Certificate

No.: 968/V 1127.00/19

Product tested	Pneumatic Actuators	**Certificate holder**	CHAODA VALVES GROUP Co., Ltd. Jiangbei Street, Oubei Yongjia, Zhejiang 325105 P.R. China
Type designation	Scotch Yoke Type Pneumatic Actuator CDY-ax-yyy-bcd/CDY-ax-yyy-bcdz, Spur Gears & Rack Pneumatic Actuator CDSxxxab/CDSxxxabcyy (For detailed information see test report)		
Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010		
Intended application	Safety Function: On demand, the complete pneumatic actuator assembly actuate a valve into a safety position. The safety position of the actuator can correspond to either "closed" or "open". The actuators are suitable for use in a safety instrumented system up to SIL 2 (low demand mode). Under consideration of the minimum required hardware fault tolerance HFT = 1 the actuators may be used in a redundant architecture up to SIL 3.		
Specific requirements	The instructions of the associated Installation, Operating and Safety Manual shall be considered.		

Valid until 2023-09-27

The issue of this certificate is based upon an examination, whose results are documented in Report No. 968/V 1127.00/19 dated 2019-09-02.
This certificate is valid only for products which are identical with the product tested.

Köln, 2019-09-02

TÜV Rheinland Industrie Service GmbH
Bereich Automation
Funktionale Sicherheit
Am Grauen Stein, 51105 Köln
Certification Body Safety & Security for Automation & Grid

Dipl.-Ing. Thomas Steffens

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Holder: **CHAODA VALVES GROUP CO., LTD.**
Jiangbei Street, Oubei Yongjia
Zhejiang, 325105
P.R. China

Product tested: **Pneumatic Actuators**
Scotch Yoke Type Pneumatic Actuator
CDY-ax-yyy-bcd/CDY-ax-yyy-bcdz,
Spur Gears & Rack Pneumatic Actuator
CDSxxxab/CDSxxxabcyy
(For detailed information see test report)

Results of Assessment

Route of Assessment		2_H / 1_S	
Type of Sub-system		Type A	
Mode of Operation		Low Demand Mode	
Hardware Fault Tolerance	HFT	0	
Type of Design		Single Acting	Double Acting
Lambda Dangerous confidence level of calculation 1-α = 95 %	λ_D	249 FIT	498 FIT
Lambda Dangerous Undetected assumed Diagnostic Coverage DC = 0 %	λ_{DU}	249 FIT	498 FIT
Average Probability of Failure on Demand 1oo1 assumed Proof Test Interval T_1 = 1 year	**$PFD_{avg}(T_1)$**	**1,09 E-03**	**2,18 E-03**
Average Probability of Failure on Demand 1oo2 assumed Proof Test Interval T_1 = 1 year assumed β_{1oo2} = 10 %	**$PFD_{avg}(T_1)$**	**1,10 E-04**	**2,20 E-04**

Origin of values

The stated values are the results of extensive qualification tests on the reliability of the safety function under critical conditions.
Random and systematic failures which are the responsibility of the manufacturer were examined.

Systematic Capability

The development and manufacturing process and the functional safety management applied by the manufacturer in the relevant lifecycle phases of the product have been audited and assessed as suitable for the manufacturing of products for use in applications with a maximum Safety Integrity Level of 3 (SC3).

Periodic Tests and Maintenance

The given values require periodic tests and maintenance as described in the Safety Manual. The operator is responsible for the consideration of specific external conditions (e.g. ensuring of required quality of media, max. temperature, time of impact), and adequate test cycles.