



Rail

Add value.
Inspire trust.

Report

on the

Certificate

Z10 002759 0001 Rev. 00

of the

Safety Component M8000 Series Electric Actuator

Applicant

Chongqing Chuanyi Automation Co.,Ltd Actuator Filiale
Huangshan Road 61#, North New Region,
401121 Chongqing
PEOPLES'S REPUBLIC OF CHINA

Report No.: CC101748C

Version 1.0 of 2023-11-22

Testing Laboratory for Safety Components

TÜV SÜD Rail GmbH
Rail Automation
Barthstraße 16
D-80339 München

Certification Body

TÜV SÜD Product Service GmbH
Ridlerstraße 65
D-80339 München

(Page 1 of 13)

This report may be represented only in full wording. The use for promotion needs written permission. This report contains the result of a unique investigation of the product being tested and places no generally valid judgment about characteristics out of the running fabrication. Official translations of this technical report are to be authorised by the test and certification body.

Table of Contents

page

1	Target of Evaluation (ToE)	4
2	Scope of Testing	5
2.1	Test Specimen	5
2.2	Nomenclature and Identification of M8000 Series Electric Actuator	5
3	Certification Requirements	8
3.1	Certification Documentation	9
4	Standards and Guidelines	10
4.1	Functional Safety.....	10
4.2	Electrical Safety	10
4.3	Environmental Testing.....	10
4.4	Electromagnetic Compatibility	11
4.5	Safety Information in the Product Documentation (safety manual, operating instructions, labelling)	11
4.6	Quality Management System	11
5	Results	12
5.1	Functional Safety.....	12
6	Implementation Conditions and Restrictions	13
7	Certificate Number	13

List of Tables

page

Table 1:	Modification history.....	3
Table 2:	Nomenclature of M8000 Series Electric Actuator	6
Table 3:	Electrical Parameters	6
Table 4:	HW Identification of M8000 Series Electric Actuator.....	6
Table 5:	SW Identification of M8000 Series Electric Actuator	7
Table 6:	Technical Report.....	9
Table 8:	Basic safety standards	10
Table 9:	Associated safety standards.....	10
Table 10:	Electrical safety standards.....	10
Table 11:	Environmental testing standards	11
Table 12:	Electromagnetic compatibility standards.....	11
Table 13:	Safety information standards.....	11
Table 14:	Quality Management System	11

Modification History

Rev.	Status	Date	Author	Modification / Description
1.0	Active	2023-11-22	Franz Seika	-

Table 1: Modification history

1 Target of Evaluation (ToE)

In March 2021 Chongqing Chuanyi Automation Co.,Ltd Actuator Filiale requested TÜV SÜD Rail GmbH to test and certify the M8000 Series Electric Actuator according to the standard listed in clause 4 of this report. The project number related to this Technical Report is 717522849.

The ToE is a product used in safety related applications. The M8000 Series Electric Actuator is a Safety Component approved for

- SIL 2(SC3) according to IEC 61508

2 Scope of Testing

2.1 Test Specimen

The M8000 Series Electric Actuator is built up in a 1oo1D architecture realizing following safety functions:

- ESD (Emergency Shut Down)
- According to the de-energization principle, under normal circumstances, if there is no need to perform the ESD function, the SIS system will provide a high level (+15VDC~+30VDC) to the ESD input channel of the actuator; When ESD function is demanded, the SIS system control command becomes an open circuit or logic low level (-3VDC~+5VDC), and the electric actuator executes the ESD function immediately.

The M8000 Series Electric Actuator is a multi-turn electric actuator with built-in intelligent controller. The electric head adopts worm gear and worm structure, and a gearbox can be attached to meet the needs of different torques. It is typically used in electric power, metallurgy, petroleum, chemical industry, building materials, urban water supply, sewage treatment and other industries.

The control unit receives 4-20mA control signal or switch value and drives the motor to rotate. The motor drives the worm, and the worm drives the worm gear to drive the output shaft to rotate. The position sensor detects the displacement of the motor rotation and sends the valve position signal to the CPU board. When the position signal is detected to be consistent with the position specified by the given control signal, the motor power is cut off, and the self-locking characteristics of the worm gear and worm keep the actuator at the specified opening position.

2.2 Nomenclature and Identification of M8000 Series Electric Actuator

The M8000 Series Electric Actuator tested is identified by the nomenclature as follows:

<u>M</u>	<u>8</u>	<u>3</u>	<u>1</u>	<u>0</u>	<u>d</u>
I	II	III	IV	V	VI

Key	No.	Content
Model Name	I	M: M series electric actuator
Output mode	II	8: Multi-turn
Control module	III	3: Intelligent switch type 4: Intelligent adjustment type
Output torque	IV	1: 60 N.m; 2: 120 N.m; 3: 250 N.m; 4: 450 N.m;

		5: 600 N.m; 6: 900 N.m
Output speed	V	0: 36 r/min
Environment (non-safety related)	VI	Blank: non-explosion-proof; d: Explosion-proof.

Table 2: Nomenclature of M8000 Series Electric Actuator

Item	Specification
Rated input	380-400VAC, 3P, 50Hz
Temperature range	-40 ~ +70°C
Humidity	Below 95%RH
Altitude	Below 2000m

Table 3: Electrical Parameters

The M8000 Series Electric Actuator tested is identified by hardware as follows:

Name	Date	HW	Remarks
CPU board ME0351020.pdf	2022-04-29	ME0351020 rev 00	CPU board schematic
CPU board PCB layout ME8530164.pdf	2022-01-19	ME8530164 rev 01	CPU board layout
signal board ME0351008.pdf	2022-01-19	ME0351008 rev 01	Signal board schematic
signal board PCB layout ME8530097F.pdf	2022-01-19	ME8530097F rev 01	Signal board layout
filter board ME0351001.pdf	2022-01-19	ME0351001 rev 01	Filter board schematic
filter board PCB layout ME8530004 .pdf	2022-01-19	ME8530004 rev 01	Filter board layout
drive board ME0351010.pdf	2022-01-19	ME0351010 rev 01	Drive board schematic
drive board PCB layout ME8530014.pdf	2022-07-07	ME8530014 rev 01	Drive board layout
hall position sample board ME0351066F.pdf	2022-01-19	ME0351066F rev01	Hall position sample board schematic
hall position sample board PCB layout ME8530085F.pdf	2022-01-19	ME8530085F rev01	Hall position sample board layout

Table 4: HW Identification of M8000 Series Electric Actuator

The M8000 Series Electric Actuator tested is identified by software version as follows:

Name	Date	SW	Remarks
Sil_m8000 V1.05	2022-09-29	Sil_m8000 V1.05	CRC: 0xE267B6CC

Table 5: SW Identification of M8000 Series Electric Actuator

3 Certification Requirements

The certification of the M8000 Series Electric Actuator 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)
 - Analysis of the software
 - 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.
CC99094T	Technical Report	717522849
Safety related requirements, conditions and restrictions can be found in the following user documentation		
M8000 series safety manual V012207	Safety Manual	V012207
m83,m84d series operation manual v092208	Operation Manual	v092208

Table 6: Technical Report

Based on the specified purpose of use of the M8000 Series Electric Actuator 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 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 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/ programmable electronic safety-related systems
/N3/	IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 3: Software requirements

Table 8: Basic safety standards

No.	Reference	Description
/N4/	IEC 61511-1:2016 + AMD1:2017	Functional safety - Safety instrumented systems for the process industry sector – Part 1: Framework, definitions, system, hardware and application programming requirements

Table 9: Associated safety standards

4.2 Electrical Safety

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

No.	Reference	Description
/N5/	IEC 61010-1:2010 + AMD1:2016 + COR1:2019	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements

Table 10: Electrical safety standards

4.3 Environmental Testing

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

No.	Reference	Description
/N6/	IEC 60529:1989 + AMD2:2013 + COR1:2019	Degrees of protection provided by enclosures (IP Code)

Table 11: Environmental testing standards

4.4 Electromagnetic Compatibility

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

No.	Reference	Description
/N7/	IEC 61326-3-2:2017	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 3-2: Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) – Industrial applications with specified electromagnetic environment

Table 12: Electromagnetic compatibility standards

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

No.	Reference	Description
/N8/	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

Table 13: Safety information standards

4.6 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_04.53 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 14: Quality Management System



Rail

5 Results

5.1 Functional Safety

The tests performed and quality assurance measures implemented by the Chongqing Chuanyi Automation Co.,Ltd Actuator Filiale have shown that the M8000 Series Electric Actuator 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 2(SC3) in accordance with IEC 61508

6 Implementation Conditions and Restrictions

The use of the M8000 Series Electric Actuator 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 M8000 Series Electric Actuator 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.
- The operating conditions like lifetime or operating temperature as specified in the user documentation shall be met.
- The procedures of modification of safety related data and components described in the user manual have to be followed.
- The maintenance and repair instructions described in the instruction manual of the M8000 Series Electric Actuator have to be followed.

7 Certificate Number

This report specifies technical details and implementation conditions required for the application of M8000 Series Electric Actuator to the certificate:

Z10 002759 0001 Rev. 00

Technical Certifier