BESCHEINIGUNG ◆ ATTESTATION ◆ 证明书 ◆ СВИДЕТЕЛЬСТВО ◆ CONSTANCIA ◆ ATTESTAZIONE

Industrie Service

ATTESTATION

Manufacturer:	Siemens AG
Product category:	Functional blocks for stacker cranes
Type:	Software library „ASRM_Failsafe_TS1500_V30" F_SAFE_POS, F_SLP_MONITOR, F_ENDZONE, F_BRAKE_TEST, F_LOAD_MONITOR, F_SBR_MONITOR, F_MIN_MAX
Application:	Control and monitoring of stacker cranes in conjunction with the safety-related automation systems SIMATIC STEP 7 Safety Advanced of the company Siemens AG
TÜV Equipment:	2645430
TÜV report no.:	Br-ET-2039-01-18 dated 2018-07-24
Test regulations:	EN 528: 2008 EN ISO 13849-1: 2015 EN ISO 13849-2: 2012 EN 62061: 2015
Result:	The function blocks meet the applicable requirements as set out in the product and application standards. The applicable requirements are described in specifications and in the functional requirements outlined in the Manual. In line with the requirements, no retroactive effect was detected on the protection system which, depending on the type of the plant, must be composed of the blocks to control and monitor the storage and retrieval machines. The conditions set out in the Test Report and in the relevant Manual shall be observed and adhered to.

TÜV SÜD Industrie Service GmbH
Department of Electrical Engineering
and Building Services
Regensburg Branch
Head of Department

Regensburg, 2018-08-10

Christian Eberle

Inspection report
ASRM Safety Library

Industrie Service

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TÜV Equipment: 2645430
Report No.: Br-ET-2039-01-18

Inspection Body:	TÜV SÜD Industrie Service GmbH Electrical and Building Services Engineering Department Regensburg branch office
Test item:	Functional components for control and monitoring of stacker cranes (RBG) F_SAFE_POS, F_SLP_MONITOR, F_ENDZONE, F_BRAKE_TEST, F_LOAD_MONITOR, F_SBR_MONITOR, F_MIN_MAX
Expert:	B. Eng. Peter Michtl
Period of inspection:	07/2018
Evaluation criteria:	EN 528: 2008 EN ISO 13849-1: 2015 EN ISO 13849-2: 2012 EN 62061: 2015
Result of inspection:	No deficiencies were identified. The measures under Point 8 must be observed.

Regensburg, 24.07.2018

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Expert

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Peter Michtl

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1 Purpose and scope of inspection

On behalf of Siemens AG, the functional components described below for the control and monitoring of stacker cranes (RBG) were subjected to a safety-related inspection with regard to the requirements of the evaluation criteria given in Section 3.

In the course of the migration of the TIA Portal from V14 to V15, optimizations of the functional components were performed, with the result that a reevaluation of the test documents as well as a Factory Acceptance Test (FAT) of the components was conducted.

The aim of the evaluation was to determine whether the requirements laid down in the specification documents were fulfilled.

2 Inspection documents

As the basis for the evaluation, the inspection body was provided with the following documents:

\U01\ Management of functional safety, development process for safety-related systems, process description, version B2 of 12.01.2017

\U02\ Modification Note MOD-00005 of 19.04.2018

\U03\ Modification Note MOD-00006 of 20.04.2018

\U04\ FSM/Validation-Plan, Version G2 of 19.04.2018

\U05\ FSM/Validation-Planning Review Report, Version G2 of 19.04.2018

\U06\ Safety Requirements Specification, Version F2 of 19.04.2018

\U07\ Specification Review Report, Version D2 of 19.04.2018

\U08\ Safety Assessment Report I, Version D2 of 19.04.2018

\U09\ Functional Design Specification, Version J2 of 25.04.2018

\U10\ Safety Requirements Tracking List, Version G2 of 25.04.2018

\U11\ Detail Design Specification, F_BRAKE_TEST, Version G2 of 31.04.2018

\U12\ Detail Design Specification, F_ENDZONE, Version G2 of 31.04.2018

\U13\ Detail Design Specification, F_LOAD_MONITOR, Version G2 of 31.04.2018

\U14\ Detail Design Specification, F_SAFE_POS, Version K2 of 31.04.2018

\U15\ Detail Design Specification, F_SBR_MONITOR, Version H2 of 31.04.2018

\U16\ Detail Design Specification, F_SLP_MONITOR, Version G2 of 31.04.2018

\U17\ Detail Design Specification, F_MIN_MAX, Version E2 of 19.11.2015

\U18\ Safety Assessment Report II, Version E2 of 31.04.2018

\U19\ Release of Software, Version REL00010 of 07.05.2018

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\U20\ Module Test Specification, F_BRAKE_TEST, Version C2 of 08.05.2018

\U21\ Module Test Specification, F_ENDZONE, Version C2 of 08.05.2018

\U22\ Module Test Specification, F_LOAD_MONITOR, Version C2 of 08.05.2018

\U23\ Module Test Specification, F_SAFE_POS, Version E2 of 08.05.2018

\U24\ Module Test Specification, F_SBR_MONITOR, Version C2 of 08.05.2018

\U25\ Module Test Specification, F_SLP_MONITOR, Version C2 of 08.05.2018

\U26\ Module Test Specification, F_MIN_MAX, Version B2 of 08.12.2015

\U27\ Module Test Report, F_BRAKE_TEST, Version C2 of 30.05.2018

\U28\ Module Test Report, F_ENDZONE, Version C2 of 30.05.2018

\U29\ Module Test Report, F_LOAD_MONITOR, Version C2 of 30.05.2018

\U30\ Module Test Report, F_SAFE_POS, Version F2 of 30.05.2018

\U31\ Module Test Report, F_SBR_MONITOR, Version C2 of 30.05.2018

\U32\ Module Test Report, F_SLP_MONITOR, Version C2 of 30.05.2018

\U33\ Module Test Report, F_MIN_MAX, Version B2 of 08.01.2016

\U34\ Factory Acceptance Test Specification, Version D2 of 02.07.2018

\U35\ Manual as well as inspection and release of manual, Release of Manual V3.0 of 29.06.2018

\U36\ Factory Acceptance Test Report, Version D2 of 03.07.2018

\U37\ Safety Assessment Report III, Version D2 of 04.07.2018

\U38\ Safety Assessment Report IV, Version D2 of 04.07.2018

3 Evaluation criteria

The inspection was performed on the basis of the following directives and standards:

- EN 528: 2008 "Rail dependent storage and retrieval equipment - Safety requirements"
- EN ISO 13849-1: 2015 "Safety of machinery - Safety-related parts of control systems -- Part 1: General principles for design
- EN ISO 13849-2: 22 "Safety of machinery - Safety-related parts of control systems -- Part 2 Validation"
- EN 62061: 2015 "Safety of machinery: Functional safety of electrical, electronic and programmable electronic control systems"

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4 Description of inspection item

The inspection item consists of the software functional components of the software library "ASRM_Failsafe_TS1500_V30.zal15" listed below.

F_SAFE_POS	Formation of a safe position and speed value
F_SLP_MONITOR	Safe position monitoring at the end of the travel range
F_ENDZONE	Safe position monitoring and safe speed profile at the end of the travel range
F_BRAKE_TEST	Safe brake test in combination with the drive function "SBT"
F_LOAD_MONITOR	Overload and slack cable detection
F_SBR_MONITOR	Monitoring of a brake ramp
F_MIN_MAX	Minimum/maximum value selection

The functional components can be used in a system for control and monitoring of stacker cranes. They provide protection functions in accordance with EN 528 and simplify programing, functional testing and final acceptance of the user-specific software.

In order to be able to achieve the defined protection targets, at least the following automation components are necessary:

- Failsafe SIMATIC S7 controller of the S7-1500F range in combination with the SIMATIC STEP 7 Professional V15 (or higher) programming environment or SIMATIC STEP 7 Safety Advanced V15 (or higher)
- SINAMICS S120 drive system with CU320-2 (from firmware version 4.6) control unit with SMC20/SMC30 or DRIVE-CLiQ sensor modules in combination with SINAMICS MICROMASTER STARTER V4.4 (or higher) or SINAMICS Startdrive V15 (or higher) parameterization environment
- Safe PROFIBUS/PROFINET transmission (PROFI Safe-Telegramm) between SINAMICS and F-CPU
- F-DQ module to control the brakes
- External mechanical brake and/or motor holding brake
- Signal source for load measurement on overload/slack cable detection, e.g. via F-AI with qualified encoder or two transducers which are validated against each other (e.g., load cell and motor torque)

The block package covers several variants of sensor combinations. Depending on the application, both single sensor systems, consisting of a safe motor sensor with safe (form-fit) installation, and double or treble sensor systems including multiple on safe sensors may be selected.

As a result of the various sensor variants and the hardware variants resulting from this, the achieved safety integrity level/performance level of the safety functions must be established by the user. A maximum of SIL2 / PLd can be achieved using the equipment under discussion.

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5 Performance of the functional inspection

The following individual inspections were performed:

5.1 Evaluation of the management of functional safety

5.2 Inspection of the specification of the functional components

5.3 Module tests and Factory Acceptance Test (FAT)

5.4 Determination of component numbers and signatures

6 Result of inspection

The inspections performed produced the following results:

6.1 Evaluation of the management of functional safety

With regard to the existing system for the management of functional safety in accordance with IEC 61508 Part 1-7: 2011 at Siemens AG, it can be assumed that the functional components under discussion are sufficiently free of systematic errors.

Corresponding certificates for use of these automation components (see Section 4) in safety-related applications are available.

The programming environment inspected (STEP 7 Safety Advanced) adequately covers the measures for error avoidance in the development of the software.

The representation of the individual components takes place in software modules. The software was developed on the basis of the V-model and designed to provide modularity and verifiability.

The fulfilment of the functionality, the sequence of operations and time-related data, time limits, coordination, data structure and properties of data, assumptions and dependencies in design and verifiability were taken into account with regard to the individual applications and are sufficiently described in the specification documents of the individual components.

6.2 Inspection of the specification of the functional components

The application-related evaluation of the individual functional components with regard to the evaluation criteria given in Section 3took place on the basis of the specification documents made available.

6.2.1 Functional component F_SAFE_POS

The inspection of the functionality of the component F_SAFE_POS “safe position and speed" on the basis of the documents "Safety Requirements Specification", “Functional Design Specification" and “Detail Design Specification" (see Section 2) led to the conclusion that the requirements specified there for the particular application have been implemented properly.

In the use of the functional component, it is mandatory that the conditions in Section 8 be taken into account.

6.2.2 Functional component F_SLP_MONITOR

The inspection of the functionality of the component F_SLP_MONITOR “safe position and end of travel range" on the basis of the documents "Safety Requirements Specification", “Functional Design Specification" and “Detail Design Specification" (see Section 2) led to the conclusion that the requirements specified there for the particular application have been implemented properly.

In the use of the functional component, it is mandatory that the conditions in Section 8 be taken into account.

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6.2.3 Functional component F_ENDZONE

The inspection of the functionality of the component F_ENDZONE “safe position and safe speed profile at the end of the travel range" on the basis of the documents "Safety Requirements Specification", “Functional Design Specification" and “Detail Design Specification" (see Section 2) led to the conclusion that the requirements specified there for the particular application have been implemented properly.

In the use of the functional component, it is mandatory that the conditions in Section 8 be taken into account.

6.2.4 Functional component F_BRAKE_TEST

The inspection of the functionality of the component F_BRAKE_TEST “safe brake test" on the basis of the documents "Safety Requirements Specification", “Functional Design Specification" and “Detail Design Specification" (see Section 2) led to the conclusion that the requirements specified there for the particular application have been implemented properly.

In the use of the functional component, it is mandatory that the conditions in Section 8 be taken into account.

6.2.5 Functional component F_LOAD_MONITOR

The inspection of the functionality of the component F_LOAD_MONITOR “Overload and slack cable detection" on the basis of the documents "Safety Requirements Specification", “Functional Design Specification" and “Detail Design Specification" (see Section 2) led to the conclusion that the requirements specified there for the particular application have been implemented properly.

In the use of the functional component, it is mandatory that the conditions in Section 8 be taken into account.

6.2.6 Functional component F_SBR_MONITOR

The inspection of the functionality of the component F_SBR_MONITOR “monitoring of a brake ramp" on the basis of the documents "Safety Requirements Specification", “Functional Design Specification" and “Detail Design Specification" (see Section 2) led to the conclusion that the requirements specified there for the particular application have been implemented properly.

In the use of the functional component, it is mandatory that the conditions in Section 8 be taken into account.

6.2.7 Functional component F_MIN_MAX

The inspection of the functionality of the component F_MIN_MAX “maximum/minimum value selection" on the basis of the documents "Safety Requirements Specification", “Functional Design Specification" and “Detail Design Specification" (see Section 2) led to the conclusion that the requirements specified there for the particular application have been implemented properly.

In the use of the functional component, it is mandatory that the conditions in Section 8 be taken into account.

6.3 Module tests and Factory Acceptance Test (FAT)

The verification and validation of the requirements laid down in the specification documents of the functional components took place on the basis of the module tests performed by Siemens AG. With the help of the validation documents provided, "Module Test Specification“ and "Module Test Report“ (see Section 2) it was determined that the requirements specified for the individual functional components were implemented properly.

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In the framework of the Factory Acceptance Test (FAT) on a simulation system, performed on 03.07.2018 by Siemens AG in the presence of TÜV SÜD Industrie Service GmbH (Mr. Peter Michtl), Department IS-EG1-RGB, the safety-related functions/characteristics of the functional components were conclusively validated through practical tests.

6.4 Determination of component numbers and signatures

The functional components are summarized in the software library "ASRM_Failsafe_TS1500_V30.zal15" for SIMATIC STEP 7 Safety Advanced.

The component numbers and signatures are listed below:

Component number	***Component name***	***Component signature (hex)***
FB 200	F_SAFE_POS	31FE30F7
FB 201	F_SLP_MONITOR	8E0F26F0
FB 202	F_ENDZONE	F32AD89B
FB 203	F_BRAKE_TEST	8E09C5C0
FB 204	F_LOAD_MONITOR	ABA72836
FB 207	F_SBR_MONITOR	AAE3712D
FC 206	F_MIN_MAX	A225BBC3

7 Result of inspection

The inspection of the functional components F_SAFE_POS, F_SLP_MONITOR, F_ENDZONE, F_BRAKE_TEST, F_LOAD_MONITOR, F_SBR_MONITOR and F_MIN_MAX for control and monitoring of stacker cranes revealed no deficiencies.

The relevant requirements are described in the specifications and the functional requirements in the manual.

The inspection did not discover a retroactive effect on the protection system, which must be formed from the components for control and monitoring of the stacker cranes according to the system type.

The conditions in Section 8 and in the manual shall be observed and met.

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8 Measures

The following must be taken into account in the use of the functional components:

1 The notes and conditions listed in the specifications and in the manual shall be observed and met.

2 The component signatures of the components used dependent on the application shall be validated on site.

3 The proper wiring of the components as well as the wiring of the individual components shall be validated on site taking into account the particular application and the system conditions. The user is responsible for the correct wiring of the components.

4 The type of stop reaction to be performed in the inverter (STO, SS1, SOS, SS2, SDI) and the time until standstill shall be specified and validated on site on the basis of the risk assessment of the machine and taking into account the particular application and the system conditions. The user is responsible for the correct wiring of the stop signal in the shutdown logic.

5 The necessary safety integrity level/performance level of all implemented safety functions with the functional components under discussion must be determined by the use in the form of a risk assessment. Here the overall safety function including the peripherals (sensors, actuators) shall always be considered. The safety functions must fulfill the corresponding requirements of EN 528 Table C2.

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