Report

on the

Certificate

Z10 077217 0034 Rev. 00

of the

Safety Component
AC Servo Driver
L8 series, EL8 series

Applicant

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Modification History

Rev.	Status	Date	Author	Modification / Description
1.0	Active	2024-04-17	Klaus Leupold	Initial

Table 1: Modification history

1 Target of Evaluation (ToE)

In August 2022 the company China Leadshine Technology Co., Ltd. requested TÜV SÜD Rail GmbH to test and certify the L8 series, EL8 series according to the standard listed in clause 4 of this report. The project number related to this Technical Report is 717526015.

The ToE is a product used in safety related applications. The L8 series, EL8 series is a Safety Component approved for

- SIL 3 according to IEC 61508
- Maximum SIL 3 according to IEC 62061
- PL e, Cat. 3 according to ISO 13849-1

2 Scope of Testing

2.1 Test Specimen

The L8 series, EL8 series is built up in a 1oo2 architecture realizing following safety functions:

- Safe Torque Off (STO)

The safety function itself is implemented in hardware only. Software is only used for diagnostic reasons.

2.2 Nomenclature and Identification of L8 series, EL8 series

The L8 series, EL8 series tested is identified by the nomenclature as follows:

L8	P	-	(a)	400	F	(b)	-	(c)	
I	II		III	IV	V	VI		VII	
I	Series designation								
	L8:	L8 series (Chinese series)							
II	Communication ports								
	P:	Pulse and RS485							
	EC:	EtherCAT							
III	Industry code (not relevant to safety construction)								
	(a):	XXXXXXXXXX							
		The model number may include a “XXXXXXXXXX”, Where “XXXXXXXXXX” can be blank or combination of any alphanumeric and/or symbols that represents Industry							
	(blank):	Standard model, not industry customized (default)							
IV	Rated power								
	100:	100W							
		(Input: 1PH or 3PH AC 200-240V 50/60Hz 1.7A/0.8A; output: 3PH AC 0-240V 0-500Hz 1.2A 100W)							
	400:	400W							
		(Input: 1PH or 3PH AC 200-240V 50/60Hz 4.0A/2.3A; output: 3PH AC 0-240V 0-500Hz 2.8A 400W)							
	750:	750W							
		(Input: 1PH or 3PH AC 200-240V 50/60Hz 7.9A/4.4A; output: 3PH AC 0-240V 0-500Hz 5.5A 750W)							
	1000:	1000W							
		(Input: 1PH or 3PH AC 200-240V 50/60Hz 8.8A/4.7A; output: 3PH AC 0-240V 0-500Hz 7.0A 1000W)							
V	Type								

	F:	Full function version (supports full loop and STO functions)
VI	Product code (not relevant to product construction)	
	(b):	The model number may include a “XXXXXXXXXX”, Where “XXXXXXXXXX” can be blank or combination of any alphanumeric and/or symbols that represents product code.
VII	Customer code (not relevant to safety construction)	
	(c):	XXXXXXXXXX
		The model number may include a suffix “XXXXXXXXXX”, Where “XXXXXXXXXX” can be blank or combination of any alphanumeric and/or symbols that represents customer identity.

EL8	-	RS	400	F	-	(a)	-	(b)	
I		II	III	IV		V		VI	

I	Series designation	
	EL8:	EL8 series (Overseas series)
II	Communication ports	
	RS:	Pulse and Modbus
	EC:	EtherCAT
III	Rated power	
	100:	100W
		(Input: 1PH or 3PH AC 200-240V 50/60Hz 1.7A/0.8A; output: 3PH AC 0-240V 0-500Hz 1.2A 100W)
	400:	400W
		(Input: 1PH or 3PH AC 200-240V 50/60Hz 4.0A/2.3A; output: 3PH AC 0-240V 0-500Hz 2.8A 400W)
	750:	750W
		(Input: 1PH or 3PH AC 200-240V 50/60Hz 7.9A/4.4A; output: 3PH AC 0-240V 0-500Hz 5.5A 750W)
	1000:	1000W
		(Input: 1PH or 3PH AC 200-240V 50/60Hz 8.8A/4.7A; output: 3PH AC 0-240V 0-500Hz 7.0A 1000W)
IV	Type	
	F:	Full function version (supports full loop and STO functions)
V	Product code (not relevant to product construction)	
	(a):	The model number may include a “XXXXXXXXXX”, Where “XXXXXXXXXX” can be blank or combination of any alphanumeric and/or symbols that represents product code.
VI	Customer code (not relevant to safety construction)	
	(b):	XXXXXXXXXX
		The model number may include a suffix “XXXXXXXXXX”, Where “XXXXXXXXXX” can be blank or combination of any

		alphanumeric and/or symbols that represents customer identity.

Table 2: Nomenclature of L8 series, EL8 series

The L8 series, EL8 series tested is identified by hardware as follows:

Control Board:

PCB	-	L8	xx	-	xxx		C		V2.0
I		II	III	-	IV		V		VI

I	PCB file name	
II	Product Series: L8 Series	
III	Communication ports	
	P:	Pulse and RS485
	EC:	EtherCAT
IV	Rated power	
	100	100W
	400	400W
	750	750W
	1000	1000W
V	Type of PCB	
	C:	Control Board
VI	Version	

Table 3: HW Identification of L8 series, EL8 series Control Board

Drive Board:

PCB	-	L8		xxx		D		V2.0
I		II		III		IV		V

I	PCB file name	
II	Product Series: L8 Series	
III	Rated power	
	100	100W
	400	400W
	750	750W
	1000	1000W
IV	Type of PCB	
	D:	Driver Board
V	Version	

Table 4: HW Identification of L8 series, EL8 series Driver Board

The L8 series, EL8 series tested is identified by software version as follows:

Name	SW	Remarks
HWL_Sto.c HWL_Sto.h	V2.10	

Table 5: SW Identification of L8 series, EL8 series

3 Certification Requirements

The certification of the L8 series, EL8 series is according to the regulations and standards listed in clause 4 of this document. This certifies 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 product structure / architecture (Block-Diagram-FMEA)
- Analysis of the hardware (FMEDA on component or block level, quantitative analysis)
- Verification and validation procedures/activities
- Fault simulations and software tests
- Approval of fault avoidance measures
- Functional tests

II. Electrical Safety

III. Susceptibility to environmental errors including

- Climate and temperature
- IP degree of protection
- Mechanical effects

IV. Electromagnetic compatibility (EMC)

- Immunity

V. Safety information in the product documentation (safety manual, user manual, installation and operating instructions).

VI. Product-Related Quality Assurance in Manufacture and Product Development

3.1 Certification Documentation

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

Document No.	Description	Project No.
CS102707T	Technical Report	717526015
Safety related requirements, conditions and restrictions can be found in the following user documentation		
16-SM_STO_LS_D2022001-1-2201_L8_V1.0.docx	Safety Manual / Installation Manual	717526015

Table 6: Technical Report

Based on the specified purpose of use of the L8 series, EL8 series in safety critical process 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 Guidelines and Directives

No.	Reference	Description
/N1/	2006/42/EC	Directive 2006/24/EC of the European Parliament and of the Council of 2006-05-17 on machinery

Table 8: Guidelines and directives

4.2 Functional Safety

No.	Reference	Description
/N2/	IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements
/N3/	IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/ programmable electronic safety-related systems
/N4/	IEC 62061:2021	Safety of machinery - Functional safety of safety-related control systems
/N5/	ISO 13849-1:2023	Safety of machinery - Safety-related parts of control systems Part 1: General principles for design

Table 9: Basic safety standards

No.	Reference	Description
/N6/	IEC 61800-5-2:2016	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements – Functional

Table 10: Associated safety standards

4.3 Electrical Safety

Remark: The following standards were approved by other testing services.

No.	Reference	Description
/N7/	IEC 61800-5-1:2007+A1:2016	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy

Table 11: Electrical safety standards

4.4 Environmental Testing

Remark: The following standards were approved by other testing services.

No.	Reference	Description
/N8/	IEC 61800-5-1:2007+A1:2016	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy
/N9/	IEC 60529:1989 + AMD2:2013 + COR1:2019	Degrees of protection provided by enclosures (IP Code)

Table 12: Environmental testing standards

4.5 Electromagnetic Compatibility

Remark: The following standards were approved by other testing services.

No.	Reference	Description
/N10/	IEC 61800-5-2:2016	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements – Functional
/N11/	IEC 61800-3:2017	Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods

Table 13: Electromagnetic compatibility standards

4.6 Safety Information in the Product Documentation (safety manual, operating instructions, labelling)

No.	Reference	Description
/N12/	ISO 13849-1:2023	Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
/N13/	IEC 61800-5-2:2016	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements – Functional

Table 14: Safety information standards

4.7 Quality Management System

No.	Reference	Description
[M1]	QMS	Quality Management System TÜV SÜD Rail GmbH

No.	Reference	Description
	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_04.53 Detail Phase Hardware 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 15: Quality Management System

5 Results

5.1 Functional Safety

The tests performed and quality assurance measures implemented by the China Leadshine Technology Co., Ltd. have shown that the L8 series, EL8 series complies with the testing criteria specified in clause 4 subject to the conditions defined in clause 6 and is suitable for safety-related use in applications up to

- SIL 3 in accordance with IEC 61508 and
- SIL 3 according to IEC 62061 and
- category 3 PL e according to ISO 13849-1.

6 Implementation Conditions and Restrictions

The use of the L8 series, EL8 series shall comply with the current version of the safety parts of the user manual, and the following implementation and installation requirements have to be followed, if the L8 series, EL8 series is used in safety-related installations.

- The guidelines and requirements specified in the user documentation shall be followed. Only modules certified for safety-related operation shall be used for safety-critical functions.

- Timing aspects like reaction times, test intervals or test execution times have to be considered by the implementation of the final Safety function.

7 Certificate Number

This report specifies technical details and implementation conditions required for the application of L8 series, EL8 series to the certificate:

Z10 077217 0034 Rev. 00

Technical Certifier

Digital
unterschrieben von
Matthias Ramold
Datum: 2024.04.18
16:11:27 +02'00'