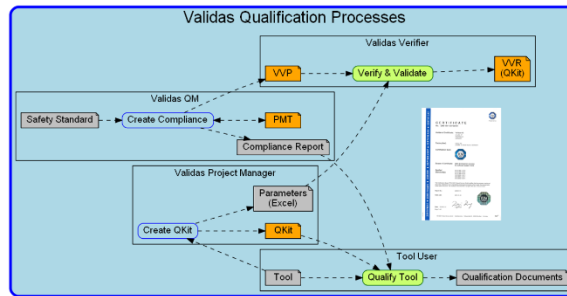


# Verification and Validation Report for Perform Module Test



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0.1	2018-11-19	Generic	Slotosch	Created initial template
0.2	2018-11-19	Generic	Slotosch	Added Chapter structure and introduction
0.3	2018-01-06	Generic	Slotosch	Added Issues and Project chapters
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## Document Revision History

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0.1	Mon 2019/03/11 07:15:32	Generic	Slotosch	Created from generic Template 0.4
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0.5	2019-03-11	Reviewed	Oscar Slotosch	Reviewed Requirements & Compliance
1.0	2019-03-11	Final	Oscar Slotosch	Finalized document

## Contents

<b>1</b>	<b>Scope of this Document.....</b>	<b>6</b>
<b>2</b>	<b>Project Perform Module Test .....</b>	<b>7</b>
<b>3</b>	<b>Parameters of Perform Module Test.....</b>	<b>7</b>
3.1	Parameter MODULE & Values.....	7
<b>4</b>	<b>Persons in Perform Module Test .....</b>	<b>8</b>
4.1	Person Tester.....	8
<b>5</b>	<b>Artifacts of Perform Module Test .....</b>	<b>8</b>
5.1	Artifact Code Coverage Report .....	8
5.2	Artifact SUT.....	9
5.3	Artifact Specification .....	9
5.4	Artifact Test Case.....	10
5.5	Artifact Test Report .....	10
<b>6</b>	<b>Checks of Perform Module Test .....</b>	<b>11</b>
6.1	Check Check at ModuleTest/Artifacts/SafetyCase/CoverageReport.....	11
6.1.1	Check Check of Code Coverage Report .....	11
6.1.1.1	Check Analyze MCDC.....	12
6.1.1.1.1	Check MCDC OK.....	12
6.1.1.1.2	Check All Conditions Considered.....	13
6.2	Check Check at ModuleTest/Artifacts/SafetyCase/TestReport .....	14
6.2.1	Check Check of Test Report.....	14
6.2.1.1	Check Analyze Test Results of Test Report .....	15
6.2.1.1.1	Check Test Results Complete .....	15
6.2.1.1.2	Check Test Results OK .....	16
6.3	Check Check at ModuleTest/Artifacts/SafetyCase/Tests.....	17
6.3.1	Check Check of Test Case .....	17
6.3.1.1	Check Validate Tests.....	18
6.3.1.1.1	Check Test Complete .....	19
6.3.1.1.2	Check Test Effective.....	19
<b>7</b>	<b>Results for Perform Module Test.....</b>	<b>20</b>
7.1	Results for Check at ModuleTest/Artifacts/SafetyCase/CoverageReport .....	20
7.1.1	Results for Check of Code Coverage Report .....	20
7.1.1.1	Results for Analyze MCDC .....	20
7.1.1.1.1	Results for MCDC OK .....	20
7.1.1.1.2	Results for All Conditions Considered .....	21
7.2	Results for Check at ModuleTest/Artifacts/SafetyCase/TestReport .....	22
7.2.1	Results for Check of Test Report .....	22
7.2.1.1	Results for Analyze Test Results of Test Report.....	22
7.2.1.1.1	Results for Test Results Complete .....	22
7.2.1.1.2	Results for Test Results OK .....	23

7.3	Results for Check at ModuleTest/Artifacts/SafetyCase/Tests .....	24
7.3.1	Results for Check of Test Case.....	24
7.3.1.1	Results for Validate Tests .....	24
7.3.1.1.1	Results for Test Complete .....	24
7.3.1.1.2	Results for Test Effective .....	25
<b>8</b>	<b>Issues of Perform Module Test.....</b>	<b>26</b>
8.1	Fixed Issues in Perform Module Test .....	26
<b>9</b>	<b>Summary of Perform Module Test.....</b>	<b>27</b>
<b>10</b>	<b>Glossary .....</b>	<b>28</b>
<b>11</b>	<b>References .....</b>	<b>30</b>

# 1 Scope of this Document

This document describes the verification and validation of the project Perform Module Test that has been performed using the process described in [PR]. By successfully validating and verifying the Perform Module Test, the compliance claimed in [CR] for the process is establish.

The applied process is a variant from the generic process and created according to the Validas Qualification Methodology, see [QMeth]. It has been tailored for the project (see Section 2) by assigning values to process parameters (see Section 3) and by defining the requirements to be satisfied see [CR].

The concrete verification and validation (V&V) tasks are described in Section 6. These checks have been performed for all necessary parameters. The responsible persons are documented in Section 4. Every check refers to one artifact that is checked. The artifacts are described in Section 5. The results of this application are described in Section 7. Section 8 lists the issues of the product and Section 9 summarizes the results.

The document concludes with a glossary in Section 10 and references in Section 11.

## 2 Project Perform Module Test

This chapter describes the general information of the project 'Perform Module Test'.  
This V&V report has been generated using extended mode, such that it contains all such that it contains all CheckResult with result PASS as well.

Project Perform Module Test	
<b>Name:</b>	Perform Module Test
<b>Description:</b>	All activities for performing the module tests have been performed successfully. In this example only the coverage measurement is considered (most complex & interesting).
<b>Comment:</b>	2019/03/11 05:11:07: Imported test results from E:\git\pmt-prototype\bundles\de.validas.spm.pmt.examples\ModuleTest\VV\PerformModuleTest_VVReport.xls 2019/03/11 05:16:24: Imported test results from E:\git\pmt-prototype\bundles\de.validas.spm.pmt.examples\ModuleTest\VV\PerformModuleTest_VVReport.xls 2019/03/11 05:28:01: Imported test results from E:\git\pmt-prototype\bundles\de.validas.spm.pmt.examples\ModuleTest\VV\PerformModuleTest_VVReportDelta.xls 2019/03/11 05:42:28: Imported test results from E:\git\pmt-prototype\bundles\de.validas.spm.pmt.examples\ModuleTest\VV\PerformModuleTest_VVReportFinal.xls
<b>Issue Tracker:</b>	<a href="https://teststatt.atlassian.net/projects/VP/issues/">https://teststatt.atlassian.net/projects/VP/issues/</a>
<b>Product:</b>	Modules
<b>Version:</b>	Exported 2019/03/10 17:04:33

Table 1 Project Perform Module Test

## 3 Parameters of Perform Module Test

This chapter describes the configuration of 'Perform Module Test' i.e. the used parameters and their values.

1parameter (and corresponding values) of Perform Module Test are described in this section.

### 3.1 Parameter MODULE & Values

This section describes parameter MODULE and its 2 values.

Parameter MODULE	
<b>Name:</b>	MODULE
<b>Description:</b>	

The name of module that is currently tested.
<b>Comment:</b>
The name can vary for different modules.

**Table 2 Parameter MODULE**

The 2 values for MODULE are:

1. math
2. stdio

## 4 Persons in Perform Module Test

This chapter describes the roles in 'Perform Module Test' i.e. the involved persons and their responsibilities.

### 4.1 Person Tester

This section describes person Tester and it's activities.

Person Tester
<b>Name:</b>
Tester
<b>Description:</b>
Responsible for testing the module including creation of test specification, implementation analysis.
<b>Assigned Person</b>
Oscar Slotosch
<b>Developed Artifacts:</b>
<ul style="list-style-type: none"> <li>• Code Coverage Report, see Table 4</li> <li>• Test Case, see Table 7</li> <li>• Test Report, see Table 8</li> </ul>

**Table 3 Person Tester**

## 5 Artifacts of Perform Module Test

This chapter describes the artifacts of 'Perform Module Test' i.e. the checked elements.

### 5.1 Artifact Code Coverage Report

This section describes artifact Code Coverage Report.

Artifact Code Coverage Report
<b>Name:</b>
Code Coverage Report
<b>Description:</b>
The report with the selected coverage (Statement, Branch, MCDC).
<b>Comment:</b>
Input of Analyze MCDC; Verified by Analyze MCDC



<b>Path</b>
ModuleTest/Artifacts/SafetyCase/CoverageReport
<b>Repository</b>
Default Repository
<b>Repository-URL</b>
E:\git\pmt-prototype\bundles\de.validas.spm.pmt.examples\ModuleTest
<b>Modified</b>
11/3/19

Table 4 Artifact Code Coverage Report

## 5.2 Artifact SUT

This section describes artifact SUT.

<b>Artifact SUT</b>
<b>Name:</b>
SUT
<b>Description:</b>
Subject Under Test, typically SW modules.
<b>Comment:</b>
Input of Analyze MCDC; Input of Analyze Test Results; Input of Validate Tests
<b>Path</b>
ModuleTest/Artifacts/Modules
<b>Repository</b>
Default Repository
<b>Repository-URL</b>
E:\git\pmt-prototype\bundles\de.validas.spm.pmt.examples\ModuleTest
<b>Modified</b>
11/3/19

Table 5 Artifact SUT

## 5.3 Artifact Specification

This section describes artifact Specification.

<b>Artifact Specification</b>
<b>Name:</b>
Specification
<b>Description:</b>
Functional Specification.
<b>Comment:</b>
Input of Analyze MCDC; Input of Analyze Test Results; Input of Validate Tests
<b>Path</b>
ModuleTest/Artifacts/Specification
<b>Repository</b>
Default Repository
<b>Repository-URL</b>

E:\git\pmt-prototype\bundles\de.validas.spm.pmt.examples\ModuleTest
<b>Modified</b>
11/3/19

**Table 6 Artifact Specification**

## 5.4 Artifact Test Case

This section describes artifact Test Case.

Artifact Test Case	
<b>Name:</b>	
Test Case	
<b>Description:</b>	
A module test case (implementation).	
<b>Comment:</b>	
Input of Validate Tests; Verified by Validate Tests	
<b>Path</b>	
ModuleTest/Artifacts/SafetyCase/Tests	
<b>Repository</b>	
Default Repository	
<b>Repository-URL</b>	
E:\git\pmt-prototype\bundles\de.validas.spm.pmt.examples\ModuleTest	
<b>Modified</b>	
3/10/19	

**Table 7 Artifact Test Case**

## 5.5 Artifact Test Report

This section describes artifact Test Report.

Artifact Test Report	
<b>Name:</b>	
Test Report	
<b>Description:</b>	
The test report created from test execution including the test result (PASS/FAIL).	
<b>Comment:</b>	
Input of Analyze Test Results; Verified by Analyze Test Results	
<b>Path</b>	
ModuleTest/Artifacts/SafetyCase/TestReport	
<b>Repository</b>	
Default Repository	
<b>Repository-URL</b>	
E:\git\pmt-prototype\bundles\de.validas.spm.pmt.examples\ModuleTest	
<b>Modified</b>	
11/3/19	

**Table 8 Artifact Test Report**

## 6 Checks of Perform Module Test

This chapter describes all 15 checks of 'Perform Module Test' i.e. verification tasks.

### 6.1 Check Check at ModuleTest/Artifacts/SafetyCase/CoverageReport

This section describes check Check at ModuleTest/Artifacts/SafetyCase/CoverageReport and it's 1 contained check (total number of checks in this section is 5).

Check Check at ModuleTest/Artifacts/SafetyCase/CoverageReport	
<b>Name:</b>	Check at ModuleTest/Artifacts/SafetyCase/CoverageReport
<b>Description:</b>	Checking 1 Artifact in ModuleTest/Artifacts/SafetyCase/CoverageReport. Once all sub-checks are performed successfully, this implicit check can be set to PASS.
<b>Comment:</b>	If ModuleTest/Artifacts/SafetyCase/CoverageReport changes all 1 check has to be repeated. VVT (2019/03/11 05:21:44):Analyzed new Verdict FAILED of Check at ModuleTest/Artifacts/SafetyCase/CoverageReport (CREATED):has one sub-check:FAILED VVT (2019/03/11 05:28:28):Analyzed new Verdict PASSED of Check at ModuleTest/Artifacts/SafetyCase/CoverageReport (FAILED):has one sub-check:PASSED
<b>Verdict</b>	PASSED
<b>Sub Check:</b>	<ul style="list-style-type: none"><li>• Check of Code Coverage Report, see Table 10</li></ul>

Table 9 Check Check at ModuleTest/Artifacts/SafetyCase/CoverageReport

#### 6.1.1 Check Check of Code Coverage Report

This section describes check Check of Code Coverage Report and it's 1 contained check (total number of checks in this section is 4).

Check Check of Code Coverage Report	
<b>Name:</b>	Check of Code Coverage Report
<b>Description:</b>	Checking 1 check for Artifact Code Coverage Report. Once all sub-checks are performed successfully, this implicit check can be set to PASS.
<b>Comment:</b>	If ModuleTest/Artifacts/SafetyCase/CoverageReport changes all 1 check has to be repeated. VVT (2019/03/11 05:21:44):Analyzed new Verdict FAILED of Check of Code Coverage Report (ASSIGNED):has one sub-check:FAILED VVT (2019/03/11 05:28:28):Analyzed new Verdict PASSED of Check of Code Coverage Report (FAILED):has one sub-check:PASSED
<b>Verdict</b>	

PASSED
<b>Author:</b>
<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>
<b>Checked Artifact</b>
Code Coverage Report, see Table 4
<b>Sub Check:</b>
<ul style="list-style-type: none"> <li>Analyze MCDC, see Table 11</li> </ul>

**Table 10 Check Check of Code Coverage Report**

#### 6.1.1.1 Check Analyze MCDC

This section describes check Analyze MCDC and it's 2 contained checks.

Check Analyze MCDC
<b>Name:</b>
Analyze MCDC
<b>Description:</b>
Analyze if MCDC is 100% or if there are explained reasons why the coverage is <100%.
<b>Comment:</b>
null VVT (2019/03/11 05:21:44):Analyzed new Verdict FAILED of Analyze MCDC (ASSIGNED):has 2 sub-checks (worst=FAILED):1 FAILED, 1 PASSED VVT (2019/03/11 05:28:28):Analyzed new Verdict PASSED of Analyze MCDC (FAILED):has 2 sub-checks (worst=PASSED):2 PASSED
<b>Verdict</b>
PASSED
<b>Author:</b>
<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>
<b>Checked Artifact</b>
Code Coverage Report, see Table 4
<b>Required Artifacts:</b>
<ul style="list-style-type: none"> <li>Code Coverage Report, see Table 4</li> <li>SUT, see Table 5</li> <li>Specification, see Table 6</li> </ul>
<b>Parameter:</b>
<ul style="list-style-type: none"> <li>MODULE, see Table 2</li> </ul>
<b>Sub Checks:</b>
<ul style="list-style-type: none"> <li>MCDC OK [AnaCCR-MC-C1], see Table 12</li> <li>All Conditions Considered [AnaCCR-MC-C2], see Table 13</li> </ul>

**Table 11 Check Analyze MCDC**

##### 6.1.1.1.1 Check MCDC OK

This section describes check MCDC OK.

Check MCDC OK
<b>Name:</b>
MCDC OK

<b>ID:</b>
AnaCCR-MC-C1
<b>Description:</b>
Is the MCDC 100% (or are reasonable explanations given in case it is less than 100%)?
<b>Comment:</b>
null VVT (2019/03/11 05:21:44):Analyzed new Verdict PASSED of MCDC OK (ASSIGNED):has 2 results (worst=PASSED):2 PASSED
<b>Verdict</b>
PASSED
<b>Author:</b>
<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>
<b>Checked Artifact</b>
Code Coverage Report, see Table 4
<b>Parameter:</b>
<ul style="list-style-type: none"> <li>MODULE, see Table 2</li> </ul>
<b>Instances:</b>
<ul style="list-style-type: none"> <li>MODULE=math</li> <li>MODULE=stdio</li> </ul>
<b>Contained Check Results:</b>
<ul style="list-style-type: none"> <li>MCDC OK MODULE=math OK(PASSED), see Table 24</li> <li>MCDC OK MODULE=stdio OK(PASSED), see Table 25</li> </ul>

**Table 12 Check MCDC OK**

#### 6.1.1.1.2 Check All Conditions Considered

This section describes check All Conditions Considered.

<b>Check All Conditions Considered</b>	
<b>Name:</b>	All Conditions Considered
<b>ID:</b>	AnaCCR-MC-C2
<b>Description:</b>	Have all conditions of the module been considered / instrumented (or are some files not instrumented that belong to the module)?
<b>Comment:</b>	null VVT (2019/03/11 05:21:44):Analyzed new Verdict FAILED of All Conditions Considered (ASSIGNED):has 2 results (worst=FAILED):1 FAILED, 1 PASSED VVT (2019/03/11 05:28:28):Analyzed new Verdict PASSED of All Conditions Considered (FAILED):has 2 results (worst=PASSED):2 PASSED
<b>Verdict</b>	PASSED
<b>Author:</b>	<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>
<b>Checked Artifact</b>	

Code Coverage Report, see Table 4
<b>Parameter:</b>
<ul style="list-style-type: none"> <li>MODULE, see Table 2</li> </ul>
<b>Instances:</b>
<ul style="list-style-type: none"> <li>MODULE=math</li> <li>MODULE=stdio</li> </ul>
<b>Contained Check Results:</b>
<ul style="list-style-type: none"> <li>All Conditions Considered MODULE=math OK(PASSED), see Table 27</li> <li>All Conditions Considered MODULE=stdio OK(PASSED), see Table 26</li> </ul>

**Table 13 Check All Conditions Considered**

## 6.2 Check Check at ModuleTest/Artifacts/SafetyCase/TestReport

This section describes check Check at ModuleTest/Artifacts/SafetyCase/TestReport and it's 1 contained check (total number of checks in this section is 5).

Check Check at ModuleTest/Artifacts/SafetyCase/TestReport
<b>Name:</b>
Check at ModuleTest/Artifacts/SafetyCase/TestReport
<b>Description:</b>
Checking 1 Artifact in ModuleTest/Artifacts/SafetyCase/TestReport. Once all sub-checks are performed successfully, this implicit check can be set to PASS.
<b>Comment:</b>
If ModuleTest/Artifacts/SafetyCase/TestReport changes all 1 check has to be repeated. VVT (2019/03/11 05:21:44):Analyzed new Verdict PASSED of Check at ModuleTest/Artifacts/SafetyCase/TestReport (CREATED):has one sub-check:PASSED
<b>Verdict</b>
PASSED
<b>Sub Check:</b>
<ul style="list-style-type: none"> <li>Check of Test Report, see Table 15</li> </ul>

**Table 14 Check Check at ModuleTest/Artifacts/SafetyCase/TestReport**

### 6.2.1 Check Check of Test Report

This section describes check Check of Test Report and it's 1 contained check (total number of checks in this section is 4).

Check Check of Test Report
<b>Name:</b>
Check of Test Report
<b>Description:</b>
Checking 1 check for Artifact Test Report. Once all sub-checks are performed successfully, this implicit check can be set to PASS.
<b>Comment:</b>
If ModuleTest/Artifacts/SafetyCase/TestReport changes all 1 check has to be repeated. VVT (2019/03/11 05:21:44):Analyzed new Verdict PASSED of Check of Test Report (ASSIGNED):has one sub-check:PASSED

<b>Verdict</b>
PASSED
<b>Author:</b>
<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>
<b>Checked Artifact</b>
Test Report, see Table 8
<b>Sub Check:</b>
<ul style="list-style-type: none"> <li>Analyze Test Results of Test Report, see Table 16</li> </ul>

**Table 15 Check Check of Test Report**

### 6.2.1.1 Check Analyze Test Results of Test Report

This section describes check Analyze Test Results of Test Report and it's 2 contained checks.

<b>Check Analyze Test Results of Test Report</b>	
<b>Name:</b>	Analyze Test Results of Test Report
<b>Description:</b>	Checks the test results (There should not be surprises and all expected tests should be OK). It also contributes to the coveral sumary statement on the safety of the tested module(s).
<b>Comment:</b>	Analysis of test results is done as part of the process (and it is required for unit tests), but it is not required for coverage (6.9.4.4) VVT (2019/03/11 05:21:44):Analyzed new Verdict PASSED of Analyze Test Results of Test Report (ASSIGNED):has 2 sub-checks (worst=PASSED):2 PASSED
<b>Verdict</b>	
PASSED	
<b>Author:</b>	
<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>	
<b>Checked Artifact</b>	
Test Report, see Table 8	
<b>Required Artifacts:</b>	
<ul style="list-style-type: none"> <li>SUT, see Table 5</li> <li>Specification, see Table 6</li> <li>Test Report, see Table 8</li> </ul>	
<b>Parameter:</b>	
<ul style="list-style-type: none"> <li>MODULE, see Table 2</li> </ul>	
<b>Sub Checks:</b>	
<ul style="list-style-type: none"> <li>Test Results Complete [AnaTR-C1], see Table 17</li> <li>Test Results OK [AnaTR-C2], see Table 18</li> </ul>	

**Table 16 Check Analyze Test Results of Test Report**

#### 6.2.1.1.1 Check Test Results Complete

This section describes check Test Results Complete.

#### Check Test Results Complete

<b>Name:</b>
Test Results Complete
<b>ID:</b>
AnaTR-C1
<b>Description:</b>
Are the test results complete, i.e. have all required tests been executed?
<b>Comment:</b>
null VVT (2019/03/11 05:21:44):Analyzed new Verdict PASSED of Test Results Complete (ASSIGNED):has 2 results (worst=PASSED):2 PASSED
<b>Verdict</b>
PASSED
<b>Author:</b>
<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>
<b>Checked Artifact</b>
Test Report, see Table 8
<b>Parameter:</b>
<ul style="list-style-type: none"> <li>MODULE, see Table 2</li> </ul>
<b>Instances:</b>
<ul style="list-style-type: none"> <li>MODULE=math</li> <li>MODULE=stdio</li> </ul>
<b>Contained Check Results:</b>
<ul style="list-style-type: none"> <li>Test Results Complete MODULE=math OK(PASSED), see Table 28</li> <li>Test Results Complete MODULE=stdio OK(PASSED), see Table 29</li> </ul>

**Table 17 Check Test Results Complete**

#### 6.2.1.1.2 Check Test Results OK

This section describes check Test Results OK.

<b>Check Test Results OK</b>
<b>Name:</b>
Test Results OK
<b>ID:</b>
AnaTR-C2
<b>Description:</b>
Are the tests results OK, i.e. PASS or only failing/error for known bugs?
<b>Comment:</b>
null VVT (2019/03/11 05:21:44):Analyzed new Verdict PASSED of Test Results OK (ASSIGNED):has 2 results (worst=PASSED):2 PASSED
<b>Verdict</b>
PASSED
<b>Author:</b>
<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>
<b>Checked Artifact</b>



Test Report, see Table 8
<b>Parameter:</b>
<ul style="list-style-type: none"> <li>MODULE, see Table 2</li> </ul>
<b>Instances:</b>
<ul style="list-style-type: none"> <li>MODULE=math</li> <li>MODULE=stdio</li> </ul>
<b>Contained Check Results:</b>
<ul style="list-style-type: none"> <li>Test Results OK MODULE=math OK(PASSED), see Table 31</li> <li>Test Results OK MODULE=stdio OK(PASSED), see Table 30</li> </ul>

**Table 18 Check Test Results OK**

### 6.3 Check Check at ModuleTest/Artifacts/SafetyCase/Tests

This section describes check Check at ModuleTest/Artifacts/SafetyCase/Tests and it's 1 contained check (total number of checks in this section is 5).

Check Check at ModuleTest/Artifacts/SafetyCase/Tests	
<b>Name:</b>	Check at ModuleTest/Artifacts/SafetyCase/Tests
<b>Description:</b>	Checking 1 Artifact in ModuleTest/Artifacts/SafetyCase/Tests. Once all sub-checks are performed successfully, this implicit check can be set to PASS.
<b>Comment:</b>	<p>If ModuleTest/Artifacts/SafetyCase/Tests changes all 1 check has to be repeated.</p> <p>VVT (2019/03/11 05:21:44):Analyzed new Verdict FAILED of Check at ModuleTest/Artifacts/SafetyCase/Tests (CREATED):has one sub-check:FAILED</p> <p>VVT (2019/03/11 05:28:28):Analyzed new Verdict PASSED of Check at ModuleTest/Artifacts/SafetyCase/Tests (FAILED):has one sub-check:PASSED</p>
<b>Verdict</b>	PASSED
<b>Sub Check:</b>	<ul style="list-style-type: none"> <li>Check of Test Case, see Table 20</li> </ul>

**Table 19 Check Check at ModuleTest/Artifacts/SafetyCase/Tests**

#### 6.3.1 Check Check of Test Case

This section describes check Check of Test Case and it's 1 contained check (total number of checks in this section is 4).

Check Check of Test Case	
<b>Name:</b>	Check of Test Case
<b>Description:</b>	Checking 1 check for Artifact Test Case. Once all sub-checks are performed successfully, this implicit check can be set to PASS.
<b>Comment:</b>	If ModuleTest/Artifacts/SafetyCase/Tests changes all 1 check has to be repeated.

VVT (2019/03/11 05:21:44):Analyzed new Verdict FAILED of Check of Test Case (ASSIGNED):has one sub-check:FAILED
VVT (2019/03/11 05:28:28):Analyzed new Verdict PASSED of Check of Test Case (FAILED):has one sub-check:PASSED
<b>Verdict</b>
PASSED
<b>Author:</b>
<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>
<b>Checked Artifact</b>
Test Case, see Table 7
<b>Sub Check:</b>
<ul style="list-style-type: none"> <li>Validate Tests, see Table 21</li> </ul>

**Table 20 Check Check of Test Case**

### 6.3.1.1 Check Validate Tests

This section describes check Validate Tests and it's 2 contained checks.

<b>Check Validate Tests</b>
<b>Name:</b>
Validate Tests
<b>Description:</b>
Tests can be validated in many ways, typically by compiling them, eventually by testing against a standard implementations from open source or reviewing them. Validas.
<b>Comment:</b>
null VVT (2019/03/11 05:21:44):Analyzed new Verdict FAILED of Validate Tests (ASSIGNED):has 2 sub-checks (worst=FAILED):1 FAILED, 1 PASSED VVT (2019/03/11 05:28:28):Analyzed new Verdict PASSED of Validate Tests (FAILED):has 2 sub-checks (worst=PASSED):2 PASSED
<b>Verdict</b>
PASSED
<b>Author:</b>
<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>
<b>Checked Artifact</b>
Test Case, see Table 7
<b>Required Artifacts:</b>
<ul style="list-style-type: none"> <li>SUT, see Table 5</li> <li>Specification, see Table 6</li> <li>Test Case, see Table 7</li> </ul>
<b>Parameter:</b>
<ul style="list-style-type: none"> <li>MODULE, see Table 2</li> </ul>
<b>Sub Checks:</b>
<ul style="list-style-type: none"> <li>Test Complete [VT-C1], see Table 22</li> <li>Test Effective [VT-C2], see Table 23</li> </ul>

**Table 21 Check Validate Tests**

#### 6.3.1.1.1 Check Test Complete

This section describes check Test Complete.

Check Test Complete	
<b>Name:</b>	
	Test Complete
<b>ID:</b>	
	VT-C1
<b>Description:</b>	
	Does the test cover the requirement completely?
<b>Comment:</b>	
	null VVT (2019/03/11 05:21:44):Analyzed new Verdict PASSED of Test Complete (ASSIGNED):has 2 results (worst=PASSED):2 PASSED
<b>Verdict</b>	
	PASSED
<b>Author:</b>	
	<ul style="list-style-type: none"><li>• Tester, see Table 3</li></ul>
<b>Checked Artifact</b>	
	Test Case, see Table 7
<b>Parameter:</b>	
	<ul style="list-style-type: none"><li>• MODULE, see Table 2</li></ul>
<b>Instances:</b>	
	<ul style="list-style-type: none"><li>• MODULE=math</li><li>• MODULE=stdio</li></ul>
<b>Contained Check Results:</b>	
	<ul style="list-style-type: none"><li>• Test Complete MODULE=math OK(PASSED), see Table 32</li><li>• Test Complete MODULE=stdio OK(PASSED), see Table 33</li></ul>

Table 22 Check Test Complete

#### 6.3.1.1.2 Check Test Effective

This section describes check Test Effective.

Check Test Effective	
<b>Name:</b>	
	Test Effective
<b>ID:</b>	
	VT-C2
<b>Description:</b>	
	Can the test detect deviations (failures/errors) in case they would occur, e.g. by using some statements like "assert"?
<b>Comment:</b>	
	null VVT (2019/03/11 05:21:44):Analyzed new Verdict FAILED of Test Effective (ASSIGNED):has 2 results (worst=FAILED):1 FAILED, 1 PASSED

VVT (2019/03/11 05:28:28):Analyzed new Verdict PASSED of Test Effective (FAILED):has 2 results (worst=PASSED):2 PASSED
<b>Verdict</b>
PASSED
<b>Author:</b>
<ul style="list-style-type: none"> <li>Tester, see Table 3</li> </ul>
<b>Checked Artifact</b>
Test Case, see Table 7
<b>Parameter:</b>
<ul style="list-style-type: none"> <li>MODULE, see Table 2</li> </ul>
<b>Instances:</b>
<ul style="list-style-type: none"> <li>MODULE=math</li> <li>MODULE=stdio</li> </ul>
<b>Contained Check Results:</b>
<ul style="list-style-type: none"> <li>Test Effective MODULE=math OK(PASSED), see Table 35</li> <li>Test Effective MODULE=stdio OK(PASSED), see Table 34</li> </ul>

**Table 23 Check Test Effective**

## 7 Results for Perform Module Test

This chapter describes 12 results (OK:12, NOK:0) for 'Perform Module Test' i.e. the available verification results from performing the checks, described in the previous chapter.

The checks are hierarchically grouped according to the checks. The 12 results are contained in 3 contained checks, which are described in this chapter.

### 7.1 Results for Check at ModuleTest/Artifacts/SafetyCase/CoverageReport

This section describes all 4 results for 'Check at  
ModuleTest/Artifacts/SafetyCase/CoverageReport', see Table 9

The checks are hierarchically grouped according to the sub-checks. The 4 results are contained in 1 contained sub-check, which is described in this section.

#### 7.1.1 Results for Check of Code Coverage Report

This section describes all 4 results for 'Check of Code Coverage Report', see Table 10

The checks are hierarchically grouped according to the sub-checks. The 4 results are contained in 1 contained sub-check, which is described in this section.

##### 7.1.1.1 Results for Analyze MCDC

This section describes all 4 results for 'Analyze MCDC', see Table 11

The checks are hierarchically grouped according to the sub-checks. The 4 results are contained in 2 contained sub-checks, which are described in this section.

##### 7.1.1.1.1 Results for MCDC OK

This section describes all 2 results for 'MCDC OK', see Table 12

<b>CheckResult MCDC OK MODULE=math OK</b>
<b>Name:</b>

MCDC OK MODULE=math OK
<b>Description:</b>
Check has been performed as described using Excel Sheet CR_MODULE.
<b>Verdict</b>
PASSED
<b>Justification</b>
100%
<b>Time Stamp</b>
11/3/19
<b>Artifact Revision Or Date</b>
11/3/19
<b>Instance:</b>
<ul style="list-style-type: none"> <li>MODULE=math</li> </ul>

Table 24 CheckResult MCDC OK MODULE=math OK

<b>CheckResult MCDC OK MODULE=stdio OK</b>
<b>Name:</b>
MCDC OK MODULE=stdio OK
<b>Description:</b>
Check has been performed as described using Excel Sheet CR_MODULE.
<b>Verdict</b>
PASSED
<b>Justification</b>
100%
<b>Time Stamp</b>
11/3/19
<b>Artifact Revision Or Date</b>
11/3/19
<b>Instance:</b>
<ul style="list-style-type: none"> <li>MODULE=stdio</li> </ul>

Table 25 CheckResult MCDC OK MODULE=stdio OK

#### 7.1.1.1.2 Results for All Conditions Considered

This section describes all 2 results for 'All Conditions Considered', see Table 13

<b>CheckResult All Conditions Considered MODULE=stdio OK</b>
<b>Name:</b>
All Conditions Considered MODULE=stdio OK
<b>Description:</b>
Check has been performed as described using Excel Sheet CR_MODULE.
<b>Verdict</b>
PASSED
<b>Justification</b>
After correcting #17 it'S OK
<b>Time Stamp</b>

11/3/19
<b>Artifact Revision Or Date</b>
11/3/19
<b>Issue:</b>
<ul style="list-style-type: none"> <li>Fixed:Issue number #17 [#17], see Table 36</li> </ul>
<b>Instance:</b>
<ul style="list-style-type: none"> <li>MODULE=stdio</li> </ul>

**Table 26 CheckResult All Conditions Considered MODULE=stdio OK**

<b>CheckResult All Conditions Considered MODULE=math OK</b>
<b>Name:</b>
All Conditions Considered MODULE=math OK
<b>Description:</b>
Check has been performed as described using Excel Sheet CR_MODULE.
<b>Verdict</b>
PASSED
<b>Justification</b>
Only one atmic module
<b>Time Stamp</b>
11/3/19
<b>Artifact Revision Or Date</b>
11/3/19
<b>Instance:</b>
<ul style="list-style-type: none"> <li>MODULE=math</li> </ul>

**Table 27 CheckResult All Conditions Considered MODULE=math OK**

## **7.2 Results for Check at ModuleTest/Artifacts/SafetyCase/TestReport**

This section describes all 4 results for 'Check at

ModuleTest/Artifacts/SafetyCase/TestReport', see Table 14

The checks are hierarchically grouped according to the sub-checks. The 4 results are contained in 1 contained sub-check, which is described in this section.

### **7.2.1 Results for Check of Test Report**

This section describes all 4 results for 'Check of Test Report', see Table 15

The checks are hierarchically grouped according to the sub-checks. The 4 results are contained in 1 contained sub-check, which is described in this section.

#### **7.2.1.1 Results for Analyze Test Results of Test Report**

This section describes all 4 results for 'Analyze Test Results of Test Report', see Table 16

The checks are hierarchically grouped according to the sub-checks. The 4 results are contained in 2 contained sub-checks, which are described in this section.

##### **7.2.1.1.1 Results for Test Results Complete**

This section describes all 2 results for 'Test Results Complete', see Table 17

#### **CheckResult Test Results Complete MODULE=math OK**

<b>Name:</b>
Test Results Complete MODULE=math OK
<b>Description:</b>
Check has been performed as described using Excel Sheet CR_MODULE.
<b>Verdict</b>
PASSED
<b>Justification</b>
Overall numbers match
<b>Time Stamp</b>
11/3/19
<b>Artifact Revision Or Date</b>
11/3/19
<b>Instance:</b>
<ul style="list-style-type: none"> <li>MODULE=math</li> </ul>

**Table 28 CheckResult Test Results Complete MODULE=math OK**

<b>CheckResult Test Results Complete MODULE=stdio OK</b>	
<b>Name:</b>	
Test Results Complete MODULE=stdio OK	
<b>Description:</b>	
Check has been performed as described using Excel Sheet CR_MODULE.	
<b>Verdict</b>	
PASSED	
<b>Justification</b>	
Overall numbers match	
<b>Time Stamp</b>	
11/3/19	
<b>Artifact Revision Or Date</b>	
11/3/19	
<b>Instance:</b>	
<ul style="list-style-type: none"> <li>MODULE=stdio</li> </ul>	

**Table 29 CheckResult Test Results Complete MODULE=stdio OK**

#### 7.2.1.1.2 Results for Test Results OK

This section describes all 2 results for 'Test Results OK', see Table 18

<b>CheckResult Test Results OK MODULE=stdio OK</b>	
<b>Name:</b>	
Test Results OK MODULE=stdio OK	
<b>Description:</b>	
Check has been performed as described using Excel Sheet CR_MODULE.	
<b>Verdict</b>	
PASSED	
<b>Justification</b>	
All OK	

Time Stamp
11/3/19
Artifact Revision Or Date
3/10/19
Instance:
<ul style="list-style-type: none"> <li>MODULE=stdio</li> </ul>

Table 30 CheckResult Test Results OK MODULE=stdio OK

CheckResult Test Results OK MODULE=math OK
Name:
Test Results OK MODULE=math OK
Description:
Check has been performed as described using Excel Sheet CR_MODULE.
Verdict
PASSED
Justification
Only known issues
Time Stamp
11/3/19
Artifact Revision Or Date
11/3/19
Instance:
<ul style="list-style-type: none"> <li>MODULE=math</li> </ul>

Table 31 CheckResult Test Results OK MODULE=math OK

### 7.3 Results for Check at ModuleTest/Artifacts/SafetyCase/Tests

This section describes all 4 results for 'Check at ModuleTest/Artifacts/SafetyCase/Tests', see Table 19

The checks are hierarchically grouped according to the sub-checks. The 4 results are contained in 1 contained sub-check, which is described in this section.

#### 7.3.1 Results for Check of Test Case

This section describes all 4 results for 'Check of Test Case', see Table 20

The checks are hierarchically grouped according to the sub-checks. The 4 results are contained in 1 contained sub-check, which is described in this section.

##### 7.3.1.1 Results for Validate Tests

This section describes all 4 results for 'Validate Tests', see Table 21

The checks are hierarchically grouped according to the sub-checks. The 4 results are contained in 2 contained sub-checks, which are described in this section.

##### 7.3.1.1.1 Results for Test Complete

This section describes all 2 results for 'Test Complete', see Table 22

CheckResult Test Complete MODULE=math OK
Name:



Test Complete MODULE=math OK
<b>Description:</b>
Check has been performed as described using Excel Sheet CR_MODULE.
<b>Verdict</b>
PASSED
<b>Justification</b>
OK
<b>Time Stamp</b>
3/11/19
<b>Artifact Revision Or Date</b>
3/10/19
<b>Instance:</b>
<ul style="list-style-type: none"> <li>MODULE=math</li> </ul>

Table 32 CheckResult Test Complete MODULE=math OK

<b>CheckResult Test Complete MODULE=stdio OK</b>
<b>Name:</b>
Test Complete MODULE=stdio OK
<b>Description:</b>
Check has been performed as described using Excel Sheet CR_MODULE.
<b>Verdict</b>
PASSED
<b>Justification</b>
OK
<b>Time Stamp</b>
3/11/19
<b>Artifact Revision Or Date</b>
3/10/19
<b>Instance:</b>
<ul style="list-style-type: none"> <li>MODULE=stdio</li> </ul>

Table 33 CheckResult Test Complete MODULE=stdio OK

#### 7.3.1.1.2 Results for Test Effective

This section describes all 2 results for 'Test Effective', see Table 23

<b>CheckResult Test Effective MODULE=stdio OK</b>
<b>Name:</b>
Test Effective MODULE=stdio OK
<b>Description:</b>
Check has been performed as described using Excel Sheet CR_MODULE.
<b>Verdict</b>
PASSED
<b>Justification</b>
after correcting #18 by implementing observers it'S OK
<b>Time Stamp</b>

11/3/19
<b>Artifact Revision Or Date</b>
3/10/19
<b>Issue:</b>
<ul style="list-style-type: none"> <li>Fixed:Issue number #18 [#18], see Table 37</li> </ul>
<b>Instance:</b>
<ul style="list-style-type: none"> <li>MODULE=stdio</li> </ul>

Table 34 CheckResult Test Effective MODULE=stdio OK

CheckResult Test Effective MODULE=math OK	
<b>Name:</b>	
	Test Effective MODULE=math OK
<b>Description:</b>	
	Check has been performed as described using Excel Sheet CR_MODULE.
<b>Verdict</b>	
	PASSED
<b>Justification</b>	
	functional test
<b>Time Stamp</b>	
	11/3/19
<b>Artifact Revision Or Date</b>	
	3/10/19
<b>Instance:</b>	
	<ul style="list-style-type: none"> <li>MODULE=math</li> </ul>

Table 35 CheckResult Test Effective MODULE=math OK

## 8 Issues of Perform Module Test

This chapter describes the relevant (2) issues of the project 'Perform Module Test'.

### 8.1 Fixed Issues in Perform Module Test

This section describes the 2 fixed issues.

Issue Issue number #17	
<b>Name:</b>	
	Issue number #17
<b>ID:</b>	
	#17
<b>Description:</b>	
	stdio.h not instrumented. stdi.h contains code with conditions and has not been instrumented, such that MCDC coverage cannot be determined.
<b>Workaround:</b>	
	manually review/re-check coverage in pre-processed stdio.h
<b>Found In revision Or Date:</b>	
	10-Mar

<b>Fixed In revision Or Date:</b>
11-Mar

**Table 36 Issue Issue number #17**

<b>Issue Issue number #18</b>
<b>Name:</b>
Issue number #18
<b>ID:</b>
#18
<b>Description:</b>
side effects of printf not tested. printf has side effect, e.g. on stdout that have not been tested.
<b>Workaround:</b>
review side effects or do not use printf functions
<b>Found In revision Or Date:</b>
10-Mar
<b>Fixed In revision Or Date:</b>
11-Mar

**Table 37 Issue Issue number #18**

## 9 Summary of Perform Module Test

This section describes the summary of the Verification and Validation activities for 'Perform Module Test'.

15 checks have been performed with 12 instances.

All 27 checks and instances have been performed SUCCESSFULLY, hence Perform Module Test is successfully verified and validated and complies with it's requirements.

The following 27 checks and instances have been performed successfully:

1. Check MCD C OK [AnaCCR-MC-C1]:PASSED, see Table 12
2. Check Result MCD C OK MODULE=math OK:PASSED, see Table 24
3. Check Result MCD C OK MODULE=stdio OK:PASSED, see Table 25
4. Check All Conditions Considered [AnaCCR-MC-C2]:PASSED, see Table 13
5. Check Result All Conditions Considered MODULE=stdio OK:PASSED, see Table 26
6. Check Result All Conditions Considered MODULE=math OK:PASSED, see Table 27
7. Check Test Results Complete [AnaTR-C1]:PASSED, see Table 17
8. Check Result Test Results Complete MODULE=math OK:PASSED, see Table 28
9. Check Result Test Results Complete MODULE=stdio OK:PASSED, see Table 29
10. Check Test Results OK [AnaTR-C2]:PASSED, see Table 18
11. Check Result Test Results OK MODULE=stdio OK:PASSED, see Table 30
12. Check Result Test Results OK MODULE=math OK:PASSED, see Table 31
13. Check Analyze MCD C: PASSED, see Table 11
14. Check Analyze Test Results of Test Report: PASSED, see Table 16
15. Check Check at ModuleTest/Artifacts/SafetyCase/CoverageReport: PASSED, see Table 9
16. Check Check at ModuleTest/Artifacts/SafetyCase/TestReport: PASSED, see Table 14
17. Check Check at ModuleTest/Artifacts/SafetyCase/Tests: PASSED, see Table 19

18. Check Check of Code Coverage Report: PASSED, see Table 10
19. Check Check of Test Case: PASSED, see Table 20
20. Check Check of Test Report: PASSED, see Table 15
21. Check Test Complete [VT-C1]: PASSED, see Table 22
22. Check Result Test Complete MODULE=math OK: PASSED, see Table 32
23. Check Result Test Complete MODULE=stdio OK: PASSED, see Table 33
24. Check Test Effective [VT-C2]: PASSED, see Table 23
25. Check Result Test Effective MODULE=stdio OK: PASSED, see Table 34
26. Check Result Test Effective MODULE=math OK: PASSED, see Table 35
27. Check Validate Tests: PASSED, see Table 21

## 10 Glossary

The following abbreviations are used in the document. More information on the concepts & processes can be found in [QMeth].

- AOC: Anomalous Operating Condition
- CR: Compliance Report<sup>1</sup>
- CT: Construction Task (during QKit creation)
- KB: Known Bug
- LCR: Library Classification Report
- LQP: Library Qualification Plan
- LQR: Library Qualification Report
- LSM: Library Safety Manual
- LTG: Library Test Generator
- PCCP: (Development) Process Compliance Check Plan
- PCCR: (Development) Process Compliance Check Report
- PMT: Process Modeling Tool
- PT: Preparation Task (before QKit creation)
- QKit: Qualification Kit
- QP: Qualification Plan (general), can be LQP or TQP
- QR: Qualification Report (general), can be LQR or TQR
- QST: Qualification Support Tool
- SEOOOC: Safety Element Out Of Context according to [ISO26262]
- SM: Safety Manual (general), can be LSM or TSM
- SWC: Software Component, e.g. a library<sup>2</sup>
- TAU: Test Automation Unit
- TCA: Tool Chain Analyzer
- TD: Tool Detection (part of TCL computation according to [ISO26262])
- TCL: Tool Confidence Level (according to [ISO26262])
- TCR: Tool Classification Report
- TI: Tool Impact (part of TCL computation according to [ISO26262])
- TQL: Tool Qualification Level (according to [DO330])
- TQP: Tool Qualification Plan

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<sup>1</sup> Do not confuse with Classification Reports LCR and TCR.

<sup>2</sup> Note that libraries can be both changes and unchanged software components.

- TQR: Tool Qualification Report
- TSM: Tool Safety Manual
- V&V: Verification and Validation
- VVP: Verification and Validation Plan
- VVR: Verification and Validation Report
- VVT: Verification and Validation Tool
- VT: Verification task (after QKit creation)

## 11 References

- [CR] Compliance Report for the Process of Perform Module Test, generated by PMT
- [DO330] RTCA. DO-330: Software Tool Qualification Considerations 1st Edition 2011-12-13.
- [DO178C] RTCA. DO-178C: Software Considerations in Airborne Systems and Equipment Certification, 2011-12-13.
- [EN50128] BS EN 50128:2011, Railway applications — Communication, signaling and processing systems — Software for railway control and protection systems, BSI Standards Publication
- [FDA2002] General Principles of Software Validation; Final Guidance for Industry and FDA Staff, Jan 2002, from <http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm085371.pdf>
- [FDA\_OTs] Guidance for Industry, FDA Reviewers and Compliance on Off-The-Shelf Software Use in Medical Devices, Center for Devices and Radiological Health (CDRH), from <http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm073779.pdf>
- [IEC61508] International Electrotechnical Commission, IEC 61508, Functional safety of electrical/electronic/programmable electronic safety-related systems, Edition 2.0, Apr 2010.
- [IEC62304] International Electrotechnical Commission, IEC 62304, Medical device software – Software life cycle processes
- [ISO26262] International Organization for Standardization, ISO 26262 Road Vehicles – Functional safety– 1st Edition, 2011-11-15.
- [PR] Process Report for Process of Perform Module Test, generated by PMT
- [QMeth] Validas Qualification Method, White Paper, Version 1.7, see <Documentation>/QualificationMethodology.pdf.
- [VVP] Verification and Validation Plan (Model) for Perform Module Test generated by PMT