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Report

on the

Certificate

Z10 078930 0004 Rev. 01

of the

Software Tool TESSY

Applicant

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Report No.: RB84018C

Version 2.0 of 2023-11-13

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Modification History

Rev.	Status	Date	Author	Modification / Description
1.0	-	2011-12-07	K. Leupold	Initial
1.1	-	2013-05-08	J. Dong	Release 3.0.x
1.2	-	2014-06-16	J. Dong, S. Waldhausen	Release 3.1.x
1.3	-	2014-12-02	J. Dong	TQPack for release 3.1.11
1.4	-	2015-06-16	S. Waldhausen, W. Schlögl	Release 3.2.x
1.5	-	2016-11-04	W. Schlögl	Release 4.0.x
1.6	-	2018-08-17	W. Schlögl	Release 4.1.x
1.7	-	2019-07-29	W. Schlögl	Release 4.2.x, update to ISO 26262:2018
1.8	-	2020-09-30	W. Schlögl	Release 4.3.x
1.9	-	2021-11-05	W. Schlögl	Release 5.0.0 (support of Linux) New report template
2.0	Active	2023-11-13	W. Schlögl	Release 5.1.0, Update to A2:2020 of EN 50128:2011 Report template v19 considered

Table 1: Modification history

1 Target of Evaluation (ToE)

In August 2011, Razorcat Development GmbH requested TÜV SÜD Rail GmbH to test and certify the tool TESSY 2.9.x with respect to Functional Safety. The aim of the testing was the Certification of TESSY to be suitable to be used in safety-related developments according to IEC 61508 and ISO 26262. The related project number related was 717504799.

In April 2013, Razorcat Development GmbH contracted TÜV SÜD Rail GmbH to extend the certification by TESSY 3.0.x. TÜV SÜD Rail GmbH handled the update in the context of project No 717506657.

In May 2014, Razorcat Development GmbH contracted TÜV SÜD Rail GmbH to extend the certification by TESSY 3.1.x. TÜV SÜD Rail GmbH handled the update in the context of project No 717509219.

In Nov 2014, Razorcat Development GmbH contracted TÜV SÜD Rail GmbH to update the certification with respect to TQPack for release 3.1.11.

In May 2015, Razorcat Development GmbH contracted TÜV SÜD Rail GmbH to extend the certification by TESSY 3.2.x. TÜV SÜD Rail GmbH handled the update in the context of project No 717511065.

In October 2016, Razorcat Development GmbH contracted TÜV SÜD Rail GmbH to extend the certification by TESSY 4.0.x. TÜV SÜD Rail GmbH handled the update in the context of project No 717513632.

In July 2018, Razorcat Development GmbH contracted TÜV SÜD Rail GmbH to extend the certification by TESSY 4.1.x. Additionally, EN 50128:2011 and IEC 62304:2015 were included in the certification. TÜV SÜD Rail GmbH handled the update in the context of project No 717517243.

In July 2019, Razorcat Development GmbH contracted TÜV SÜD Rail GmbH to extend the certification by TESSY 4.2.x. Furthermore, the second edition of ISO 26262 (ISO 26262:2018) was included in the certification. TÜV SÜD Rail GmbH handled the update in the context of project No 717519264.

In September 2020, Razorcat Development GmbH contracted TÜV SÜD Rail GmbH to extend the certification by TESSY 4.3.x. TÜV SÜD Rail GmbH handled the update in the context of project No 717521533.

In October 2021, Razorcat Development GmbH contracted TÜV SÜD Rail GmbH to extend the certification by TESSY 5.0.x. TÜV SÜD Rail GmbH handled the update in the context of project No 717524005.

In October 2023, Razorcat Development GmbH contracted TÜV SÜD Rail GmbH to extend the certification by TESSY 5.1.x. Furthermore, the certification was updated with respect to EN 50128:2011/A2:2020. TÜV SÜD Rail GmbH handled the update in the context of project No 717528628.

The ToE is a product used in development of safety related applications.

2 Scope of Testing

2.1 Test Specimen

According to the definitions in IEC 61508-4, the product TESSY can be classified as an off-line support tool of class T2. TESSY supports the verification of executable code, where errors in the tool can fail to reveal defects but cannot directly create errors in the executable software.

TESSY provides an integrated suite for automated dynamic testing. A typical workflow using TESSY can be seen in Figure 1:

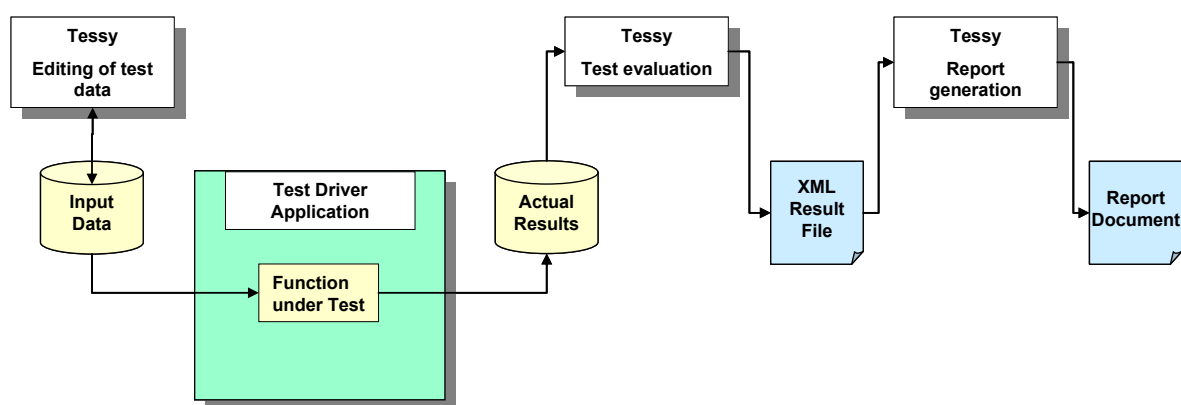


Figure 1: TESSY Core Workflow

2.2 Nomenclature and Identification of TESSY

TESSY tested is identified by software version as follows:

Software Product	Release	Supported OS	Standards considered for Certification				
			IEC 61508:2010	ISO 26262		EN 50128:2011/ A2:2020	IEC 62304:2006 +A1:2015
				2011	2018		
TESSY	2.9.x	Win32/64	✓	✓	-	-	-
TESSY	3.0.x	Win32/64	✓	✓	-	-	-
TESSY	3.1.x	Win32/64	✓	✓	-	-	-
TESSY	3.2.x	Win32/64	✓	✓	-	-	-
TESSY	4.0.x	Win64	✓	✓	-	-	-
TESSY	4.1.x	Win64	✓	✓	-	✓	✓
TESSY	4.2.x	Win64	✓	-	✓	✓	✓
TESSY	4.3.x	Win64	✓	-	✓	✓	✓
TESSY	5.0.x	Linux64	✓	-	✓	✓	✓
TESSY	5.1.x	Win64	✓	-	✓	✓	✓

Table 2: Software Identification of TESSY

3 Certification Requirements

The certification of TESSY will be according to the regulations and standards listed in clause 4 of this document. This will certify the successful completion of the following test segments.

- I. Functional Safety including
 - Functional safety management (FSM) and safety lifecycle
 - Applied safety development process
 - Analysis of the software
 - Verification and validation procedures/activities
 - Functional tests
 - Safety information in the product documentation (safety manual, user manual, installation and operating instructions).

Certification is dependent on successful completion of all above listed test segments. The testing follows the basic certification scheme for Safety Components of TÜV SÜD Rail GmbH.

3.1 Certification Documentation

The detailed technical evaluation is documented in the most recent version of the Technical Report:

Document No.	Description	Project No.
RB84018T	Technical Report	717528628
Safety related requirements, conditions and restrictions can be found in the following user documentation		
TESSY_SafetyManual	Safety Manual	-

Table 3: Technical Report

Based on the specified purpose of use of TESSY in development of safety critical applications, the certification is based on the set of standards listed in clause 4 of this document. The issuance of the certificate states compliance with these references unless specifically noted otherwise.

4 Standards and Guidelines

The regulations and guidelines which form the basis of the type testing are listed below.

4.1 Functional Safety

No.	Reference	Description
/N1/	IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements
/N2/	IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 3: Software requirements

Table 4: Basic safety standards

No.	Reference	Description
/N3/	ISO 26262-2:2018	Road vehicles - Functional safety - Part 2: Management of functional safety
/N4/	ISO 26262-6: 2018	Road vehicles - Functional safety - Part 6: Product development at the software level
/N5/	ISO 26262-8:2018	Road vehicles - Functional safety - Part 8: Supporting processes
/N6/	EN 50128:2011/ A2:2020	Railway applications - Communication, signaling and processing systems Software for railway control and protection systems
/N7/	IEC 62304:2006 ¹ +A1:2015	Medical device software - Software life-cycle processes

Table 5: Associated safety standards

4.2 Quality Management System

No.	Reference	Description
[M1]	QMS	Quality Management System TÜV SÜD Rail GmbH
	TR_RA_P_04.50	Test Program Functional Safety
	TR_RA_P_04.51	Definition Scope of testing
	TR_RA_P_04.07	Product Modification
	TR_RA_P_04.52	Concept Phase & Safety Lifecycle
	TR_RA_P_04.54	Detail Phase Software
	TR_RA_P_04.55	Safety Manual
TR_RA_P_04.56	Result of Testing	
[M2]	D-PL-11190-08-00	DAkkS accreditation according to DIN EN ISO 17025:2018 / EN ISO/IEC 17025:2017

Table 6: Quality Management System

¹ Was approved by other testing services

5 Results

5.1 Tool Classification

IEC 61508:

IEC 61508-3 demands the employment of offline support tools (7.4.4.2).

TESSY supports the verification of executable code, where errors in the tool can fail to reveal defects but cannot directly introduce errors in the executable software.

According to the definitions in IEC 61508-4:2010, TESSY can be classified as an off-line support tool of class T2.

For T2 tools, IEC 61508-3:2010 requires that:

- The tool functionality and behavior, as well as any instructions or constraints shall be documented.
- For T2 as well as for T3 tools, only qualified versions shall be used.

ISO 26262:

According to ISO 26262-8:2018, the classification depends on the detection of possible tool errors. The standard classifies software tools according to their tool impact (TI) and the probability of tool error detection (TD).

TESSY, being a diagnostic tool, cannot introduce errors into the application. Nevertheless, the tool impact is $TI = 2$, because in the case of a failure it may mask existing errors in the code being tested. The user typically will not employ a second, redundant tool to verify the results with respect to the features under test.

Depending on the applied measures of error prevention and error detection in the user development process, i.e. the applied techniques and intensity of verification and validation activities, the resulting tool error detection can vary between TD1, TD2 and TD3.

In order to achieve tool qualification for all ASIL levels, the measures

- Evaluation of the development process
- Validation of the software tool

have been applied, following the requirements of ISO 26262-8.

The user's development process including complete verification and validation should be conducted according to ISO 26262-8 in order to achieve the best possible TCL value.

IEC 62304:

IEC 62304 requires tools to be "suitably validated" (Table C.3). The tool validation according to IEC 61508 is a main aspect of the testing described in this report. Since IEC 62304 does not define how suitable validation is achieved, but refers to IEC 61508 with respect to tools, the validation can be considered suitable also in the sense of IEC 62304.

IEC 62304 AMD1:2015 does not contain changes with regard to tools.

EN 50128:

EN 50128:2011/A2:2020 is an application standard derived from IEC 61508. The requirements for software tools are explicitly derived from the requirements on software tools according to IEC 61508-3. Due to the equivalences between the two standards no separate testing has been performed with respect to EN 50128:2011/A2:2020.

The part of the audit covering the development process, quality assurance measures, verification and validation, modification and bug handling can be taken over.

5.2 Functional Safety

The tests performed and quality assurance measures implemented by the Razorcat Development GmbH have shown that TESSY complies with the testing criteria specified in clause 4 subject to the conditions defined in clause 6 and is suitable for use in safety-related development.

TESSY, classified as T2 off-line tool according to IEC 61508-4:2010, is suitable to be used in safety-related development according to IEC 61508:2010 and EN 50128:2011/A2:2020 for any SIL.

TESSY is qualified to be used in a standard-conform development process according to ISO 26262:2018 for any ASIL.

TESSY is suitable to be used in safety-related software development according to IEC 62304:2006+A1:2015 for any software safety class.

6 Implementation Conditions and Restrictions

The use of TESSY shall comply with the current version of the safety manual, and the following requirements have to be followed, if TESSY is used in safety-related development.

- The user documentation bundles information that has to be considered in a safety-related development.
- In order to benefit from the tool qualification, developers of safety-related application software should follow the registration hints in the user's guide.
- Compiler options should be used consciously, and their potential interference with the testing should be analyzed (e.g. code instrumentation may influence code optimization).

7 Certificate Number

This report specifies technical details and implementation conditions required for the application of TESSY to the certificate:

Z10 078930 0004 Rev. 01

Munich, 2023-11-13

(Technical Certifier)