                  | FS-Device waiting for the first message |
| Procedure                     | See XML file "IO-Link-Safety_spec_device_final_testsuite_testcase_96.xml" |
| Test parameter                | See Table 63 and XML file |
| Post condition                | -                          |

### TEST CASE RESULTS

<table>
<thead>
<tr>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_device_final_testsuite_testcase_96.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_96" date="20.11.2018: 14:01:13.955">
  <FSDeviceSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="SystemStart_20"/>
    <Transition SourceState="SystemStart_20" TargetState="WaitOnSPDU_21"/>
    <FSDeviceReceive PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_21" TargetState="CheckSPDU_22"/>
    <Transition SourceState="CheckSPDU_22" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="5" SDset="1" DCommErr="1" DTimeout="1" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="4" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="3" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="2" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_25"/>
    <Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
    <FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="0" DTimeout="0" CRC="valid"/>
    <Transition SourceState="WaitOnSPDU_26" TargetState="CheckSPDU_27"/>
    <Transition SourceState="CheckSPDU_27" TargetState="PrepareResponse_23"/>
  </FSDeviceSclTestCaseSteps>
</Testroot>
```
<FSDeviceSend PDin="PD" PortNum="valid" DCount="1" SDset="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<FSDeviceReceive PDout="PD" PortNum="valid" MCount="7" setSD="0" ChFACKReq="0" CRC="invalid"/>
<Transition SourceState="WaitOnSPDU_24" TargetState="PrepareResponse_25"/>
<Transition SourceState="PrepareResponse_25" TargetState="WaitOnSPDU_26"/>
<FSDeviceSend PDin="PD" PortNum="valid" DCount="0" SDset="1" DCommErr="1" DTimeout="0" CRC="valid"/>
</FSDeviceSclTestCaseSteps>
</Testroot>
10 FS-Device in reference system tests

10.1 Overview and reference systems

The FS-Device in reference system tests comprise tests, where a complete (DTI) and approved FS-Master reference system including FS-Master Tool is available. Rules for reference systems are defined in A.2.7.

IODD testing is specified in Clause 6 and therefore interoperability of the particular IODD of an FS-Device with the reference FS-Master system can be assumed. In case, an IODD tested with the help of the Checker Tool cannot be imported, the testing of the FS-Device shall be continued as far as possible, and in parallel, the manufacturer of the reference system shall be contacted for clarification.

The availability of the Dedicated Tool has been checked in Clause 6.4. It is not necessary,

- if an FS-Device has no parameters for its particular technology (no FST parameter), or
- if the manufacturer of an FS-Device provides CRC signature values (TechParCRC) for any FST parameter combination (e.g. via user manual), which can be entered into the FSP_TechParCRC field of the FS-Master Tool.

The FS-Device in reference system tests comprise tests of the Dedicated Tool, behavior of the FS-Device in case of correct or incorrect FSP protocol parameter, and test of Events that are not covered by other test cases anyway.
10.2 Dedicated Tool

10.2.1 Invokability via registry

Table 160 defines the test conditions for this test case.

Table 160 – Invokability via registry

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0148</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_REFT_INVOKEEDITOOL</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>“Dedicated Tool” of the FS-Device can be launched/invoked</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>Dedicated Tool of FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>DTI test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Reference-System and user manual</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE</th>
<th>CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>“Dedicated Tool” is dedicated to the FS-Device and can be launched/invoked</td>
</tr>
<tr>
<td>Precondition</td>
<td>–</td>
</tr>
</tbody>
</table>
| Procedure   | a) Install Dedicated Tool according to user manual  
b) Evaluation 1)  
c) Launch/invoke Dedicated Tool  
d) Evaluation 2) |
| Test parameter | – |
| Post condition | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation 1)</td>
<td>Check registry: UUID, AppPath, PID-File, VendorID, and DeviceID</td>
</tr>
<tr>
<td>Evaluation 2)</td>
<td>Check display</td>
</tr>
</tbody>
</table>
| Test passed       | Registry values OK and match information in user manual, and  
FST parameters are visible according to user manual |
| Test failed (examples) | Any check incorrect |
| Report            | Values OK: <yes/no>  
<ok | nok> |
10.2.2 Calculation of TechParCRC

Table 161 defines the test conditions for this test case.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0149</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_REFT_CALCDEDITool</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Dedicated Tool presents FST parameter, calculates and displays TechParCRC value</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>Dedicated Tool of FS-Device (no back channel in DTI communication)</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>DTI test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Reference-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                           | a) Launch/invoke Dedicated Tool  
b) Evaluation 1)  
c) Modify FST parameter values  
d) Evaluation 2)  
e) Copy & Paste TechParCRC signature to FS-Master Tool  
f) Evaluation 3)  
g) Perform commissioning of FS-Device (EUT)  
h) Evaluation 4)                           |
| Test parameter                      | –                           |
| Post condition                      | –                           |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation        | 1) Check availability of TechParCRC display (decimal value)  
2) Check changes in TechParCRC display  
3) Check reaction of FS-Master Tool (FSP_TechParCRC field)  
4) Check behavior of reference system with connected FS-Device |
| Test passed       | All checks correct |
| Test failed (examples) | Any check incorrect |
| Report            | Values OK: <yes/no> <ok | nok> |
### 10.2.3 DTI communication/Back Channel

Table 162 defines the test conditions for this test case. This test is optional.

#### Table 162 – DTI communication/Back Channel

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0150</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_REFT_BACKDEDITool</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Dedicated Tool presents FST parameter, calculates and displays TechParCRC value</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>Dedicated Tool of FS-Device (with back channel in DTI communication)</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>DTI test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Reference-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE</th>
<th>CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>FS-Master Tool invokes Dedicated Tool and passes over FST parameter via TPF. Subsequently, calculation of TechParCRC upon parameter changes takes place. Parameter values and TechParCRC are returned to FS-Master Tool via TBF (&quot;Back Channel&quot;). After parameter changes in FS-Master Tool, an update of the parameter values in the Dedicated Tool shall not occur automatically but only upon invocation of the Dedicated Tool.</td>
</tr>
<tr>
<td>Precondition</td>
<td>–</td>
</tr>
</tbody>
</table>
| Procedure | a) Launch/invoke Dedicated Tool  
b) Evaluation 1)  
c) Try changing parameter values in FS-Master Tool  
d) Evaluation 2)  
e) Close Dedicated Tool  
f) Evaluation 3)  
g) Modify FST parameter values in FS-Master Tool  
h) Relaunch Dedicated Tool  
i) Evaluation 4)  
j) Evaluation 5)  
k) Perform commissioning of FS-Device (EUT)  
l) Evaluation 6) |
| Test parameter | – |
| Post condition | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation | 1) Check availability of TechParCRC display (decimal value) in Dedicated Tool (memorize CRC value)  
2) Editing of values in FS-Master Tool shall be blocked  
3) Check identical TechParCRC display (decimal value) in FS-Master Tool (see 1)  
4) Compare parameter values in displays of Dedicated Tool and FS-Master Tool (parameter values shall match)  
5) Compare FST_TechParCRC on FS-Master Tool with TechParCRC of Dedicated Tool (CRC values should differ due to parameter changes)  
6) Check behavior of reference system with connected FS-Device |
| Test passed | All checks correct |
| Test failed (examples) | Any check incorrect |
| Report | Values OK: <yes/no> | <ok | nok> |
10.2.4 DTI communication to FS-Device

Table 163 defines the test conditions for this test case. This test is optional.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0151</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_REFT_COMMDEDITool</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>DTI communication from Dedicated Tool to FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>Dedicated Tool of FS-Device (with DTI communication and online access)</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>DTI test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Reference-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE</th>
<th>CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>DTI communication from Dedicated Tool to FS-Device</td>
</tr>
<tr>
<td>Precondition</td>
<td>User manual</td>
</tr>
<tr>
<td>Procedure</td>
<td>a) Launch/invoke Dedicated Tool</td>
</tr>
<tr>
<td></td>
<td>b) Evaluation 1)</td>
</tr>
<tr>
<td></td>
<td>c) Get access to FS-Device</td>
</tr>
<tr>
<td></td>
<td>d) Evaluation 2)</td>
</tr>
<tr>
<td>Test parameter</td>
<td>–</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check availability of connection display</td>
</tr>
<tr>
<td></td>
<td>2) Check connection to FS-Device</td>
</tr>
<tr>
<td>Test passed</td>
<td>All checks correct</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Values OK: &lt;yes/no&gt;</td>
</tr>
<tr>
<td></td>
<td>&lt;ok</td>
</tr>
</tbody>
</table>
### 10.3 FS-Device replacement

#### 10.3.1 General

Preparation of FS-Device?

#### 10.3.2 Correct FSP parameter values (Out-of-box)

Table 164 defines the test conditions for this test case.

**Table 164 – Correct FSP parameter values**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0152</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_REFT_CORRECTFSTVALUES</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Replace configured FS-Device by same FS-Device with out-of-box parameters</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure           | a) Set FSDT Validation&Backup to 3: Backup + Restore e.g. via SMI_PORTCONFIG  
|                     | b) Wait for Event 0xFF27  
|                     | c) Set FSDT Validation&Backup to 4: Restore e.g. SMI_PORTCONFIG  
|                     | d) Write System Command 131 "Back-to-box" e.g. SMI_DeviceWrite  
|                     | e) Evaluation 1)  
|                     | f) Port power Off/On e.g. via SMI_PORTPOWEROFFON  
|                     | g) Wait for Port state "SCL_ENABLED" e.g. via ArgBlock FSPortStatusList  
|                     | h) Evaluation 2)  

| Test parameter | – |
| Post condition | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation        | 1) Check Write response  
|                   | 2) Check Port state  |
| Test passed       | All checks correct |
| Test failed (examples) | Any check incorrect |
| Report            | Values OK: <yes/no>  
|                   | <ok | nok> |
### 10.3.3 Incorrect FSP parameter values

Table 165 defines the test conditions for this test case.

#### Table 165 – Incorrect FSP parameter values

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0153</td>
</tr>
<tr>
<td>Name</td>
<td>FSTC_REFT_INCORRECTFSPVALUES</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Replace configured FS-Device by same FS-Device with different parameters</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
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<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Read response</td>
</tr>
<tr>
<td></td>
<td>2) Check Write response</td>
</tr>
<tr>
<td></td>
<td>3) Check Write response</td>
</tr>
<tr>
<td></td>
<td>4) Check Event</td>
</tr>
<tr>
<td>Test passed</td>
<td>All ISDU responses OK, and Event 0xB009 received</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect and/or Event 0xB009 not received</td>
</tr>
<tr>
<td>Report</td>
<td>Values OK: &lt;yes/no&gt;</td>
</tr>
</tbody>
</table>
10.4 Events

10.4.1 Overview

Most of the FS-Device Events are already covered within the context of other test cases. Table 166 contains a list of Clauses and the concerned EventCodes.

### Table 166 – List of FS-Device Events in other test cases

<table>
<thead>
<tr>
<th>Clause</th>
<th>EventCode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.3.1, 8.2.7, 8.2.8, 11.3.6, 13.5.2</td>
<td>0xB003</td>
<td>Unexpected authentication code</td>
</tr>
<tr>
<td>7.3.2, 8.2.10</td>
<td>0xB005</td>
<td>Incorrect FSP_AuthentCRC</td>
</tr>
<tr>
<td>7.3.5, 10.3.3, 8.2.14</td>
<td>0xB009</td>
<td>Watchdog time out of specification (e.g. &quot;0&quot;)</td>
</tr>
<tr>
<td>7.3.6, 8.2.11</td>
<td>0xB006</td>
<td>Incorrect FSP_ProtParCRC</td>
</tr>
<tr>
<td>8.2.3, 8.2.4</td>
<td>0xB00A</td>
<td>No FSP_VerifyRecord received</td>
</tr>
<tr>
<td>8.2.5, 8.2.6, 8.2.12</td>
<td>0xB007</td>
<td>Incorrect FSP_TechParCRC</td>
</tr>
<tr>
<td>8.2.9</td>
<td>0xB004</td>
<td>Unexpected authentication Port</td>
</tr>
<tr>
<td>8.2.13</td>
<td>0xB008</td>
<td>Incorrect FSP_IO_StructCRC</td>
</tr>
</tbody>
</table>

Remaining Events are tested in 10.4.2.
10.4.2 Events@communication

Table 167 defines the test conditions for this test case.

**Table 167 – Events@communication**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0154</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCD_REFT_COMMINTERRUPT</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Events when communication is interrupted due to errors at SPDU exchange</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Device</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Device test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Device-Tester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Events when communication is interrupted due to errors at SPDU exchange</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>EUT: in armed mode</td>
</tr>
<tr>
<td>FSCT: in OPERATE (armed operation)</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>a) FSCT send SPDU with wrong CRC</td>
</tr>
<tr>
<td>b) Evaluation 1)</td>
</tr>
<tr>
<td>c) FSCT send SPDU with correct CRC</td>
</tr>
<tr>
<td>d) FSCT send SPDU with incorrect Counter</td>
</tr>
<tr>
<td>e) Evaluation 2)</td>
</tr>
<tr>
<td>f) FSCT send SPDU with correct Counter</td>
</tr>
<tr>
<td>g) FSCT stop sending SPDUs</td>
</tr>
<tr>
<td>h) Evaluation 3)</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>–</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
<tr>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td></td>
</tr>
<tr>
<td>1) Check for Event 0xB000</td>
<td>Transmission error (CRC signature)</td>
</tr>
<tr>
<td>2) Check for Event 0xB001</td>
<td>Transmission error (Counter)</td>
</tr>
<tr>
<td>3) Check for Event 0xB002</td>
<td>Transmission error (Timeout)</td>
</tr>
<tr>
<td>Test passed</td>
<td>All Events received correctly</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any Event incorrect or missing</td>
</tr>
<tr>
<td>Report</td>
<td>Event 0xB000 received: &lt;yes/no&gt;</td>
</tr>
<tr>
<td></td>
<td>Event 0xB001 received: &lt;yes/no&gt;</td>
</tr>
<tr>
<td></td>
<td>Event 0xB002 received: &lt;yes/no&gt;</td>
</tr>
</tbody>
</table>
11 FS-Master Port operations tests

11.1 Overview
The FS-Master Port operations test cases comprise the necessary information about the product to test, the basic FS-Master operations such as identification, authorization, and FSCP authenticity from an upper-level FSCP system. Other test cases deal with Port power OFF/ON, VerifyRecord for verification, detection of misconnection, and safe FS-Device replacement.

11.2 FS-Master meta data

11.2.1 User manual and safety assessment certificate
"Highly recommended" feature exceptions.

Table 168 defines the test conditions for this test case.

**Table 168 – User manual and safety assessment certificate**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0155</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_INFO_DOCUMENTS</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check user/safety manuals for exceptions, properties, and certificates</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>User/safety manual of FS-Master and Master Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], &quot;highly recommended&quot; feature status, Annex H.6</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE</th>
<th>CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>Manufacturers/vendors are obliged to inform in a user manual about not implemented &quot;highly recommended&quot; features and to provide a &quot;Safety Manual&quot; as well as a safety assessment certificate.</td>
</tr>
<tr>
<td>Precondition</td>
<td>–</td>
</tr>
</tbody>
</table>
| Procedure | a) Identify in user manual not implemented "highly recommended" features  
b) Identify information in safety manual according to Annex H.6 in [4]  
c) Identify functional safety assessment certificate |
| Test parameter | – |
| Post condition | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation | 1) Check exceptions in user manual  
2) Check required parameters in safety manual  
3) Check statements for relevant aspects of particular standard (IEC 61508/ISO13849), the assessment body, and the certificate number |
| Test passed | Exceptions permitted, and  
Safety Manual available (for example "product mission time", "safety level - SIL/PL", "probability of a dangerous failure per hour – PFH", and statements on delay times for the calculation of safety function response times, and  
Certificate accepted and noted in test report |
| Test failed (examples) | Any check incorrect |
| Report | Documents OK: <yes/no>  
<ok | nok> |
11.2.2 Connector and cable information

Table 169 defines the test conditions for this test case.

Table 169 – Connector and cable information

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0156</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_CONF_INFO_CONNECTCABLE</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check user/safety manuals for connector and cable information (OSSDe)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>User/safety manual of FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 4.1.4, Figure 9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                          | a) Identify in user manual connector Pin layout in case of M type connector  
                                          b) Identify cable recommendations with respect to robustness and loop resistance |
| Test parameter                     | –                           |
| Post condition                     | –                           |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation                         | 1) Check Pin layout  
                                          2) Check recommendations on robustness and loop resistance |
| Test passed                        | Pin layouts are correct, and  
                                          Robustness recommendations for cable coating such as "tear proof" and "cut resistant" as well as for loop resistance such that minimum supply voltages are guaranteed at maximum supply current are available |
| Test failed (examples)             | Any check incorrect |
| Report                             | Documents OK: <yes/no>       <ok | nok> |
### 11.2.3 Default behavior (Power, OSSDe, configurations)

Table 33 defines the test conditions for this test case.

Table 170 – Default behavior (Power, OSSDe, configurations)

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0157</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_CONF_INFO_DEFAULTPARAM</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master information: Power supply, OSSDe filter, Port configurations</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>User manual of FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Table 7, Table 8</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>–</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>FS-Master information: Power supply (derating), OSSDe filter, Port configurations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>–</td>
</tr>
<tr>
<td>Procedure</td>
<td>a) Identify parameter &quot;Port power supply&quot; in safety/user manual</td>
</tr>
<tr>
<td></td>
<td>b) Identify parameter &quot;Discrepancy time&quot; in safety/user manual</td>
</tr>
<tr>
<td></td>
<td>c) Identify parameter &quot;Filter time&quot; in safety/user manual</td>
</tr>
<tr>
<td></td>
<td>d) Identify &quot;Port configurations&quot; in safety/user manual</td>
</tr>
<tr>
<td></td>
<td>e) Identify &quot;Safety function response time&quot; information</td>
</tr>
<tr>
<td>Test parameter</td>
<td>–</td>
</tr>
<tr>
<td>Post condition</td>
<td>Memorize power supply, OSSDe filter values, Port configurations, response time</td>
</tr>
</tbody>
</table>

### TEST CASE RESULTS CHECK / REACTION

| Evaluation          | 1) Check "Port power supply" information                                       |
|                     | 2) Check parameter "Discrepancy time"                                          |
|                     | 3) Check parameter "Filter time"                                               |
|                     | 4) Check possible Port configurations                                           |
|                     | 5) Check SFRT information                                                       |
| Test passed         | At least one Port can provide a current of ISMmax ≥ 1000 mA, and               |
|                     | Value of "Discrepancy time - t_{dis}" = 3 ms, and                             |
|                     | Value of "Filter time" = 1ms according to test pulse duration t_{i}, and       |
|                     | Port configurations comply with specification, and                             |
|                     | SFRT information refers to integration specification and IEC 61784-3 if appropriate |
| Test failed (examples) | Any check incorrect                                                      |

Report

Documents OK: <yes/no>  <ok | nok>
### 11.3 FS-Master operations

#### 11.3.1 Overview

#### 11.3.2 FS-Master identification

Table 171 defines the test conditions for this test case.

#### Table 171 – FS-Master identification

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0158</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_INFO_FSMIDENT</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Get FS-Master identification</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], E.2</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check Argblock &quot;MasterIdent&quot;</td>
</tr>
<tr>
<td>Test passed</td>
<td>MasterIdent.VendorID corresponds to manual and IO-Link reference, and</td>
</tr>
<tr>
<td></td>
<td>MasterIdent.MasterID corresponds to manual, and</td>
</tr>
<tr>
<td></td>
<td>MasterIdent.MasterType = 3, and</td>
</tr>
<tr>
<td></td>
<td>MasterIdent.Features_1.Bit 2 = 1, and</td>
</tr>
<tr>
<td></td>
<td>MasterIdent.MaxNumberOfPorts corresponds to Manual, and</td>
</tr>
<tr>
<td></td>
<td>MasterIdent.PortTypes[0 to n] = {3, 4, or 5}</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Identification OK: &lt;yes/no&gt; &lt;ok</td>
</tr>
</tbody>
</table>
11.3.3 FS-Master access and authenticity

Table 172 defines the test conditions for this test case.

**Table 172 – FS-Master authenticity**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0159</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_INFO_FSMAUTHENT</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Get FS-Master authenticity</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check ArgBlock &quot;FSCPAuthenticity&quot;</td>
</tr>
<tr>
<td>Test passed</td>
<td>Both elements correspond to settings from upper-level FSCP system</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Authenticity OK: &lt;yes/no&gt;</td>
</tr>
</tbody>
</table>
11.3.4 Port power off/on

Table 173 defines the test conditions for this test case.

**Table 173 – Port power off/on**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0160</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_FSOP_PORTPOWEROFFON</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether Power power off/on is possible</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
</tbody>
</table>
| Precondition                       | EUT: PORT_MIXFCSOM
|                                   | SMTU: SMTU_STANDARD_STATE_32 |
| Procedure                          | a) SMI_PortPowerOffOn(ABPS_PORT_POWER_OFF)
|                                   | b) STM_WAIT_TIMEOUT :returns "Power"
|                                   | c) SMTU_PowerState_Get
|                                   | d) Evaluation 1)
|                                   | e) SMI_PortPowerOffOn(ABPS_PORT_POWER_ON)
|                                   | f) STM_WAIT_TIMEOUT
|                                   | g) SMTU_PowerState_Get :returns "Power"
|                                   | h) Evaluation 2)
|                                   | i) SMTU_PowerOffTime_Start
|                                   | j) SMI_PortPowerOffOn(ABPS_POWER_CYCLE<PowerOffTime=500>)
|                                   | k) SMTU_PowerOffTime_Get :returns "PowerOffTime"
|                                   | l) Evaluation 3)
|                                   | m) SMTU_PowerOffTime_Start
|                                   | n) SMI_PortPowerOffOn(ABPS_POWER_CYCLE<PowerOffTime=65535>)
|                                   | o) SMTU_PowerOffTime_Get :returns "PowerOffTime"
|                                   | p) Evaluation 4) |
| Test parameter                    | – |
| Post condition                    | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation        | 1) Check "Power"
|                   | 2) Check "Power"
|                   | 3) Check "PowerOffTime"
|                   | 4) Check "PowerOffTime"
| Test passed       | "Power" = Off, and
|                   | "Power" = Off, and
|                   | 490 < "PowerOffTime" < 510, and
|                   | 65000 < "PowerOffTime" < 66000 |
| Test failed (examples) | Any check incorrect |
| Report             | Values OK: <yes/no> <ok | nok> |
11.3.5 PREOPERATE – verification

VerifyRecord available, power cycle, (no safety check)

Table 174 defines the test conditions for this test case.

### Table 174 – PREOPERATE – verification

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0161</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_FSOP_PREOPVERIFY</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether VerifyRecord is sent to FS-Device</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
</tr>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Compare values of &quot;VerifyRecord&quot; with FSP parameters in Port configuration</td>
</tr>
<tr>
<td>Test passed</td>
<td>All compared parameters match</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any comparison failed</td>
</tr>
<tr>
<td>Report</td>
<td>Values OK: &lt;yes/no&gt; &lt;ok</td>
</tr>
</tbody>
</table>
11.3.6 PREOPERATE – misconnection

Authentication check

Table 175 defines the test conditions for this test case.

Table 175 – PREOPERATE – misconnection

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0162</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_FSO_PPREOPMISSCONNE</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master indicates FS-Device misconnection</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Annex G.4</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>


### 11.3.7 PREOPERATE – replacement

Table 176 defines the test conditions for this test case.

Table 176 – PREOPERATE – replacement

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0163</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_FSOP_PREOPREPLACE</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master performs FS-Device replacement correctly</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Annex G.3</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

**Purpose (detailed)**
Check whether FS-Master performs FS-Device replacement correctly (Back-to-box)

**Precondition**
- EUT: PORT_MIXFSCOM
- SMTU: SMTU_STANDARD_STATE_32 ;no FST Parameter

**Procedure**
- a) SMI_PortPowerOffOn(ABPS_PORT_OFF)
- b) SMTU_Authent_Set(Authent1/2=0, Port=0, CRC=0) ;"Authenticity" = 0
- c) SMI_PortPowerOffOn(ABPS_PORT_ON) ;self test time = 2 s
- d) Wait 3 s ;returns ArgBlock "FSPortStatusList"
- e) SMI_PortStatus(ArgBlock = 0x9100) ;returns ArgBlock "DeviceEvent"
- f) Evaluation 1)
- g) Wait on SMI_DeviceEvent ;returns ArgBlock "DeviceEvent"
- h) Evaluation 2)
- i) Wait on SMI_PortEvent ;returns ArgBlock "PortEvent"
- i) Wait on SMI_PortEvent ;returns ArgBlock "PortEvent"
- j) Evaluation 3)

**Test parameter**

**Post condition**

### TEST CASE RESULTS CHECK / REACTION

**Evaluation**
1) Check ArgBlock "FSPortStatusList"
2) Check ArgBlock "DeviceEvent"
3) Check ArgBlock "PortEvent"

**Test passed**
FSPortStatusList.PortStatusInfo = 8, and ;SCL_ENABLED
None of the FS EventCodes ;see Annex B in [4]

**Test failed (examples)**
Any check incorrect

**Report**
Values OK:  <yes/no>       <ok | nok>
12 FS-Master safety communication layer tests

12.1 Interface for the FS-Master SCL test scripts

The test scripts for the automated safety layer tests are encoded as XML files. Each and every test script ("FSMasterSclTestCaseSteps") consists of test step instructions as described in Table 177. The XML Schema of the interface parameters for the FS-Master automated safety layer test is illustrated in Figure 15.

NOTE The general concept of SCL protocol conformance testing is described in A.2.3. The automated safety layer tester for FS-Masters is described in A.2.4.

Figure 15 – Schema of steps and parameters/attributes

Table 177 defines the FS-Master interface parameters.
### Table 177 – FS-Master interface parameters/attributes

<table>
<thead>
<tr>
<th>Test step instruction</th>
<th>Parameter</th>
<th>Value range</th>
</tr>
</thead>
</table>
| **FSMasterSend_FSAppSend**  
  (FS-Master → Test System)  
  (see) | PDout | SD – Test System expects SD values (= 0)  
  PD – Test System expects PD values (> 0) |
| | PortNum | valid – Test System expects configured Port number |
| | MCount | 0 to 7 |
| | setSD | 0, 1 |
| | ChFAckReq | 0, 1 |
| | CRC | valid – Test System expects correct CRC-Signature |
| | PDin_M | SD – Test System expects SD values (= 0)  
  PD – Test System expects PD values (> 0) |
| | Bit 0: SDset_S | 0, 1 |
| | Bit 1: ChFAckReq_S | 0, 1 |
| | Bit 2: DCommErr_S | 0, 1 |
| | Bit 3: DTimeout_S | 0, 1 |
| | Bit 4: MCommErr_S | 0, 1 |
| | Bit 5: MTimeout_S | 0, 1 |
| **FSMasterReceive_FSAppReceive**  
  (Test System → FS-Master) | PDin | PD – Test System sends PD values (> 0) |
| | PortNum | valid – Test System sends configured Port number  
  invalid – Test System sends not configured Port number |
| | DCount | 0 to 7 |
| | SDset | 0, 1 |
| | DCommErr | 0, 1 |
| | DTimeout | 0, 1 |
| | CRC | valid – Test System sends correct CRC-Signature  
  invalid – Test System sends incorrect CRC-Signature |
| | PDout_M | PD – Test System sends PD values (> 0) |
| | Bit 0: setSD_C | 0, 1 |
| | Bit 1: ChFAck_C | 0, 1 |
| **Timeout**  
  (Test System → FS-Master) | | Test System sends no new message within a time delay ≥ MTime. See for example 12.2.3. |
| **Transition**  
  (Tag) | SourceState | This parameter is informative and will be inserted only in test logging from test system |
| | TargetState | This parameter is informative and will be inserted only in test logging from test system |

The test step instruction "FSMasterSend_FSAppSend" is used for messages sent by the FS-Master test object (EUT). Within these messages, the test data to the IO-Link communication port and to the FS-Master "processing" interface are specified in one test message. This approach has been chosen due to the special test setup not allowing explicit access for the test system to the "processing" port of the test object (in this case the FS-Master, see Figure A.7).

The values of the parameters PDout, PortNum, MCount, setSD, ChFAckReq and CRC are defined for the IO-Link communication port, whereas the values of the parameters PDin_M, SDset_S, ChFAckReq_S, DCommErr_S, DTimeout_S, MCommErr_S, and MTimeout_S are defined for the "processing" interface.
With the test step instruction "FSMasterReceive_FSAppReceive" the reception of test messages by the FS master is specified. The test messages comprise also the IO-Link communication Port and the "processing" interface.

The parameter values of PDin, PortNum, DCount, SDset, DCommErr, DTimeout, and CRC are determined for the IO-Link communication Port, whereas the values of the parameters PDout_M, setSD_C, and ChFAck_C are determined for the "processing" interface.

The test step instruction "Timeout" specifies for how long the test system shall not send a response. This time shall be greater than the watchdog time of the EUT (MTime).

The XML tag "Transition" is used for traceability of test messages with respect to the expected transition of the state machine specified in [4]. This information is only descriptive and has no impact on the test flow of the test tool.

12.2 FS-Master SCL test suite

12.2.1 Test script 1

Table 178 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

Table 178 – FS-Master test script 1

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCl_FSTC_0164</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Comparison of expected and received values according to the XML file</td>
</tr>
<tr>
<td>Test passed</td>
<td>Comparison OK</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Comparison not OK</td>
</tr>
<tr>
<td>Report</td>
<td>Printout of the automated SCL protocol tester &lt;pass/fail&gt;</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_1.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_1" date="20.11.2018: 14:01:29.066">  
<FSMasterSclTestCaseSteps>  
<Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
<Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
```
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" DCommErr="1" DTimeout="0" CRC="valid"/>
<Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
<PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="1" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<Transition SourceState="WaitOnResponse_3" TargetState="CheckSPDU_4"/>
<Transition SourceState="CheckSPDU_4" TargetState="PrepareSPDU_6"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
<PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="1" DCommErr="0" DTimeout="0" CRC="valid"/>
<Transition SourceState="CheckSPDU_4" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="invalid"/>
<PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<Transition SourceState="WaitOnResponse_3" TargetState="CheckSPDU_3"/>
<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
<PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<Transition SourceState="WaitOnResponse_4" TargetState="CheckSPDU_5"/>
<Transition SourceState="CheckSPDU_5" TargetState="PrepareSPDU_6"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
<PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<Transition SourceState="WaitOnResponse_4" TargetState="CheckSPDU_5"/>
<Transition SourceState="CheckSPDU_5" TargetState="PrepareSPDU_6"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="0" ChFAckReq="0" CRC="valid"/>
<PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" DCommErr="0" DTimeout="0" CRC="valid"/>
<Transition SourceState="WaitOnResponse_4" TargetState="CheckSPDU_5"/>
12.2.2 Test script 2

Table 179 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and SDset.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0165</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_SETSD1MC0SDSET1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_2.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_2" date="20.11.2018: 14:01:29.066">  
<FSMasterSclTestCaseSteps>  
  <Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
  <Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
  <FSMasterSend_FSAppSend POut="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
  <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
  <Transition SourceState="WaitOnResponse_2" TargetState="PrepareSPDU_4"/>
  <Transition SourceState="PrepareSPDU_4" TargetState="WaitOnResponse_5"/>
  <FSMasterSend_FSAppSend POut="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid" PDin_M="PD" SDset_S="0" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
  <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
  <Transition SourceState="WaitOnResponse_5" TargetState="CheckSPDU_3"/>
  <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_4"/>
  <Transition SourceState="PrepareSPDU_4" TargetState="WaitOnResponse_5"/>
  <FSMasterSend_FSAppSend POut="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
  <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
  <Transition SourceState="WaitOnResponse_5" TargetState="CheckSPDU_3"/>
  <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_4"/>
  <Transition SourceState="PrepareSPDU_4" TargetState="WaitOnResponse_5"/>
  <FSMasterSend_FSAppSend POut="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="2" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
  <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="4" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
  <Transition SourceState="WaitOnResponse_5" TargetState="CheckSPDU_3"/>
  <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_4"/>
  <Transition SourceState="PrepareSPDU_4" TargetState="WaitOnResponse_5"/>
</FSMasterSclTestCaseSteps>
</Testroot>
```
<FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"/> 4923
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="4" SDset="0" ChFAckReq="0" CRC="valid"/> 4924
<Transition SourceState="WaitOnResponse_5" TargetState="CheckSPDU_3"/> 4925
<FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="4" setSD="0" ChFAckReq="0" CRC="valid"/> 4926
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="3" SDset="0" ChFAckReq="0" CRC="valid"/> 4927
<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_4"/> 4928
<FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="5" setSD="0" ChFAckReq="0" CRC="valid"/> 4929
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" ChFAckReq="0" CRC="valid"/> 4930
<Transition SourceState="PrepareSPDU_4" TargetState="WaitOnResponse_5"/> 4931
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="6" setSD="1" ChFAckReq="0" CRC="valid"/> 4932
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="1" SDset="1" ChFAckReq="0" CRC="valid"/> 4933
<Transition SourceState="WaitOnResponse_5" TargetState="CheckSPDU_3"/> 4934
<FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="6" setSD="1" ChFAckReq="0" CRC="valid"/> 4935
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="1" SDset="1" ChFAckReq="0" CRC="valid"/> 4936
<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/> 4937
<FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="7" setSD="1" ChFAckReq="0" CRC="valid"/> 4938
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="1" SDset="1" ChFAckReq="0" CRC="valid"/> 4939
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/> 4940
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="6" setSD="1" ChFAckReq="0" CRC="valid"/> 4941
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="1" SDset="1" ChFAckReq="0" CRC="valid"/> 4942
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_3"/> 4943
<FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="6" setSD="1" ChFAckReq="0" CRC="valid"/> 4944
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="1" SDset="1" ChFAckReq="0" CRC="valid"/> 4945
<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/> 4946
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="6" setSD="1" ChFAckReq="0" CRC="valid"/> 4947
</Testroot>
12.2.3 Test script 3

Table 180 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and ChannelFailureAck = 1.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0166</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_SETSD1MC0CFAC1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed)       | Protocol flow in case of distinct error |
| Precondition             | FS-Master to send first message         |
| Procedure               | See XML file "IO-Link-Safety_spec_master_final_testsuite_testcase_3.xml" |
| Test parameter           | See Table 177 and XML file               |
| Post condition           | –                                         |

### TEST CASE RESULTS CHECK / REACTION

| Evaluation               | Comparison of expected and received values according to the XML file |
| Test passed              | Comparison OK                                                        |
| Test failed (examples)   | Comparison not OK                                                     |
| Report                   | Printout of the automated SCL protocol tester <pass/fail>             |

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_3.xml":

```xml
<xml version="1.0" encoding="UTF-8"/>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_3" date="20.11.2018: 14:01:29.067">
  <FSMasterScTestCaseSteps>
    <Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
    <Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <Transition SourceState="WaitOnResponse_2" TargetState="WaitOnResponse_2"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="1" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
    <Transition SourceState="WaitOnResponse_2" TargetState="PrepareSPDU_3"/>
    <Transition SourceState="PrepareSPDU_3" TargetState="PrepareSPDU_4"/>
    <FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <Transition SourceState="WaitOnResponse_5" TargetState="PrepareSPDU_7"/>
    <Transition SourceState="PrepareSPDU_6" TargetState="PrepareSPDU_6"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="1"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
    <Transition SourceState="PrepareSPDU_8" TargetState="PrepareSPDU_6"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
  </FSMasterScTestCaseSteps>
</Testroot>
```
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="6" SDset="0" DCommErr="0" DTimeout="0" CRC="invalid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="2" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="1" DTimeout_S="0" MCommErr_S="1" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="1" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="3" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="1" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<Timeout/>
<Transition SourceState="WaitOnResponse_7" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="1" DTimeout_S="0" MCommErr_S="0" MTimeout_S="1"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
<Transition SourceState="WaitOnResponse_7" TargetState="WaitOnResponse_7"/>
</FSMasterSclTestCaseSteps>
</Testroot>
12.2.4 Test script 4

Table 181 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a setSD error, MCount = 0, and DCommErr.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0167</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_4.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_4" date="20.11.2018: 14:01:29.067">
<FSMasterSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
    <Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="1" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
    <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="6" SDset="0" DCommErr="1" DTimeout="0" CRC="invalid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
    <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="2" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="1" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
    <Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="3" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="4" SDset="0" DCommErr="1" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
</FSMasterSclTestCaseSteps>
</Testroot>
```
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="3" setSD="1" ChFAckReq="0" CRC="valid"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="invalid" DCount="4" SDset="0" DCommErr="0" DTimeout="1" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="4" setSD="1" ChFAckReq="0" CRC="valid" PDiin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="1" MCommErr_S="1" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="invalid" DCount="3" SDset="0" DCommErr="0" DTimeout="1" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="5" setSD="1" ChFAckReq="0" CRC="valid" PDiin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="1" MCommErr_S="1" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="invalid" DCount="2" SDset="0" DCommErr="0" DTimeout="1" CRC="valid" PDout_M="PD" setSD_C="1" ChFAck_C="1"/>
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="6" setSD="1" ChFAckReq="0" CRC="valid" PDiin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="1" MCommErr_S="1" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="1" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="1" ChFAck_C="1"/>
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="7" setSD="1" ChFAckReq="1" CRC="valid" PDiin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="1" ChFAck_C="1"/>
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid" PDiin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="1" ChFAck_C="1"/>
<Transition SourceState="WaitOnResponse_5" TargetState="WaitOnResponse_5"/>
</FSMasterSclTestCaseSteps>
</Testroot>
12.2.5 Test script 5

Table 182 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD error, MCount = 0, and DCommErr.

Table 182 – FS-Master test script 5

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0168</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_5.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_5" date="20.11.2018: 14:01:29.067">  
<FSMasterSclTestCaseSteps>  
<Transition SourceState="Init" TargetState="PrepareSPDU_1"/>  
<Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>  
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="1" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>  
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>  
<Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>  
<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>  
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="1" DTimeout_S="0" MCommErr_S="1" MTimeout_S="0"/>  
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>  
<Transition SourceState="WaitOnResponse_7" TargetState="WaitOnResponse_7"/>  
<FSMasterSclTestCaseSteps>  
</Testroot>
```
Table 183 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD = 1, MCount = 0, and DCommErr.

**Table 183 – FS-Master test script 6**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0169</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
</tbody>
</table>

Purpose (detailed): Protocol flow in case of distinct error

Precondition: FS-Master to send first message

Procedure: See XML file "IO-Link-Safety_spec_master_final_testsuite_testcase_6.xml"

Test parameter: See Table 177 and XML file

Post condition: –

Evaluation: Comparison of expected and received values according to the XML file

Test passed: Comparison OK

Test failed (examples): Comparison not OK

Report: Printout of the automated SCL protocol tester <pass/fail>

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_6.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_6" date="20.11.2018: 14:01:29.067">  
<TFMasterSclTestCaseSteps>  
<Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
<Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="1" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
<Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="6" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
<Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="2" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_4"/>
<Transition SourceState="PrepareSPDU_4" TargetState="WaitOnResponse_5"/>
```
<FSMasterSend_FSAppSend PDout="" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid" PDin_M="PD" SDset_S="0" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>

<FSMasterReceive_FSAppReceive PDin="" PortNum="valid" DCount="6" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>

<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>

<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="4" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="1" MTimeout_S="0"/>

<FSMasterSclTestCaseSteps>

</FSMasterSclTestCaseSteps>

</Testroot>
12.2.7 Test script 7

Table 184 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD = 1, MCount = 0, and DCommErr.

Table 184 – FS-Master test script 7

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0170</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_SETSD1MC0DCE1</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_7.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_7" date="20.11.2018: 14:01:29.067">
  <FSMasterSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
    <Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
    <FSMasterSend_FSAppSend PDtoout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDiin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="1" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
    <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
    <FSMasterSend_FSAppSend PDtoout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="1" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDiin="PD" PortNum="valid" DCount="6" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
    <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
    <FSMasterSend_FSAppSend PDtoout="SD" PortNum="valid" MCount="2" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDiin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
    <Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
    <FSMasterSend_FSAppSend PDtoout="SD" PortNum="valid" MCount="2" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDiin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
    <Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_4"/>
    <Transition SourceState="PrepareSPDU_4" TargetState="WaitOnResponse_5"/>
  </FSMasterSclTestCaseSteps>
</Testroot>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="4" setSD="1" ChFAccReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAccReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="1" MTimeout_S="0">  
<Transition SourceState="WaitOnResponse_5" TargetState="CheckSPDU_6"/>
<FSMasterReceive_FSAppReceive PDin="SD" PortNum="valid" DCount="6" SDset="0" DCommErr="0" DTimeout="0" CRC="invalid" PDout_M="PD" setSD_C="0" ChFAcc_C="1"/>
</FSMasterSclTestCaseSteps>
12.2.8 Test script 8

Table 185 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD = 1, MCount = 0, DCommErr, and Portnumber error.

### Table 185 – FS-Master test script 8

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0171</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_SETSD1MC0DCE1PNERR</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
</tbody>
</table>

#### TEST CASE CONDITIONS / PERFORMANCE

**Purpose (detailed)** Protocol flow in case of distinct error

**Precondition** FS-Master to send first message

**Procedure** See XML file "IO-Link-Safety_spec_master_final_testsuite_testcase_8.xml"

**Post condition** –

#### TEST CASE RESULTS CHECK / REACTION

**Evaluation** Comparison of expected and received values according to the XML file

**Test passed** Comparison OK

**Test failed (examples)** Comparison not OK

**Report** Printout of the automated SCL protocol tester <pass/fail>

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_8.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_8" date="20.11.2018: 14:01:29.068">
  <FSMasterSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="1" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_2" TargetState="PrepareSPDU_6"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="6" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="WaitOnResponse_7"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="2" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="WaitOnResponse_7"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="3" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="4" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="WaitOnResponse_7"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="4" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="3" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="WaitOnResponse_7"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="5" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="2" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="WaitOnResponse_7"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="6" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="1" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="WaitOnResponse_7"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="7" setSD="1" ChFAckReq="1" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="1" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
  </FSMasterSclTestCaseSteps>
</Testroot>
```
5258  <FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid"
5259  PDin_M="PD" SDset_S="0" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
5260  <FSMasterReceive_FSAppReceive PDin="PD" PortNum="invalid" DCount="6" SDset="0" DCommErr="0" DTimeout="0"
5261  CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="1"/>
5262  <Transition SourceState="WaitOnResponse_5" TargetState="CheckSPDU_3"/>
5263  <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
5264  <Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
5265  <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="4" setSD="1" ChFAckReq="0" CRC="valid"
5266  PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="1" MTimeout_S="0"/>
5267  </FSMasterSclTestCaseSteps>
5268  </Testroot>
Table 186 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD =1 and MCount =0.

### Table 186 – FS-Master test script 9

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCL_FSTC_0172</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_SETSD1MC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Protocol flow in case of distinct error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>FS-Master to send first message</td>
</tr>
<tr>
<td>Procedure</td>
<td>See XML file &quot;IO-Link-Safety_spec_master_final_testsuite_testcase_9.xml&quot;</td>
</tr>
<tr>
<td>Test parameter</td>
<td>See Table 177 and XML file</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

### TEST CASE RESULTS CHECK / REACTION

| Evaluation | Comparison of expected and received values according to the XML file |
| Test passed | Comparison OK |
| Test failed (examples) | Comparison not OK |
| Report | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_9.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_9" date="20.11.2018: 14:01:29.068">
  <FSMasterScTestCaseSteps>
    <Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
    <Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
    <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_4"/>
    <Transition SourceState="PrepareSPDU_4" TargetState="WaitOnResponse_5"/>
    <FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="1" setSD="0" ChFAckReq="0" CRC="valid" PDin_M="PD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="6" SDset="1" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_5" TargetState="CheckSPDU_3"/>
    <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_4"/>
    <Transition SourceState="PrepareSPDU_4" TargetState="WaitOnResponse_5"/>
    <FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="2" setSD="0" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_5" TargetState="CheckSPDU_3"/>
    <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_4"/>
    <Transition SourceState="PrepareSPDU_4" TargetState="WaitOnResponse_5"/>
    <FSMasterSend_FSAppSend PDout="PD" PortNum="valid" MCount="3" setSD="0" ChFAckReq="0" CRC="valid" PDin_M="PD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
  </FSMasterScTestCaseSteps>
</Testroot>
```
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="invalid" DCount="0" SDset="0" DCommErr="0" DTimeout="1"
CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>

<Transition SourceState="WaitOnResponse_5" TargetState="CheckSPDU_3"/>

<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>

<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="4" setSD="1" ChFAckReq="0" CRC="valid"
PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="1" MCommErr_S="1" MTimeout_S="0"/>

</FSMasterSclTestCaseSteps>

</Testroot>
### 12.2.10 Test script 10

Table 187 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD = 1, MCount = 0, Port number error, and CRC error.

**Table 187 – FS-Master test script 10**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0173</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_PNERRCRCERR</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

### TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed) | Protocol flow in case of distinct error |
| Precondition       | FS-Master to send first message         |
| Procedure          | See XML file "IO-Link-Safety_spec_master_final_testsuite_testcase_10.xml" |
| Test parameter     | See Table 177 and XML file              |
| Post condition     | –                                         |

### TEST CASE RESULTS CHECK / REACTION

| Evaluation          | Comparison of expected and received values according to the XML file |
| Test passed         | Comparison OK |
| Test failed (examples) | Comparison not OK          |
| Report              | Printout of the automated SCL protocol tester <pass/fail> |

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_10.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_10" date="20.11.2018: 14:01:29.068">
  <FSMasterScTestCaseSteps>
    <Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
    <Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTtimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="1" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
    <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
    <Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="1" DTimeout_S="0" MCommErr_S="0" MTtimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="6" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
    <Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
    <Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="2" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="1" MTtimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
    <Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
    <Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
    <Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
  </FSMasterScTestCaseSteps>
</Testroot>
```
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="3" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="invalid" DCount="4" SDset="0" DCommErr="0" DTimeout="0"/>

<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>

<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>

<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="4" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="invalid" DCount="2" SDset="0" DCommErr="0" DTimeout="0"/>

<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>

<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>

<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="5" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0"/>

<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>

<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>

<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="6" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0"/>

<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>

<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>

<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="7" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0"/>

<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>

<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>

<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="8" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0"/>

<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>

<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
12.2.11 Test script 11

Table 188 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of setSD = 1, MCount = 0, Port number error, and CRC error.

Table 188 – FS-Master test script 11

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0174</td>
</tr>
<tr>
<td>Name</td>
<td>FSTMCM_SCLM_FLOW_PNERRCRCERR</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_11.xml":

```xml
<xml version="1.0" encoding="UTF-8"/>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_11" date="20.11.2018: 14:01:29.068">
<FSMasterSclTestCaseSteps>
<Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
<Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="7" SDset="0" DCommErr="1" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
<Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
<Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="1" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="6" SDset="0" DCommErr="0" DTimeout="0" CRC="invalid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="2" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="1" MTimeout_S="0"/>
<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="5" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
<Transition SourceState="WaitOnResponse_7" TargetState="CheckSPDU_8"/>
<Transition SourceState="CheckSPDU_8" TargetState="PrepareSPDU_6"/>
<Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
```

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="3" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="invalid" DCount="4" SDset="0" DCommErr="0" DTimeout="0" MCommErr="0" MTimeout="0"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="4" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="invalid" DCount="2" SDset="0" DCommErr="0" DTimeout="0" MCommErr="0" MTimeout="0"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="5" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" MCommErr="1" MTimeout="0"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="6" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" MCommErr="0" MTimeout="0"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="7" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" MCommErr="1" MTimeout="0"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="8" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" MCommErr="0" MTimeout="0"/>

<FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="9" setSD="1" ChFAckReq="0" CRC="valid"/>

<FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" MCommErr="0" MTimeout="0"/>
12.2.12 Test script 12

Table 189 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of a port number error and MCount = 0.

Table 189 – FS-Master test script 12

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0175</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_PNERRMC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_12.xml":

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_12" date="20.11.2018: 14:01:29.068">
    <FSMasterSclTestCaseSteps>
        <Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
        <Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
        <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
        <Transition SourceState="WaitOnResponse_2" TargetState="WaitOnResponse_2"/>
        <FSMasterReceive_FSAppReceive PDin="PD" PortNum="invalid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="valid" PDout_M="PD" setSD_C="0" ChFAck_C="0"/>
        <Transition SourceState="WaitOnResponse_2" TargetState="WaitOnResponse_2"/>
        <Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
        <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
        <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
    </FSMasterSclTestCaseSteps>
</Testroot>
```
12.2.13 Test script 13

Table 190 defines the test conditions for this test case. The associated XML file contains steps and message parameters for the state flow check in case of CRC error and MCount =0.

Table 190 – FS-Master test script 13

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0176</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_FLOW_CRCERRMC0</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td></td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master automated SCL protocol test</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], clause 11.3.2, Figure 41 (services); clause 11.5.2, Figure 46 (state chart)</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>See Table A.6</td>
</tr>
</tbody>
</table>

TEST CASE CONDITIONS / PERFORMANCE

| Purpose (detailed) | Protocol flow in case of distinct error |
| Precondition       | FS-Master to send first message         |
| Procedure          | See XML file "IO-Link-Safety_spec_master_final_testsuite_testcase_13.xml" |
| Test parameter     | See Table 177 and XML file              |
| Post condition     | –                                         |

TEST CASE RESULTS CHECK / REACTION

| Evaluation          | Comparison of expected and received values according to the XML file |
| Test passed         | Comparison OK                                                                   |
| Test failed (examples) | Comparison not OK                                                             |
| Report              | Printout of the automated SCL protocol tester                                |

Content of file "IO-Link-Safety_spec_master_final_testsuite_testcase_13.xml":

```xml
<Testroot xsi:noNamespaceSchemaLocation="IO-Link-Safety-Test-Procedure_Types_V1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2" name="tc_13" date="20.11.2018: 14:01:29.068">
  <FSMasterSclTestCaseSteps>
    <Transition SourceState="Init" TargetState="PrepareSPDU_1"/>
    <Transition SourceState="PrepareSPDU_1" TargetState="WaitOnResponse_2"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="invalid" PDout_M="PD" setSD_C="0" ChFack_C="0"/>
    <Transition SourceState="WaitOnResponse_2" TargetState="CheckSPDU_3"/>
    <Transition SourceState="CheckSPDU_3" TargetState="PrepareSPDU_6"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="1" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="1" MTimeout_S="0"/>
    <FSMasterReceive_FSAppReceive PDin="PD" PortNum="valid" DCount="0" SDset="0" DCommErr="0" DTimeout="0" CRC="invalid" PDout_M="PD" setSD_C="0" ChFack_C="0"/>
    <Transition SourceState="PrepareSPDU_6" TargetState="WaitOnResponse_7"/>
    <FSMasterSend_FSAppSend PDout="SD" PortNum="valid" MCount="0" setSD="1" ChFAckReq="0" CRC="valid" PDin_M="SD" SDset_S="1" ChFAckReq_S="0" DCommErr_S="0" DTimeout_S="0" MCommErr_S="0" MTimeout_S="0"/>
  </FSMasterSclTestCaseSteps>
</Testroot>
```
13 FS-Master with reference FS-Devices tests

13.1 Overview

The FS-Master with reference FS-Devices test comprise tests, where several approved FS-Devices as reference are available. Rules for reference systems are defined in A.2.3.

An approved SMTU can also be used as an approved FS-Device if an IODD exists.

The FS-Master in reference tests comprise tests of the splitter and composer for Process Data. Since tests for SR PD are already included in 12.2, the test cases here focus on the NSR PD part. They are followed by test cases for special SMI services for read back of the (safety) Port configuration and Port status and optionally by test cases for the correct Process Data in case of OSSD (FS-DI) Port mode. In addition, Port Events are tested. Besides tests for the FS-Master SCL protocol watchdog, the aspects of Safety Function Response Time (SFRT) are covered.

13.2 Splitter/composer

13.2.1 Splitter in mixed PD mode (CRC32)

Table 191 defines the test conditions for this test case.

<table>
<thead>
<tr>
<th>Table 191 – Splitter in mixed PD mode (CRC32)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEST CASE ATTRIBUTES</strong></td>
</tr>
<tr>
<td>Identification (ID)</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Purpose (short)</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
</tr>
<tr>
<td>Test case version</td>
</tr>
<tr>
<td>Category / type</td>
</tr>
<tr>
<td>Specification (clause)</td>
</tr>
<tr>
<td>Configuration / setup</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>TEST CASE CONDITIONS / PERFORMANCE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>TEST CASE RESULTS</strong></th>
<th><strong>CHECK / REACTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check (NSR) &quot;PDIn&quot;</td>
</tr>
<tr>
<td>Test passed</td>
<td>PDIn.InputDataLength = 1, PDIn.PDIO = 3</td>
</tr>
<tr>
<td></td>
<td>PDIn.PQI = 1</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Values OK: &lt;yes/no&gt;</td>
</tr>
</tbody>
</table>
### 13.2.2 Splitter in mixed PD mode (CRC16)

Table 192 defines the test conditions for this test case.

**Table 192 – Splitter in mixed PD mode (CRC16)**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0179</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_FSOP_SPLITTERMIXPD16</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether NSR PD of an FS-Device (sensor) are transferred correctly</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 10.2, 10.3, 10.5</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
</tbody>
</table>
| Precondition                       | EUT: PORT_MIXFSCOM
SMTU: SMTU_STANDARD_STATE_16       |
| Procedure                          | a) SMTU_NSR_Set(NSR, PDValid) ;set NSR Process Data + PDValid
b) SMTU_SPDU_Change ;wait until SPDU has changed
c) SMI_PDIn                           |
| Test parameter                     | NSR[4] = {3, 6, 9, 12}, PDValid = 1 |
| Post condition                     | –  |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check (NSR) &quot;PDin&quot;</td>
</tr>
</tbody>
</table>
| Test passed       | PDIn.InputDataLength = 4,
PDIn.PDi[i = 0, …, 3] = {3, 6, 9, 12},
PDIn.PQI = 1 |
| Test failed (examples) | Any check incorrect |
| Report             | Values OK: <yes/no> <ok | nok> |
### 13.2.3 Composer in mixed PD mode (CRC32)

Table 193 defines the test conditions for this test case.

#### Table 193 – Composer in mixed PD mode (CRC32)

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0181</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_FSOP_COMPOSERMIXPD32</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether NSR PD to an FS-Device (actuator) are transferred correctly</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 10.2, 10.3, 10.5</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>
### 13.2.4 Composer in mixed PD mode (CRC16)

Table 194 defines the test conditions for this test case.

#### Table 194 – Composer in mixed PD mode (CRC16)

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0183</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_FSOP_COMPOSERMIXPD16</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether NSR PD to an FS-Device (actuator) are transferred correctly</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], 10.2, 10.3, 10.5</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check &quot;FSPDInOut&quot;</td>
</tr>
<tr>
<td></td>
<td>2) Check &quot;mixed PD&quot;</td>
</tr>
<tr>
<td>Test passed</td>
<td>FSPDInOut.PDO0 = 3, FSPDInOut.PDO0 = 6, FSPDInOut.PDO0 = 9, FSPDInOut.PDO0 = 12, and NSR = {3, 6, 9, 12}, OE = Valid</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Values OK: &lt;yes/no&gt; &lt;ok</td>
</tr>
</tbody>
</table>
13.3 SMI service tests (safety)

13.3.1 Read back safety configuration

Table 195 defines the test conditions for this test case.

Table 195 – Read back safety configuration

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0185</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SMIS_READBACKCONFIG</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether safety configuration is read back correctly</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4],</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

**TEST CASE CONDITIONS / PERFORMANCE**

**Purpose (detailed)**
Check whether safety configuration is read back correctly with the help of SMI_ReadbackPortConfiguration using Argblock 0x8100

**Precondition**
EUT: PORT_POWER_OFF
SMTU: SMTU_STANDARD_STATE_32

**Procedure**
a) SMI_PortPowerOffOn()
b) Wait 3 s
c) SMI_PortConfiguration(ABPS_FSCONFIG_MIXEDCOM)
d) SMI_ReadBackPortConfiguration(0x8100); returns ArgBlock "FSPortConfigList"

e) Evaluation 1)

**Test parameter**
–

**Post condition**
–

**TEST CASE RESULTS CHECK / REACTION**

**Evaluation**
1) Compare ArgBlock "FSPortConfigList" with ABPS_FSCONFIG_MIXEDCOM

**Test passed**
All comparisons match

**Test failed (examples)**
Any mismatch at comparison

**Report**
Mismatches: <yes/no> <ok | nok>
### 13.3.2 Safety Port status

Table 196 defines the test conditions for this test case.

**Table 196 – Safety Port status**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0186</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SMIS_FSPORTSTATUS</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether Port status is read back correctly</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>PortQualityInfo.Bit0/1 = 0 ; TransmissionRate = COM2</td>
</tr>
<tr>
<td>MasterCycleTime = 0x28 ; InputDataLength = 0x20</td>
</tr>
<tr>
<td>OutputDataLength = 0x20 ; VendorID = 0xFDE8</td>
</tr>
<tr>
<td>DeviceID = 0x002BD2 ; NumberofDiags = 0</td>
</tr>
<tr>
<td>DiagEntry0 = 0 ; DiagEntry1 = 0</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>

### 13.4 Port with FS-DI/OSSDe (optional)

Testing of this functionality is covered by SDCI_FSTC_0008 in 5.4.1.
### 13.5 Events

#### 13.5.1 Port specific Event

Table 197 defines the test conditions for this test case.

<table>
<thead>
<tr>
<th>Table 197 – Port specific Event</th>
</tr>
</thead>
</table>

---

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0187</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_REFD_PORTEVENTCORRECT</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether Port Event is generated correctly</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4], Table B.2</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

---

**TEST CASE CONDITIONS / PERFORMANCE**

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Check whether Port Event is generated correctly, e.g. a transmission Error (Timeout) occurred.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>EUT: PORT_MIXFSCOM SMTU: SMTU_STANDARD_STATE_32 ;no FST Parameter</td>
</tr>
</tbody>
</table>
| Procedure          | a) SMI_PDOu(ABPS_PDOUT32<OutputDataLength=1>)  
|                    | b) SMI_SPDUou(ABPS_SPDUOUT25 <SPD[i]=0>)  
|                    | c) SMTU_SPDU_Repetition (3s):Pause > WatchdogTimeout to trigger Timeout Error  
|                    | d) SMI_SPDUou(ABPS_SPDUOUT25 <SPD[i]=1>)  
|                    | e) Wait on SMI_PortEvent  
|                    | d) Evaluation 1)  

| Test parameter | – |
| Post condition | – |

---

**TEST CASE RESULTS**

<table>
<thead>
<tr>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation 1) Check ArgBlock &quot;PortEvent&quot;</td>
</tr>
<tr>
<td>Test passed</td>
</tr>
<tr>
<td>Test failed (examples)</td>
</tr>
<tr>
<td>Report</td>
</tr>
</tbody>
</table>
### 13.5.2 FS-Device Event

Table 198 defines the test conditions for this test case.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0188</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_REFD_FSDEVICEEVENTCORRECT</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether FS-Device Event is propagated correctly</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check ArgBlock &quot;DeviceEvent&quot;</td>
</tr>
<tr>
<td>Test passed</td>
<td>EventCode = 0xB003 ;Unexpected authentication code</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>No Event or EventCode incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>FS-Device Event OK: &lt;yes/no&gt; &lt;ok</td>
</tr>
</tbody>
</table>
13.6 Safety function response time

13.6.1 General concepts and accuracies

Figure 16 illustrates the effects of the worst-case delay times (WCDT) and one fault delay times (OFDT) of the components involved in a safety function based on a pure FS-Master and FS-Device system. see Annex H.6 in [4], which requires for a

- a manufacturer/vendor of FS-Devices to provide the "worst-case delay time" (WCDT) value.
  WCDT is defined as the time from triggering an FS-Device (sensor) until the output shows a corresponding signal change or Process Data change. For an FS-Device (actuator) it is the time from signal change or Process Data change to the actuator's safe state.

- a manufacturer/vendor of FS-Devices to provide the "one fault delay time" (OFDT) value. The definition of OFDT is similar to WCDT, however in case of a fault within the FS-Device at the time of the measurement.

Therefore, since it is mandatory for all components to provide WDCT and OFDT in user manuals, FS-Master tools are enabled to provide values for the total worst case delay time (TWCDT) and safety function response time.

An FS-Master shall also provide values for FS-Master_WD (OFDT), usually derived from program processing duration and for IOL-S WD for the output side.

Figure 16 – SFRT of a stand-alone FS-Master with processing

Only one fault shall be assumed per trip. The watchdog time with the largest impact on the safety function response time (SFRT) shall be considered for a safety function. For a machine usually an overtravel measurement (usually at least 10 measurements) is performed.

Table 199 shows the accuracies and tolerances to be used for timings.

Table 199 – Accuracies and tolerances for timings

<table>
<thead>
<tr>
<th>Item</th>
<th>Accuracy</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement accuracy</td>
<td>+/- 1 %</td>
<td>–</td>
</tr>
<tr>
<td>Permitted watchdog time tolerance</td>
<td>+/- 10 %</td>
<td>–</td>
</tr>
</tbody>
</table>

Figure 17 illustrates the effects of the worst-case delay times (WDCT) and one fault delay times (OFDT) of the components involved in a safety function based on FS-Master and FS-
Devices integrated in a fieldbus functional safety communication profile (FSCP), see for example [11].

**Figure 17 – SFRT including IOL-S and FSCP**

Figure 18 illustrates, how the watchdog timer of an FS-Master is tested. The Safety Master Tester Unit (SMTU), playing the role of an FS-Devices, is controlled in such a way that the response SPDU ("DCount\_i = 3") is delayed through artificial repetitions. For details see 13.6.2.

**Figure 18 – Test of the FS-Master watchdog**

The actual watchdog response time cannot be measured with IO-Link on-board equipment. This shall be measured by the manufacturer using development tools or determined via software analysis (safety assessment, see 8.3.3).
### 13.6.2 FS-Master watchdog test

Table 200 defines the test conditions for this test case.

#### Table 200 – FS-Master watchdog test

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0189</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_SCLM_WATCHDOGPRECISION</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Check whether FS-Master watchdog timeout coincides with IODD value</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4],</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>FS-Master-Tester-Unit (SMTU)</td>
</tr>
</tbody>
</table>

#### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>Check whether FS-Master’s safety reaction time upon watchdog timeout coincides with the FSP_Watchdog value in the IODD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>EUT: Port config DEACTIVATED; Transmission rate = COM2; SMTU: Configured for armed operation :see field test parameter</td>
</tr>
</tbody>
</table>
| Procedure          | a) Choose test parameter with first FSP_Watchdog value :see field test parameter  
|                    | b) Set PortConfig with FSP_VerifyRecord with values of A) and B)  
|                    | e.g. via SMI_PortConfiguration using ArgBlock 0x8100 :see field test parameter :returns "WD_time"  
|                    | c) SMTU_Measure_WDtime  
|                    | f) Evaluation 1)  
|                    | g) Repeat from c) 3 times  
|                    | h) Choose test parameter with next FSP_Watchdog value  
| Test parameter     | A) FSP protocol parameter record:  
|                    | FSP_ProtVersion = defaultValue in IODD,  
|                    | FSP_ProtMode = defaultValue in IODD,  
|                    | FSP_Watchdog = (50 ms, 100 ms),  
|                    | FSP_IOStructCRC = defaultValue in IODD,  
|                    | FSP_TechParCRC = valid CRC signature  
|                    | FSP_ProtParCRC = valid CRC signature  
|                    | B) FSP authenticity parameter record:  
|                    | FSCP_Authenticity_1 = 1,  
|                    | FSCP_Authenticity_2 = 2,  
|                    | FSP_Prot = 1,  
|                    | FSP_AuthentCRC = 11456  
| Post condition     | – |

#### TEST CASE RESULTS CHECK / REACTION

| Evaluation | Check "WD_time", memorize maximum WD_time and minimum WD_time |
| Test passed | Deviation of maximum/minimum WD_time less than 10 % @ 50 ms, and Deviation of maximum/minimum WD_time less than 10 % @ 100 ms |
| Test failed (examples) | Any check incorrect |
| Report     | WD_time (min) @ 50 ms: <value> :<ok | nok>  
|            | WD_time(max) @ 50 ms: <value> :<ok | nok>  
|            | WD_time (min) @ 100 ms: <value> :<ok | nok>  
|            | WD_time (max) @ 100 ms: <value> :<ok | nok>   |
13.6.3 Integration aspects

In 13.6.1, the general concepts are explained also for a more complex FS-Master integrated in a fieldbus’s functional safety communication profile (FSCP) according to the IEC 61784-3 series. In this case, usually the FS-Master plays only the role of a mapper of Process Data from one safety communication system to the other.

The designer/manufacturer of such a mapping FS-Master/Gateway shall provide WCDT and OFDT for the mapping part to enable computer-aided approximation of a safety function response time. Integration specifications to FSCPs should comprise definitions and descriptions how to achieve these values.
## 14 FS-Master Tool tests

### 14.1 IODD import

Table 201 defines the test conditions for this test case.

**Table 201 – IODD import**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0190</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_TOOL_IODDIMPORT</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>IODD of the SMTU can be imported into FS-Master Tool</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master Tool test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4]</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>EUT + IODD of SMTU (or any FS-Device)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
<tr>
<td>Procedure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Test parameter</td>
</tr>
<tr>
<td>Post condition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check import status (CRC signature, Display)</td>
</tr>
<tr>
<td></td>
<td>2) Check FSP_ParamDescCRC</td>
</tr>
<tr>
<td>Test passed</td>
<td>All checks correct</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Values OK: &lt;yes/no&gt;</td>
</tr>
<tr>
<td></td>
<td>&lt;ok</td>
</tr>
</tbody>
</table>
**14.2 IODD conventions (PD headlines coloring)**

Table 202 defines the test conditions for this test case.

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCL_FSTC_0191</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_TOOL_IODDCONVENTIONS</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>IODD of the SMTU is displayed according to IODD rules</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master Tool test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>EUT + IODD of SMTU</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE</th>
<th>CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>Check whether IODD of the SMTU is displayed according to IODD rules, e.g. headers of Process Data and FS parameters in yellow color</td>
</tr>
<tr>
<td>Precondition</td>
<td>–</td>
</tr>
</tbody>
</table>
| Procedure    | a) Import and open IODD of the SMTU  
|              | b) Evaluation 1)          |
| Test parameter | FS parameter in user manual |
| Post condition | –                        |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation 1)</td>
<td>Check display</td>
</tr>
<tr>
<td>Test passed</td>
<td>Headers of Process Data and FS parameters in yellow color according to IODD rules</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Display not according to IODD rules</td>
</tr>
</tbody>
</table>
| Report             | Values OK: <yes/no>  
|                    | <ok | nok>            |
### 14.3 FS parameters visible completely

Table 203 defines the test conditions for this test case.

**Table 203 – FS parameters visible completely**

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0192</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_TOOL_IODDDisplayComplete</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>IODD FS parameter of the SMTU are displayed completely and appropriately</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master Tool test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>EUT + IODD of SMTU (or any FS-Device) + user manual</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                         | a) Import and open IODD of the SMTU  
b) Display all FSP parameters  
c) Evaluation 1)  
d) Display all FST parameters  
e) Evaluation 2) |
| Test parameter                    | FS parameter in user manual |
| Post condition                    | – |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation        | 1) Compare all FSP parameters with user manual  
2) Compare all FST parameters with user manual |
| Test passed       | All comparisons correct or tolerable (no misunderstandings) |
| Test failed (examples) | Any comparison incorrect |
| Report            | Comparisons OK: <yes/no> | <ok | nok> |
### 14.4 FS-Device parameterization

Table 204 defines the test conditions for this test case.

#### Table 204 – FS-Device parameterization

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0193</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_TOOL_FSTPARAMETERS</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>FST parameterization is possible</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master Tool test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>EUT + IODD of SMTU (or any FS-Device)</td>
</tr>
</tbody>
</table>

#### TEST CASE CONDITIONS / PERFORMANCE

<table>
<thead>
<tr>
<th>Purpose (detailed)</th>
<th>FS-parameterization is possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td></td>
</tr>
<tr>
<td>Procedure</td>
<td>a) Import IODD</td>
</tr>
<tr>
<td></td>
<td>b) Establish communication with SMTU</td>
</tr>
<tr>
<td></td>
<td>c) Modify FS parameter</td>
</tr>
<tr>
<td></td>
<td>d) Evaluation 1)</td>
</tr>
<tr>
<td>Test parameter</td>
<td>FST parameter in user manual</td>
</tr>
<tr>
<td>Post condition</td>
<td></td>
</tr>
</tbody>
</table>

#### TEST CASE RESULTS CHECK / REACTION

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>1) Compare SMTU behavior with description in SMTU user manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test passed</td>
<td>All checks correct or tolerable (no misunderstandings)</td>
</tr>
<tr>
<td>Test failed</td>
<td>Any check incorrect</td>
</tr>
<tr>
<td>Report</td>
<td>Behavior OK: &lt;yes/no&gt; &lt;ok</td>
</tr>
</tbody>
</table>
14.5 Dedicated Tool operation

Table 205 defines the test conditions for this test case.

Table 205 – Dedicated Tool operation

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0194</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_TOOL_COMMDEDITool</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Dedicated Tool of the SMTU can communicate with Master Tool</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>EUT + IODD of SMTU + Dedicated Tool from SMTU</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
</tr>
<tr>
<td>Precondition</td>
</tr>
</tbody>
</table>
| Procedure                         | a) Launch/invoke Dedicated Tool  
b) Evaluation 1)  
c) Try changing parameter values in FS-Master Tool  
d) Evaluation 2)  
e) Close Dedicated Tool  
f) Evaluation 3)  
g) Modify FST parameter values in FS-Master Tool  
h) Relaunch Dedicated Tool  
i) Evaluation 4)  
j) Evaluation 5)  
k) Perform commissioning of SMTU  
l) Evaluation 6) |
| Test parameter                    | –                           |
| Post condition                    | –                           |

<table>
<thead>
<tr>
<th>TEST CASE RESULTS CHECK / REACTION</th>
</tr>
</thead>
</table>
| Evaluation                        | 1) Check availability of TechParCRC display (decimal value) in Dedicated Tool (memorize CRC value)  
2) Editing of values in FS-Master Tool shall be blocked  
3) Check identical TechParCRC display (decimal value) in FS-Master Tool (see 1))  
4) Compare parameter values in displays of Dedicated Tool and FS-Master Tool (parameter values shall match)  
5) Compare FST_TechParCRC on FS-Master Tool with TechParCRC of Dedicated Tool (CRC values should differ due to parameter changes)  
6) Check behavior of FS-Master system with connected SMTU |
| Test passed                       | All checks correct          |
| Test failed (examples)            | Any check incorrect         |
| Report                            | Values OK: <yes/no>         | <ok | nok> |
### 14.6 DDO exchange

Table 206 defines the test conditions for this test case.

#### Table 206 – DDO exchange

<table>
<thead>
<tr>
<th>TEST CASE ATTRIBUTES</th>
<th>IDENTIFICATION / REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification (ID)</td>
<td>SDCI_FSTC_0195</td>
</tr>
<tr>
<td>Name</td>
<td>FSTCM_TOOL_DDOEXCHANGE</td>
</tr>
<tr>
<td>Purpose (short)</td>
<td>Device Data Objects (DDOs) can be exchanged between tools</td>
</tr>
<tr>
<td>Equipment under test (EUT)</td>
<td>FS-Master + Tool</td>
</tr>
<tr>
<td>Test case version</td>
<td>1.0</td>
</tr>
<tr>
<td>Category / type</td>
<td>FS-Master test, test to pass</td>
</tr>
<tr>
<td>Specification (clause)</td>
<td>[4].</td>
</tr>
<tr>
<td>Configuration / setup</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE CONDITIONS / PERFORMANCE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose (detailed)</td>
<td>Check whether Device Data Objects (DDOs) can be exchanged with the Master Tool</td>
</tr>
<tr>
<td>Precondition</td>
<td>–</td>
</tr>
<tr>
<td>Procedure</td>
<td>a) Import Test-DDO into FS_Master Tool</td>
</tr>
<tr>
<td></td>
<td>b) Evaluation 1)</td>
</tr>
<tr>
<td></td>
<td>c) Create a DDO in FS-Master Tool</td>
</tr>
<tr>
<td></td>
<td>d) Import the DDO into FS-Master Tester or FS-Device Tester Tool.</td>
</tr>
<tr>
<td></td>
<td>e) Evaluation 2)</td>
</tr>
<tr>
<td>Test parameter</td>
<td>Test-DDO</td>
</tr>
<tr>
<td>Post condition</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEST CASE RESULTS</th>
<th>CHECK / REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>1) Check whether FS-Master Tool display matches imported Test-DDO</td>
</tr>
<tr>
<td></td>
<td>2) Check whether display of Tester Tool matches exported DDO of FS-Master Tool</td>
</tr>
<tr>
<td>Test passed</td>
<td>All checks correct</td>
</tr>
<tr>
<td>Test failed (examples)</td>
<td>Any check incorrect</td>
</tr>
</tbody>
</table>
| Report                                     | Values OK: <yes/no>           |<ok | nok>
15 Environmental tests

15.1 General
Annex H in [2] defines the basic environmental tests (EMC) for the SDCI communication part of an FS-Master/FS-Device system. Clause 5.4.2 in [2] specifies environmental conditions (e.g. electrical safety) especially for FS-Master with Port Class B.

It depends on the technology of an FS-Device and the countries of deployment, whether additional environmental tests are required to achieve for example a CE mark in Europe.

15.2 Product specific standards
Usually, the sector specific EMC standard IEC 61326-3-1 or the generic EMC standard 61000-6-7 are relevant for FS-Master.

For FS-Devices, there are several EMC standards, including but not limited to:

- Product standard IEC 61496-1 (Electro-sensitive protective equipment)
- Product standard IEC 60947-5-3 (Proximity switches)
- Sector standard IEC 61326-3-1 (Factory automation)
- Generic standard IEC 61000-6-7 (in case of no sector or product standard, such as in case of drives)

The following rule applies: Product standards shall be observed if available, otherwise sector standard or then generic standard.

15.3 EMC tests
EMC tests in respect of a particular phenomenon are defined in the IEC 61000-4-x series. Details for the respective test set-ups are described in Annex H.1.6 in [2] and in 4.4 or 0.

15.4 Test report templates
Tests are required for the following phenomena:

- Electrostatic discharge (ESD: IEC 61000-4-2)
- Electromagnetic field (HF: IEC 61000-4-3)
- Fast transients (Burst: IEC 61000-4-4)
- Surge protection (Surge: IEC 61000-4-5): optional, depending on deployment
- Conducted radio frequency (CRF: IEC 61000-4-6)

Usually, the test levels and durations exceed the values of NSR devices. A special performance criterion "DS" allows the devices to enter a Defined State at these extended "stress" tests, which is supposed to be safe in safety functions.

A passed EMC test is a precondition for a Manufacturer Declaration of Conformity. It shall comprise statements on the results of the above EMC tests. The forms in [9] may be used if they contain the appropriate information.
Annex A
(normative)

Test configurations, principles, and tools

A.1 Measurement circuits / setups

A.1.1 Measurement circuits for static FS-Master parameter tests
Figure A.1 illustrates the measurement circuits for static FS-Master parameter tests in 5.2.

![Measurement circuit for static FS-Master parameter tests]

Figure A.1 – Measurement circuits for static FS-Master parameter tests

A.1.2 Measurement circuits for static FS-Device parameter tests
Figure A.2 illustrates the measurement circuits for static FS-Device parameter tests in 5.3.
Method ① or ② can be applied.

![Measurement circuit for static FS-Device parameter tests]

Figure A.2 – Measurement circuits for static FS-Device parameter tests

A.1.3 Measurement circuits for dynamic FS-Master parameter tests
Figure A.3 illustrates the measurement circuits for dynamic FS-Master parameter tests in 5.4
A.1.4 Measurement circuits for dynamic FS-Device parameter tests

Figure A.4 illustrates the measurement circuits for dynamic FS-Device parameter tests in 5.5.

A.2 Test tools

A.2.1 Overview

Seven tools have been identified supporting the performance of the test cases in this document:

- "OSSD Signal Generator", see A.2.2
- "Upper-Tester" (UT) for SCL protocol conformance testing, see A.2.3
- "FS-Master tester system" including the "Safety Master Tester Unit" (SMTU), see A.2.4
- "FS-Device tester" (FSDT), see A.2.5
- "IODD Checker Tool", see A.2.6
- Reference FS-Master/Tool and FS-Devices, see A.2.7
- "EMC-Test tool" (optional)
A.2.2 OSSD signal generator

Several test cases require complex correlated signal sequences on both OSSD channels, which cannot be stimulated by a reference off-the-shelf FS-Device. An OSSD signal generator, acting as a controllable FS-Device, which is connected to an FS-Master, can provide the required OSSD signals and the superimposed OSSD test pulses (see Figure A.3).

Figure A.5 shows an example of an OSSD signal sequence and its description.

The OSSD signal sequences are specified by the symbols "H" and "L", describing the OSSD signal levels during a time slot. Unless otherwise noted, the duration of a slot is longer than required for the detection of any possible signal combination.

The combined symbols for the description of OSSD sequences are defined in Table A.1.

Figure A.5 – Example of an OSSD signal sequence description

Table A.1 – Description means for OSSD signal sequences

<table>
<thead>
<tr>
<th>Combined symbol</th>
<th>OSSD1 level</th>
<th>OSSD2 level</th>
<th>Duration of time slot</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH(d)</td>
<td>High</td>
<td>High</td>
<td>d</td>
</tr>
<tr>
<td>HL(d)</td>
<td>High</td>
<td>Low</td>
<td>d</td>
</tr>
<tr>
<td>LH(d)</td>
<td>Low</td>
<td>High</td>
<td>d</td>
</tr>
<tr>
<td>LL(d)</td>
<td>Low</td>
<td>Low</td>
<td>d</td>
</tr>
</tbody>
</table>

Figure A.6 shows means to describe OSSD test pulses for the FS-Device output testing (see [4], 5.3.2.3). Parameters are "T" for period, "d" for duration of the test pulse, and "o" for the offset between test pulse train1 and train2.

Figure A.6 – OSSD test pulses
The OSSD test pulses are specified by test pulse symbol pairs, like the OSSD signal sequence in curly brackets.

**Table A.2 – Test pulse symbols**

<table>
<thead>
<tr>
<th>Test pulse symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>( p(T, d) )</td>
<td>Train1 of low pulses with repetition period &quot;T&quot; and duration &quot;d&quot;</td>
</tr>
<tr>
<td>( p(T, d, o) )</td>
<td>Train2 of low pulses with repetition period &quot;T&quot;, duration &quot;d&quot;, and offset &quot;o&quot; to train1</td>
</tr>
</tbody>
</table>

A complete OSSD signal can be described by the combination of an OSSD signal sequence and a test pulse symbol pair. The test pulses are only affecting the OSSD signal when the signal shows a "high" level.

### A.2.3 Principles of SCL protocol conformance testing

In case of IO-Link Safety, the conformance test is a black box test verifying the IUT (Implementation Under Test) against the specification [4] at defined PCO (Point of Control and Observation).

The IUT for IO-Link-Safety is the FS-Master state machine or the FS-Device state machine. It is embedded in the DUT (Device Under Test) and has the following interfaces:

- IO-Link communication interface (SPDU)
- IO-Link SCL interface to "Mapping" (FS-Master) or "Technology" (FS-Device)

In order to test the "Mapping/Technology" interface, a special "test application" would normally be required at the DUT. This "test application" is supposed to apply and check test patterns at the SCL interface inputs/outputs and thus requires control by the tester performing the test scripts.

For the sake of simplicity, IO-Link Safety uses the non-safety part of IO-Link messages as "test control channel" in order to remotely access the "test application" as shown in Figure A.7. In this case "the test application" is called "Upper Tester" (UT).

The UT is embedded in the IO mapping part of the safety gateway to an FSCP as shown in Figure A.8. It is only active during testing and controlled by certain values of the FSP parameter "FSP_ProtMode" (see [4], Annex A.2.5). These values are not visible in the IODD of an FS-Device and cannot be set by an FS-Master Tool. Solely the FS-Master Tester system is enabled.

**Figure A.7 – Principle of FS-Master SCL testing**
Figure A.8 – Remote Upper Tester (UT) as "test application"

This allows for a quite simple "test application" by just copying data between the safety and non-safety transmission parts as shown in detail in Figure A.9. Thus, the test patterns ("FS-Master Test Scripts") for the FS-Master set and check all safety process data and signals of the communication interface (SPDU) as well as all safety process data and signals of the "Mapping" interface.

Figure A.9 – Upper Tester logic operations (copy)

Figure A.10 shows how synchronization check of data (test patterns) is achieved through an 8 bit counter (TestSyncCounter) within the "test control channel" in case of "FSP_ProtMode" = "Test1" (16 bit CRC) and "Test2" (32 bit CRC).

The Octets for test message identifications "TestMessageIDhigh" and "TestMessageIDlow" shall be treated as "reserved".
Details are defined for the actual FS-Master SCL protocol tester tool in A.2.4. Many FS-Device DUTs have a fixed technology application and limited resources such that no test control channel and no remote Upper Tester can be established. Thus, a simplified FS-Device SCL testing has been chosen as shown Figure A.11. It results in the following restrictions for the test creation and performance.

The test scripts for the FS-Device set and check all safety process data and signals of the communication interface (SPDU). A static configuration with safety process data $>0$ and SDset_DS = 0 is defined for the parameters of the "Fixed technology" interface. An FS-Device shall always provide valid process data values for the test.

**Figure A.10 – Data transfer in safety and test control channel**

**Figure A.11 – Principle of FS-Device SCL testing**

### A.2.4 FS-Master tester system

Figure A.12 shows the possible configurations for an FS-Master tester system including SCL testing. This configuration can be used for all test cases such as VerifyRecord, FS-Master/FS-Device configuration, and SCL protocol test scripts, but not for physical layer tests.
Input for the FS-Master-Tester-Program are test scripts based on test cases in this document, mainly coded in XML and secured for possible audits by assessment bodies. Test results (verdict) shall be logged together with test scripts and versions of the FS-Master-Tester-Program for later reproduction. Thus, versioning of testers is required.

In order to drive the tests, the FS-Master-Tester-Program uses SMI services defined in [2] and specific SMI services defined in [4], as well as MTU instructions defined in [9] and SMTU instructions defined in A.4.7.

A.2.5  FS-Device tester (FSDT)

Figure A.13 shows the possible configurations for an FS-Device tester (FSDT). With the help of the IODD of the FS-Device, the test can be adjusted to the fixed IO data structures of the FS-Device.

Test results (verdict) shall be logged together with test scripts and versions of FS-Device Tester Software for later reproduction. Thus, versioning of testers is required.

A.2.6  IODD Checker Tool

The existing Checker Tool for non-safety IODDs shall be augmented according to Clause 6.2.
A.2.7  Reference FS-Master/FS-Master Tool and FS-Devices

A number of test cases can only be performed in an economic manner by reference FS-Master/FS-Master Tool and FS-Devices. The IO-Link Community identifies such a reference based on suggestions of the IO-Link Safety working group. The working group can revise suggestions in case the reference does not meet specified requirements. After a start-up phase it is expected that at least 3 different reference FS-Devices are available.

A.2.8  Responsibility of test equipment manufacturers

A number of test cases are dealing with verification, configuration, and parameterization. Some of them can be performed automatically, some of them only manually. It is up to the manufacturers of test equipment whether they support all or some of these test cases in the particular test equipment. However, they are responsible for complete support of all test cases for either FS-Device or FS-Master including FS-Master Tool for the manufacturer declaration. For test cases not covered by the automated test equipment, manufacturers of test equipment shall provide instructions and auxiliary means, how the tests can be performed manually.

A.3  Assessment and audits of test equipment

There are no functional safety-related requirements on the hardware of the test equipment such as redundancy. However, tester software development shall observe the rules defined in IEC 61508 or ISO 13849 for T2 level. Therefore, functional safety assessment by an accredited or recognized assessment body shall be performed for the equipment. The test scripts shall be "sealed" by CRC signature.

A.4  Components of FS-Master test cases

A.4.1  Overview

Figure A.14 provides an overview of the components of FS-Master test cases, comprising EUT- and SMTU-preconditions as well as safety test macros, ArgBlock parameter sets (ABPS) for SMI service instances, and SMTU instructions to control and monitor the SMTU.

Figure A.14 – Components of FS-Master test cases

SMI service instances and MTU/SMTU instructions can be directly used to define test procedure steps. In certain cases, it is advantageous to use macros combining SMI service instances and
MTU/SMTU-Instructions. Flow control expressions such as "wait until", "repeat from", etc. can supplement these macros. They shall be named intuitively and shall be preceded by the prefix "STM_" for safety test macro.

### A.4.2 EUT preconditions (FS-Master Port)

Table A.3 shows preconditions of the EUT in addition to the preconditions for NSR testing defined in [9]. They can represent a description of a state or a sequence of activities to reach a certain state of the EUT. Parameters are listed in Table A.7.

#### Table A.3 – Preconditions of the EUT

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Description of state or activities to reach state</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORT_OSSDe</td>
<td>Port is in OSSDe Mode</td>
</tr>
<tr>
<td></td>
<td>;SMI_FSPortConfiguration</td>
</tr>
<tr>
<td>PORT_FSCOM</td>
<td>Port is in SAFETYCOM Mode</td>
</tr>
<tr>
<td></td>
<td>;pure FS-PD exchange</td>
</tr>
<tr>
<td>PORT_MIXFSCOM</td>
<td>Port is in MIXEDSAFETYCOM Mode</td>
</tr>
<tr>
<td></td>
<td>;FS-PD and PD exchange</td>
</tr>
<tr>
<td>PORT_POWER_OFF</td>
<td>Port Power L+ switched off</td>
</tr>
<tr>
<td></td>
<td>;SMI_PortPowerOffOn</td>
</tr>
<tr>
<td>PORT_FSP_PARAMETERS</td>
<td>FSP-Parameters are stored in FS-Master for VerifyRecord</td>
</tr>
<tr>
<td></td>
<td>;SMI_FSPortConfiguration</td>
</tr>
</tbody>
</table>

### A.4.3 SMTU preconditions

Table A.4 shows macros of preconditions of the SMTU playing the role of a controllable and observable FS-Device. They describe values (instances) of parameters of a state or a sequence of activities to reach a certain state of the SMTU.

#### Table A.4 – Preconditions of the SMTU

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Description of state or activity to reach state</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMTU_STANDARD_STATE_16</td>
<td>Change/expand the MTU_STANDARD_STATE in [9] to:</td>
</tr>
<tr>
<td></td>
<td>DPP1(M-sequenceCapability) = 0x1F ;PREOPERATE = TYPE1_2,</td>
</tr>
<tr>
<td></td>
<td>OPERATE = TYPE_2_V;ISDU supported</td>
</tr>
<tr>
<td></td>
<td>DPP1(ProcessDataIn) = 0x8A ;PDIn = 88 bit</td>
</tr>
<tr>
<td></td>
<td>DPP1(ProcessDataOut) = 0x8A ;PDOut = 88 bit</td>
</tr>
<tr>
<td></td>
<td>DPP1(DeviceID) = 0x002BD3 ;DID = 11219</td>
</tr>
<tr>
<td></td>
<td>Mandatory Indices:</td>
</tr>
<tr>
<td></td>
<td>Index 0x0012 (ProductName) = &quot;SMTU&quot;</td>
</tr>
<tr>
<td></td>
<td>Index 0x4200 (Authenticity record):</td>
</tr>
<tr>
<td></td>
<td>FSCP_Authencity = xxx(non-zero) ;&quot;Armed&quot;</td>
</tr>
<tr>
<td></td>
<td>FSP_Port = 1 ;Port number 1</td>
</tr>
<tr>
<td></td>
<td>FSP_AuthentCRC = CRC-16 ;valid signature for Authenticity</td>
</tr>
<tr>
<td></td>
<td>Index 0x4201 (Protocol record):</td>
</tr>
<tr>
<td></td>
<td>FSP_ProtVersion = 0x01 ;current protocol version</td>
</tr>
<tr>
<td></td>
<td>FSP_ProtMode = 0x01 ;25 octets FS-PD maximum</td>
</tr>
<tr>
<td></td>
<td>FSP_Watchdog = yyy ;reasonable time value!</td>
</tr>
<tr>
<td></td>
<td>FSP_TechParCRC = CRC-32 ;valid signature for IO_Struct</td>
</tr>
<tr>
<td></td>
<td>FSP_PortParCRC = CRC-32 ;valid signature for Protocol record</td>
</tr>
<tr>
<td></td>
<td>Index 0x4212 (FSP_ParamDescCRC) = CRC-32</td>
</tr>
<tr>
<td></td>
<td>;from IODD</td>
</tr>
<tr>
<td>SMTU_STANDARD_STATE_32</td>
<td>Same as SMTU_STANDARD_STATE_16, except for:</td>
</tr>
<tr>
<td></td>
<td>DPP1(ProcessDataIn) = 0x9F ;PDIn = 32 octets</td>
</tr>
<tr>
<td></td>
<td>DPP1(ProcessDataOut) = 0x9F ;PDOut = 32 octets</td>
</tr>
<tr>
<td></td>
<td>Mandatory Indices:</td>
</tr>
<tr>
<td></td>
<td>Index 0x4201 (Protocol record):</td>
</tr>
<tr>
<td></td>
<td>FSP_ProtMode = 0x02 ;25 octets FS-PD maximum</td>
</tr>
</tbody>
</table>

**NOTE 1** Only this ID can be overwritten by FS-Master for compatibility tests (see clause 8.5 in [9]). It differs from the ID value in [9].

**NOTE 2** A reasonable value should be chosen allowing watchdog tests without long test durations (<< 1 min).
A.4.4 SafetyTestMacros (STM) of the FS-Master-Tester-Program

Table A.5 shows SafetyTestMacros of the Safety-Master-Tester-Program for both EUT (FS-Master) and SMTU. All STMs shall return after ≤ 30 s (default Test_Timeout).

Table A.5 – SafetyTestMacros of the FS-Master-Tester-Program

<table>
<thead>
<tr>
<th>STM identifier</th>
<th>Variable</th>
<th>Test Service Action to enter mode</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM_SCL_START16</td>
<td>–</td>
<td>Set FS-Master to SCL state &quot;wait on SPDU&quot; and set SMTU to SCL state &quot;not ready&quot;</td>
<td>–</td>
</tr>
<tr>
<td>STM_SCL_START32</td>
<td>–</td>
<td>Set FS-Master to SCL state &quot;wait on SPDU&quot; and set SMTU to SCL state &quot;not ready&quot;</td>
<td>–</td>
</tr>
<tr>
<td>STM_WAIT_TIMEOUT</td>
<td>–</td>
<td>Wait for FSP_Watchdog timeout</td>
<td>–</td>
</tr>
<tr>
<td>STM_WAIT</td>
<td>Timeout</td>
<td>FS Master Tester pauses for the indicated duration in ms</td>
<td></td>
</tr>
</tbody>
</table>

A.4.5 SMI Event handling

The Safety-Master-Tester-Program uses the mechanisms as specified in Annex A.4.5 in [9].

A.4.6 SMI ArgBlock parameter sets (ABPS)

The ArgBlock parameter sets (ABPS) defined in Annex A.4.6 in [9] are supplemented for safety. The same rules apply.

Table A.6 – ArgBlock Parameter Sets (ABPS) for safety

<table>
<thead>
<tr>
<th>ABPS</th>
<th>ArgBlock</th>
<th>Element</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABPS_FSCONFIG_MixedCOM</td>
<td>FSPortConfigList</td>
<td>ArgBlockID</td>
<td>Unsigned16</td>
<td>0x8001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PortMode</td>
<td>Unsigned8</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Validation&amp;Backup</td>
<td>Unsigned8</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I/Q Behavior</td>
<td>Unsigned8</td>
<td>0 (not supported)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PortCycleTime</td>
<td>Unsigned8</td>
<td>0 (AFAP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VendorID</td>
<td>Unsigned16</td>
<td>0xFDE8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DeviceID</td>
<td>Unsigned32</td>
<td>0x002BD3 (different)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>InputDataLength</td>
<td>Unsigned8</td>
<td>31 (total)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OutputDataLength</td>
<td>Unsigned8</td>
<td>31 (total)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSCP_Authenticity1</td>
<td>Unsigned32</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSCP_Authenticity2</td>
<td>Unsigned32</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSP_Port</td>
<td>Unsigned8</td>
<td>1 (default)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSP_AuthentCRC</td>
<td>Unsigned16</td>
<td>64191 (0xFABF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSP_ProtVersion</td>
<td>Unsigned8</td>
<td>0x01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSP_ProtMode</td>
<td>Unsigned8</td>
<td>0x9F (32 bit CRC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSP_WatchdogTime</td>
<td>Unsigned16</td>
<td>1000 ms (0x03E8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSP_IO_StructCRC</td>
<td>Unsigned16</td>
<td>39137 (0x98E1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSP_TechParCRC</td>
<td>Unsigned32</td>
<td>1 (0x00000001)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSP_ProtParCRC</td>
<td>Unsigned16</td>
<td>62167 (0xF2D7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IO_DescVersion</td>
<td>Unsigned8</td>
<td>1 (Version 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SPDUInLength</td>
<td>Unsigned8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TotalOfInBits</td>
<td>Unsigned8</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TotalOfInOctets</td>
<td>Unsigned8</td>
<td>0</td>
</tr>
<tr>
<td>ABPS</td>
<td>ArgBlock</td>
<td>Element</td>
<td>Type</td>
<td>Value</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------</td>
<td>---------------</td>
<td>------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>ABPS</td>
<td>FSPortConfigList</td>
<td>ArgBlockID</td>
<td>Unsigned16</td>
<td>0x8100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PortMode</td>
<td>Unsigned8</td>
<td>51 (OSSDE)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...</td>
<td>...</td>
<td>Don't care (≠ 0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SPDUInLength</td>
<td>Unsigned8</td>
<td>1 octet (fixed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...</td>
<td>...</td>
<td>Don't care (≠ 0)</td>
</tr>
<tr>
<td>ABPS</td>
<td>FSPortConfigList</td>
<td>ArgBlockID</td>
<td>Unsigned16</td>
<td>0x8100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PortMode</td>
<td>Unsigned8</td>
<td>49 (SAFETYCOM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Validation&amp;Backup</td>
<td>Unsigned8</td>
<td>3 (&quot;V1.1&quot;, B+R)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I/Q Behavior</td>
<td>Unsigned8</td>
<td>0 (not supported)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PortCycleTime</td>
<td>Unsigned8</td>
<td>0 (AFAP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VendorID</td>
<td>Unsigned16</td>
<td>0xFD08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DeviceID</td>
<td>Unsigned16</td>
<td>0xFD02BD3 (different)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>InputDataLength</td>
<td>Unsigned8</td>
<td>31 (total)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OutputDataLength</td>
<td>Unsigned8</td>
<td>31 (total)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSCP_Authenticity1</td>
<td>Unsigned32</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSCP_Authenticity2</td>
<td>Unsigned32</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSP_Port</td>
<td>Unsigned8</td>
<td>1 (default)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSP_AuthentCRC</td>
<td>Unsigned16</td>
<td>64101 (0xFABF)</td>
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<td></td>
<td></td>
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<td></td>
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<td>TotalOfInBits</td>
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</tr>
<tr>
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### Table A.7 – SMTU instructions

<table>
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<tr>
<th>Name</th>
<th>Parameter</th>
<th>Return value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMTU_Authent_Set</td>
<td>Authent1, Authent2, Port, CRC</td>
<td>–</td>
<td>Set deviating values</td>
</tr>
<tr>
<td>SMTU_PowerState_Get</td>
<td>–</td>
<td>1= Power On 0= Power Off</td>
<td>Returns current state of L+ power</td>
</tr>
<tr>
<td>SMTU_PowerOffTime_Start</td>
<td>–</td>
<td>–</td>
<td>Starts measurement of the PowerOffOn time</td>
</tr>
<tr>
<td>SMTU_PowerOffTime_Get</td>
<td>PowerOffTime</td>
<td>–</td>
<td>Returns measured PowerOffTime in ms after a PowerOffOn cycle</td>
</tr>
</tbody>
</table>
| SMTU_Measure_WDtime   | –                          | WD_time      | 1) SMTU to observe SPDU traffic ("MCount" and "Activate safe state" CB1)
|                        |                            |              | 2) Trigger SMTU to start measure-

### A.4.7 SMTU instructions

Instructions of the Master-Tester-Program for the MTU specified in Annex A.4.7 in [9] are supplemented for safety. Table A.7 shows (fixed) instructions of the Safety-Master-Tester-Program for the SMTU (Safety-Master-Tester-Unit). Every SMTU instruction returns the specified parameters defined in "Return value".
<table>
<thead>
<tr>
<th>Name</th>
<th>Parameter</th>
<th>Return value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMTU_MixData_Get</td>
<td>–</td>
<td>SR, NSR, OE</td>
<td>Readback mixed Process Data in SMTU</td>
</tr>
<tr>
<td>SMTU_NSRI_Set</td>
<td>NSR, PQI</td>
<td>–</td>
<td>Sets NSR Process Data in SMTU</td>
</tr>
<tr>
<td>SMTU_Pause</td>
<td>Pause time in seconds</td>
<td>–</td>
<td>SMTU does not respond during pause</td>
</tr>
<tr>
<td>SMTU_Ready_Wait</td>
<td>t2R, tRP</td>
<td>–</td>
<td>Start-up of FS-Device</td>
</tr>
<tr>
<td>SMTU_SPDU_Repetition</td>
<td>Time in seconds</td>
<td>–</td>
<td>Artificially repeat SPDU</td>
</tr>
<tr>
<td>SMTU_SPDU_Change</td>
<td>–</td>
<td>–</td>
<td>SMTU to wait until SPDU changed. Usually this is an MCount or DCount value.</td>
</tr>
<tr>
<td>SMTU_VerifyRecord_Get</td>
<td>–</td>
<td>VerifyRecord</td>
<td>Returns entire record of VerifyRecord</td>
</tr>
</tbody>
</table>

**A.4.8 Fictive IODD for SMTU**

The FS-Master tester system provides a fictive IODD for the SMTU.
Annex B
(normative)

Assessment and certification

B.1 General
In case of safety for machinery, a manufacturer declaration is only sufficient for a product to be launched, if the manufacturer fulfils certain preconditions. Otherwise, functional safety assessments by assessment bodies are required based on international standards such as IEC 61508, IEC 62061, or ISO 13849. There are three types of assessment objects in IO-Link Safety:

- Specification (see [4]),
- SCL-stacks and software tools,
- Functional safety products such as FS-Device and FS-Master including Master-Tools.

The actual assessment of IO-Link Safety can only comprise a concept approval of the specification ([4]) and companion documents as a precondition for the conformity of implementations (see B.4).

Since it is possible to implement the safety communication layers (SCL) of IO-Link Safety in a completely hardware-independent manner, manufacturers can save quiet some effort and time if precertified SCL-stacks and software tools are available on the market. Preconditions are described in B.5.2.

Procedures and constraints for functional safety products are described in detail in B.5.

B.2 Safety policy
In order to prevent and protect the manufacturers and vendors of FS-Masters and FS-Devices from possibly misleading understandings or wrong expectations and negligence actions regarding safety-related developments and applications the following shall be observed and explained in each training, seminar, workshop and consultancy.

- Any non-safety-related device automatically will not be applicable for safety-related applications just by using fieldbus or IO-Link communication and a safety communication layer. The safety technology part of a safety device shall be approved for a Safety Integrity Level (SIL) or Performance Level (PL) suitable for the intended safety functions. The IO-Link Safety part shall be implemented and approved for the same SIL/PL or better.
- In order to enable a product for safety-related applications, appropriate development processes according to safety standards shall be observed (see IEC 61508, IEC 62061, ISO 13849) and an assessment from a competent assessment body or authorized manufacturer department shall be achieved.
- The manufacturer/vendor of a safety product is responsible for the correct implementation of the safety communication layer technology, the correctness and completeness of the product documentation and information.
- Supplemental safety-related information to the regular specification in [4] shall be observed for implementation, test and assessment if applicable. Normally, this information is provided by the working group as response to a change request (CR) within the CR-database that is in state "implementation" and approved by an assessment body. The working group can decide to publish these CRs through a separate "Corrigendum" document for download on the IO-Link website.

B.3 Obligations for international business
As a rule, the international safety standards are accepted (ratified) globally. However, since safety technology in automation is relevant to occupational safety and the concomitant insurance risks in a country, recognition of the rules pointed out here is still a sovereign right.
The national "Authorities" decide on the recognition of assessment reports. The observation of additional national regulations may be required.

B.4 Concept approval of IO-Link Safety

For the approval of the safety concepts of IO-Link Safety the following has been provided by the community:

- Specification of IO-Link Safety ([4])
- Documentation of the modelling, the model checking, and the simulation including fault injection of the IO-Link safety communication layer (SCL)
- Document "Safety considerations" with Functional Safety Management, calculation of relevant Residual Error Rates, and software tool chain FMEA
- Document "Document Management and Working Group rules"

B.5 Product assessment and certification

B.5.1 Overview

Products within the domain of IO-Link Safety can be precertified software stacks or safety devices.

B.5.2 Precertified software stacks

Software shall be valid for the architecture required by the certain SIL or PL, for example redundancy in case of SIL3 or PLe. The requirements for compliant items according to IEC 61508-3 shall be observed for the assessment of a precertified SCL-stack.

Software shall be "sealed" to protect it from unintended changes. The user is only permitted to adapt the interfaces and keep the core part of the software untouched in order to keep the certificate.

B.5.3 Certified FS-Devices and stand-alone FS-Master

Figure B.1 illustrates the assessment procedures of FS-Device and stand-alone FS-Master.

**Figure B.1 – Assessment of FS-Device and stand-alone FS-Master**

Test, assessment, and certification of FS-Devices comprise three aspects:

- Conformity with regulations, for example European Directives such as Electromagnetic Compatibility (EMC – IEC 61000-6-7) and Low Voltage Directive (electrical safety – IEC 61010-2-201);
• IO-Link Interoperability, that means conformity of the FS-Device with the IO-Link specifications: The IO-Link community arranged for "Test standards" (test tool suite) based on this document and supported by Technology Providers;

• Conformance of functional safety development process with IEC 61508 (due to software/firmware involvement).

While developers can use the IO-Link "Test Standards" during development to ensure a high degree of conformity/interoperability with IO-Link and IO-Link Safety, this is not enough for functional safety. IO-Link Safety requires Test Centers assessed by the IO-Link Community and an assessment body and audited periodically. These Test Centers are performing tests and checks according to approved "Test Lab Instructions" and using approved "Reference Standards", "Test Standards" and "Reference Standards" correspond to each other. However, while the "Test Standards" can be variable to a certain extent and be adjusted to customer requirements, the "Reference Tests" are fixed and "locked/sealed" by signature.

Safety assessment bodies can play the role of a Test Center on behalf of the IO-Link Community, thus reducing time and effort.

After the final certificate of the Assessment Body, the FS-Device manufacturer can issue the IO-Link Safety Manufacturer declaration showing the certificate number of the assessment.

**B.5.4 Certified FS-Master integrated in FSCP**

Figure B.2 illustrates the assessment procedures of FS-Master on FSCP.

![Diagram of assessment procedures of FS-Master on FSCP]

**Figure B.2 – Assessment of FS-Master on FSCP**

Assessment and certification of FS-Masters on fieldbus/FSCP follows a similar concept:

• EMC tests and electrical safety issues can be different depending on the standards to be considered (generic, domain, or product);

• Usually, from a fieldbus/FSCP point-of-view, the FS-Master is a fieldbus device and shall be developed, tested, and assessed according to the interoperability/conformity rules of the particular fieldbus/FSCP. The result is a certificate of the fieldbus organization;

• The remaining steps correspond to those of an FS-Device.

**B.6 Grandfathering rules**

In future releases of this document, grandfathering rules will be necessary once the "black channel", i.e. the IO-Link layer stack is changed in an FS-Master or in an FS-Device.

Same is true for SCL stack changes in an FS-Master or in an FS-Device.
Annex C
(informative)

Information on testing
of FS-Devices and FS-Master/Tools

Information about test laboratories, which test and validate the conformity of IO-Link Safety products such as FS-Masters and FS-Devices with IO-Link specifications can be obtained from the following organization:

IO-Link Community
c/o PROFIBUS Nutzerorganisation e.V.
Haid-und-Neu-Str. 7
76131 Karlsruhe
GERMANY
Phone: +49 721 9658 590
Fax: +49 721 9658 589
E-Mail: info@io-link.com
URL: www.io-link.com
Annex D
(normative)

Manufacturer declaration for safety devices

A dedicated manufacturer declaration for FS-Devices and FS-Masters can be downloaded from the download area in www.io-link.com.
E.1 Listing of FS test cases sorted by IDs

Table E.1 shows the Test cases and its references.

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<th>Reference</th>
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<td>FSTCM PHYL_PWR1_SWITCHABLE</td>
<td>Table 12</td>
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<td>FSTC_0002</td>
<td>FSTCM PHYL_OSSD_HIGHVIMIQ</td>
<td>Table 13</td>
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<td>Table 14</td>
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<td>FSTCD PHYL_OSSD_LSRESVOLT</td>
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3 Under preparation. Stage at the time of publication: IEC/AFDIS 61131-9:2022