

SIL



Functional Safety Certificate

No. 0P230704.ZTATC13

Certificate's Holder: Zhejiang Theoborn Auto-Control Valve Ltd.
No.119, 4th road, 3rd avenue, Binhai industrial zone, economic and technical, Wenzhou, China.

Product: Pneumatic Actuator
Model(s): (see the following annex)

Standard: Has been assessed per the relevant requirements of:
IEC 61508 Parts 1-7:2010, IEC 61511-1:2003+Carr.1:2004
And meets requirements providing a level of integrity to:
Systematic Capability: SC 3(SIL 3 Capable)
Random Capability: Type A Element
SIL 2 @ HFT=0, SIL 3 @ HFT=1; Route 2h
PFD_{AVG} and Architecture Constraints must be verified each application

***Safety function:**

The actuator is a Pneumatic operator for remote actuation of valves, The operation (90° -120° or 180° rotation) may be connected by different methods:

- Direct mounting of solenoid valves (5/2 for double acting, 3/2 for spring return) to pressure connections 2 and 4.
- Screwed connection (to pressure connection 2 and 4) with air lines from separate control cabinet, the standard rotation is Clockwise to close, counter-clockwise rotation is obtained when port 2 is pressurized, for Actuator marked LF the rotation is counterclockwise to close, clockwise rotation is obtained when port 2 is pressurized.

*** Specific requirements:**

The unit must be properly designed into a Safety Instrumented Function per the Safety Manual requirements.

* Is suitable to be safety function according to the description and the configuration defined in Annex I

Verification Mark:



The Verification Mark can be affixed on the product. It is NOT permitted to alter the Verification Mark in any way

Remark: This SIL Verification of Compliance has been issued on a voluntary basis. ECM confirms that a Test Report is existent for the above listed product(s) and found to meet the requirements of above standards for application in safety related system up to Safety Level of **SIL 3**. The unit must be properly designed into a Safety Instrument Function as per the requirements in the Safety Manual. The Verification Mark shown above can be affixed on the product. It is NOT permitted to alter the Verification Mark in any way. In addition the Verification's Holder is NOT allowed to transfer the Verification to third parties. This certificate can be checked for validity at www.entecerma.it

Date of issue 04 July 2023

Expiry date 03 July 2028

For online check:



Approver
Ente Certificazione Macchine
Legal Representative
Luca Bedonni



Ente Certificazione Macchine



Annex I

No. 0P230704.ZTATC13

1. SC 3 (SIL 3 Capability):
The product has met manufacturer design process requirements of Safety Integrity Level (SIL) 3. These are intended to achieve sufficient integrity against systematic errors of design by the manufacturer.

2. The product version of hardware components used for validation and type tests are the following:

Product:	Pneumatic Actuator
Model(s):	TBN032DA(SR), TBN052DA(SR), TBN063DA(SR), TBN075DA(SR), TBN083DA(SR), TBN092DA(SR), TBN105DA(SR), TBN125DA(SR), TBN140DA(SR), TBN160DA(SR), TBN190DA(SR), TBN210DA(SR), TBN240DA(SR), TBN270DA(SR), TBN300DA(SR), TBN350DA(SR), TBN400DA(SR), TBNS052DA(SR), TBNS063DA(SR), TBNS075DA(SR), TBNS083DA(SR), TBNS092DA(SR), TBNS105DA(SR), TBNS125DA(SR), TBNS140DA(SR), TBNS160DA(SR), TBNS190DA(SR), TBNS210DA(SR), TBNS240DA(SR), TBNS270DA(SR), TBN II 032DA(SR), TBN II 052DA(SR), TBN II 063DA(SR), TBN II 075DA(SR), TBN II 083DA(SR), TBN II 092DA(SR), TBN II 105DA(SR), TBN II 125DA(SR), TBN II 140DA(SR), TBN II 160DA(SR), TBN II 190DA(SR), TBN II 210DA(SR), TBN II 240DA(SR), TBN II 270DA(SR), TBN II 300DA(SR), TBN II 350DA(SR), TBN II 400DA(SR), BP-065-DA(SR), BP-085-DA(SR), BP-100-DA(SR), BP-130-DA(SR), BP-160-DA(SR), BP-200-DA(SR), BP-270-DA(SR), BP-350-DA(SR).

3. A Safety Instrumented Function (SIF) designed with this product must not be used at a SIL level higher than stated.

4. Random Capability:
The SIL limit imposed by the Architectural Constraints for each element.

5. IEC 61508 Failure Rates in FIT*
For product used in a final element assembly, SIL must be verified for the specific application using the following failure rate data.

Failure rates for the product in FIT*

Model	Failure Category	λ_{sd}	λ_{su}	λ_{dd}	λ_{du}
See the above	Stay put	0	83	0	6
	ESD Open	226	122	73	3
	ESD Close	208	132	96	3

6. SIL Verification:
The Safety Integrity Level (SIL) of an entire Safety Instrumented Function (SIF) must be verified via a calculation of PFD_{AVG} considering redundant architectures, proof test interval, proof test effectiveness, any automatic diagnostics, average repair time and the specific failure rates of all products included in the SIF. Each subsystem must be checked to assure compliance with minimum hardware fault tolerance (HFT) requirements.

* FIT = 1 failure / 10E9 hours