

Certificate



SIL/PL
Capability

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ID 0600000000

No.: 968 V 1154.00/20

Product tested	Pneumatic Rotatory Actuators	Certificate holder	bar pneumatische Steuerungssysteme GmbH Auf der Hohl 1 53547 Dattenberg Germany
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Type designation	actubar (AS - single acting/ AD double acting) agturn (GS - single acting/ GD double acting)
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Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010
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Intended application	Safety functions: - Move a valve to it´s safe position by internal spring force (single acting actuators) - Move a valve to it´s safe position by external pressure supply (double acting actuators) - Stay Put in it´s current position 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.
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Specific requirements	The instructions of the associated Installation, Operating and Safety Manual shall be considered.
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Summary of test results see back side of this certificate.

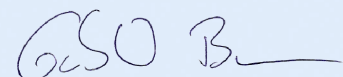
Valid until 2025-03-21

The issue of this certificate is based upon an examination, whose results are documented in Report No. 968/V 1154.00/20 dated 2020-03-21.
This certificate is valid only for products which are identical with the product tested.

TÜV Rheinland Industrie Service GmbH
Bereich Automation
Funktionale Sicherheit
Am Grauen Stein, 51105 Köln

Köln, 2020-03-21

Certification Body Safety & Security for Automation & Grid


Dipl.-Ing. Gebhard Bouwer

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Precisely Right.

Holder: bar pneumatische Steuerungssysteme GmbH
Auf der Hohl 1
53547 Dattenberg

Product tested: pneumatic rotary actuators
Type series actubar (AD/AS)

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

Safety Function: Single Acting - Spring return

Lambda Dangerous Undetected ¹	λ_{DU}	2.10 E-07 / h	210 FIT
Average Probability of Failure on Demand 1oo1²	PFD_{avg}(T₁)	9.18 E-04	
Average Probability of Failure on Demand 1oo2³	PFD_{avg}(T₁)	9.28 E-05	

Safety Function: Double Acting

Lambda Dangerous Undetected ¹	λ_{DU}	3.15 E-07 / h	315 FIT
Average Probability of Failure on Demand 1oo1²	PFD_{avg}(T₁)	1.38 E-03	
Average Probability of Failure on Demand 1oo2³	PFD_{avg}(T₁)	1.40 E-04	

Safety Function: Stay put⁴

Lambda Dangerous Undetected ¹	λ_{DU}	4.46 E-07 / h	446 FIT
Average Probability of Failure on Demand 1oo1²	PFD_{avg}(T₁)	1.95 E-03	
Average Probability of Failure on Demand 1oo2³	PFD_{avg}(T₁)	2.00 E-04	

¹ confidence level of calculation $1-\alpha = 95\%$ and assumed Diagnostic Coverage DC = 0 %

² assumed Proof Test Interval $T_1 = 1$ year

³ assumed Proof Test Interval $T_1 = 1$ year and $\beta_{1oo2} = 10\%$

⁴ under consideration of internal and external tightness, additional components for this safety function not part of the evaluation

Origin of values

The failure rate was derived using the FMEDA method. Random failures, which are the responsibility of the manufacturer, were investigated. In addition, the values given were validated on the basis of the results of supplementary qualification tests on the reliability of the safety function under critical conditions and the evaluation of field experience over the last 10 years.

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 inspected and assessed as suitable for the manufacturing of products for use in applications with a maximum Safety Integrity Level of 3 (SC 3).

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.

Holder: bar pneumatische Steuerungssysteme GmbH
Auf der Hohl 1
53547 Dattenberg

Product tested: pneumatic rotary actuators
Type series agturn (GD/GS)

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

Safety Function: Single Acting - Spring return

Lambda Dangerous Undetected ¹	λ_{DU}	2.87 E-07 / h	287 FIT
Average Probability of Failure on Demand 1oo1 ²	$PFD_{avg}(T_1)$	1.26 E-03	
Average Probability of Failure on Demand 1oo2 ³	$PFD_{avg}(T_1)$	1.28 E-04	

Safety Function: Double Acting

Lambda Dangerous Undetected ¹	λ_{DU}	4.12 E-07 / h	412 FIT
Average Probability of Failure on Demand 1oo1 ²	$PFD_{avg}(T_1)$	1.80 E-03	
Average Probability of Failure on Demand 1oo2 ³	$PFD_{avg}(T_1)$	1.84 E-04	

Safety Function: Stay put⁴

Lambda Dangerous Undetected ¹	λ_{DU}	5.98 E-07 / h	598 FIT
Average Probability of Failure on Demand 1oo1 ²	$PFD_{avg}(T_1)$	2.62 E-03	
Average Probability of Failure on Demand 1oo2 ³	$PFD_{avg}(T_1)$	2.70 E-04	

¹ confidence level of calculation 1- α = 95 % and assumed Diagnostic Coverage DC = 0 %

² assumed Proof Test Interval T_1 = 1 year

³ assumed Proof Test Interval T_1 = 1 year and β_{1oo2} = 10 %

⁴ under consideration of internal and external tightness, additional components for this safety function not part of the evaluation

Origin of values

The failure rate was derived using the FMEDA method. Random failures which are the responsibility of the manufacturer were investigated. In addition, the values given were validated on the basis of the results of supplementary qualification tests on the reliability of the safety function under critical conditions.

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