Certificate

SIL/PL Capability

TÜVRheinland CERTIFIED

www.tuv.com
ID 0600000000

No.: 968/V 1054.00/18

Product tested	Pneumatic actuator for valves with safety function (std. 90° single / double, rotation angles 120°/135°/145°/180°, fast acting, travel stop, hydr. dampened, fail mid, stainless steel, 3 positions 180°/90°/0)	**Certificate holder**	Air Torque S.p.A. Via dei Livelli Sopra, 11 24060 Costa di Mezzate Italy
Type designation	AT Upgrade R&P aluminum series, PT R&P aluminum series, SB/SC AT Stainless steel R&P series, different variants see pages 2 - 6 of this certificate		
Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010		
Intended application	Safety function: Actuate the valve into a safety position The actuators are suitable for use in a safety instrumented system up to SIL 2. 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.		

Summary of test results see pages 2 - 6 of this certificate.

Valid until 2023-04-04

The issue of this certificate is based upon an examination, whose results are documented in Report No. 968/V 1054.00/18 dated 2018-04-04.
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, 2018-04-04

Certification Body Safety & Security for Automation & Grid

Dipl.-Ing. Stephan Häb

TÜV Rheinland Industrie Service GmbH, Am Grauen Stein, 51105 Köln / Germany
Tel.: +49 221 806-1790, Fax: +49 221 806-1539, E-Mail: industrie-service@de.tuv.com

TÜVRheinland®
Precisely Right.

Holder: **AIR TORQUE S.p.A.**
Via dei Livelli Sopra, 11
24060 Costa di Mezzate (Bergamo)
Italy

Product tested: **AT045..U D to AT1000/1/4..U D**
AT045..U S to AT1000/1/4..U S
PT045.. D to PT1000/1/4.. D
PT045.. S to PT1000/1/4.. S
(STD 90°, single / double acting)

Results of Assessment

Route of Assessment		2_H / 1_S
Type of Sub-system		Type A
Modes of Operation		Low and High Demand Mode
Hardware Fault Tolerance	HFT	0

Low Demand Mode

Lambda Dangerous confidence level of calculation 1-α = 95 %	λ_D	1.00 E-08 / h	10 FIT
Lambda Dangerous Undetected assumed Diagnostic Coverage DC = 0 %	λ_{DU}	1.00 E-08 / h	10 FIT
Mean Time To Dangerous Failure	$MTTF_D$	1.00 E+08 h	11,416 a
Average Probability of Failure on Demand 1oo1 assumed Proof Test Interval T_1 = 1 year	**$PFD_{avg}(T_1)$**	**4.38 E-05**	
Average Probability of Failure on Demand 1oo2 assumed Proof Test Interval T_1 = 1 year assumed β_{1oo2} = 10 %	**$PFD_{avg}(T_1)$**	**4.38 E-06**	

High Demand Mode

Average Frequency of a Dangerous Failure per Hour	**PFH**	**4.56 E-07 / h**
Maximum number of demands	$n_{op,max}$	50 / a

Origin of values

The stated values are the results of extensive qualification tests on the reliability of the safety function under critical conditions. In addition, the failure rate was verified by the analysis of field feedback.
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 (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.

TÜVRheinland®
Precisely Right.

Holder: **AIR TORQUE S.p.A.**
Via dei Livelli Sopra, 11
24060 Costa di Mezzate (Bergamo)
Italy

Product tested: **AT052..U D/S to AT1002..U D/S (120°)**
PT052.. D/S to PT1002.. D/S (120°)
AT053..U D/S to AT1003..U D/S (135°)
PT053.. D/S to PT1003.. D/S (135°)
AT055..U D/S to AT1005..U D/S (145°)
PT055.. D/S to PT1005.. D/S (145°)
AT058..U D/S to AT1008..U D/S (180°)
PT058.. D/S to PT1008.. D/S (180°)
(rotation angle, single / double acting)

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	
Lambda Dangerous confidence level of calculation 1-α = 95 %	λ_D	1.00 E-08 / h	10 FIT
Lambda Dangerous Undetected assumed Diagnostic Coverage DC = 0 %	λ_{DU}	1.00 E-08 / h	10 FIT
Mean Time To Dangerous Failure	$MTTF_D$	1.00 E+08 h	11,416 a
Average Probability of Failure on Demand 1oo1 assumed Proof Test Interval T_1 = 1 year	**$PFD_{avg}(T_1)$**	**4.38 E-05**	
Average Probability of Failure on Demand 1oo2 assumed Proof Test Interval T_1 = 1 year assumed β_{1oo2} = 10 %	**$PFD_{avg}(T_1)$**	**4.38 E-06**	

Origin of values
The stated values are the results of extensive qualification tests on the reliability of the safety function under critical conditions. In addition, the failure rate was verified by the analysis of field feedback.
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 (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.

TÜVRheinland®
Precisely Right.

Holder: **AIR TORQUE S.p.A.**
Via dei Livelli Sopra, 11
24060 Costa di Mezzate (Bergamo)
Italy

Product tested: **FA AT045..U D to FA AT1000/1/4..U D**
FA AT045..U S to FA AT1000/1/4..U S
FA PT045.. D to FA PT1000/1/4.. D
FA PT045.. S to FA PT1000/1/4.. S
(fast acting, single / double acting)

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	
Lambda Dangerous confidence level of calculation 1-α = 95 %	λ_D	1.00 E-08 / h	10 FIT
Lambda Dangerous Undetected assumed Diagnostic Coverage DC = 0 %	λ_{DU}	1.00 E-08 / h	10 FIT
Mean Time To Dangerous Failure	$MTTF_D$	1.00 E+08 h	11,416 a
Average Probability of Failure on Demand 1oo1 assumed Proof Test Interval T_1 = 1 year	**$PFD_{avg}(T_1)$**	**4.38 E-05**	
Average Probability of Failure on Demand 1oo2 assumed Proof Test Interval T_1 = 1 year assumed β_{1oo2} = 10 %	**$PFD_{avg}(T_1)$**	**4.38 E-06**	

Origin of values

The stated values are the results of extensive qualification tests on the reliability of the safety function under critical conditions. In addition, the failure rate was verified by the analysis of field feedback.
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 (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.

TÜVRheinland®
Precisely Right.

Holder: **AIR TORQUE S.p.A.**
Via dei Livelli Sopra, 11
24060 Costa di Mezzate (Bergamo)
Italy

Product tested: **R50/100 AT045..U D to R50/100 AT1000/1/4..U D**
R50/100 AT045..U S to R50/100 AT1000/1/4..U S
R50/100 PT045.. D to R50/100 PT1000/1/4.. D
R50/100 PT045.. S to R50/100 PT1000/1/4.. S
(travel stop, single / double acting)

Results of Assessment

Route of Assessment		2_H / 1_S
Type of Sub-system		Type A
Modes of Operation		Low and High Demand Mode
Hardware Fault Tolerance	HFT	0

Low Demand Mode

Lambda Dangerous confidence level of calculation 1-α = 95 %	λ_D	1.00 E-08 / h	10 FIT
Lambda Dangerous Undetected assumed Diagnostic Coverage DC = 0 %	λ_{DU}	1.00 E-08 / h	10 FIT
Mean Time To Dangerous Failure	$MTTF_D$	1.00 E+08 h	11,416 a
Average Probability of Failure on Demand 1oo1 assumed Proof Test Interval T_1 = 1 year	**$PFD_{avg}(T_1)$**	**4.38 E-05**	
Average Probability of Failure on Demand 1oo2 assumed Proof Test Interval T_1 = 1 year assumed β_{1oo2} = 10 %	**$PFD_{avg}(T_1)$**	**4.38 E-06**	

High Demand Mode

Average Frequency of a Dangerous Failure per Hour	**PFH**	**7.54 E-09 / h**
Maximum number of demands	$n_{op,max}$	50 / a

Origin of values

The stated values are the results of extensive qualification tests on the reliability of the safety function under critical conditions. In addition, the failure rate was verified by the analysis of field feedback.
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 (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.

TÜVRheinland®
Precisely Right.

Holder: **AIR TORQUE S.p.A.**
Via dei Livelli Sopra, 11
24060 Costa di Mezzate (Bergamo)
Italy

Product tested: **HC AT051/054 to HC AT1001/1004 (hydraulic dampened)**
HC PT050/1/4 to HC PT1000/1/4 (hydraulic dampened)
FM AT058 to FM AT1008 (fail mid)
FM PT058 to FM PT1008 (fail mid)
SB/SC AT051/054 to SB/SC AT1001/1004 (stainless steel)
SB/SC PT050/1/4 to SB/SC PT1000/1/4 (stainless steel)
3P/3PD AT058 to 3P/3PD AT1008 (3 position 180°)
3P/3PD PT058 to 3P/3PD PT1008 (3 position 180°)
3P/3PD AT051/054 to 3P/3PD AT1001/1004 (3 position 90°)
3P/3PD PT050/1/4 to 3P/3PD PT1000/14 (3 position 90°)

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	
Lambda Dangerous confidence level of calculation 1-α = 95 %	λ_D	1.00 E-08 / h	10 FIT
Lambda Dangerous Undetected assumed Diagnostic Coverage DC = 0 %	λ_{DU}	1.00 E-08 / h	10 FIT
Mean Time To Dangerous Failure	$MTTF_D$	1.00 E+08 h	11,416 a
Average Probability of Failure on Demand 1oo1 assumed Proof Test Interval T_1 = 1 year	**$PFD_{avg}(T_1)$**	**4.38 E-05**	
Average Probability of Failure on Demand 1oo2 assumed Proof Test Interval T_1 = 1 year assumed β_{1oo2} = 10 %	**$PFD_{avg}(T_1)$**	**4.38 E-06**	

Origin of values
The stated values are the results of extensive qualification tests on the reliability of the safety function under critical conditions. In addition, the failure rate was verified by the analysis of field feedback.
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 (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.

Certificate

SIL/PL Capability

TÜVRheinland® CERTIFIED

www.tuv.com
ID 0600000000

No.: 968/V 1075.00/18

Product tested	Pneumatic and Hydraulic Actuators	**Certificate holder**	Air Torque S.p.A. Via dei Livelli Sopra, 11 24060 Costa di Mezzate Italy
Type designation	AT-HD – SR and AT-HD – DA Models: 065, 085, 100, 130, 160, 200		
Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010		
Intended application	Safety Function: Type SR (Spring Return): Safe closing due to internal energy storage when external power supply fails or is removed Type DA (Double Action): Safe closing/opening when operating command fails or is removed meanwhile the safe command is triggered The assessment based on the certification program of the Certification Body comes to the result that the actuators meet the requirements of IEC 61508:2010 and are therefore 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 acc. IEC 61511.		
Specific requirements	The instructions of the associated Installation, Operating and Safety Manual shall be considered.		

Summary of test results see back side of this certificate.

Valid until 2023-11-07

The issue of this certificate is based upon an examination, whose results are documented in Report No. 968/V 1075.00/18 dated 2018-09-20.
This certificate is valid only for products which are identical with the product tested.

Köln, 2018-11-07

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

Dr.-Ing. Thorsten Gantevoort

TÜV Rheinland Industrie Service GmbH, Am Grauen Stein, 51105 Köln / Germany
Tel.: +49 221 806-1790, Fax: +49 221 806-1539, E-Mail: industrie-service@de.tuv.com

www.fs-products.com
www.tuv.com

DAkkS Deutsche Akkreditierungsstelle D-ZE-11052-02-01

TÜVRheinland® Precisely Right.

TÜVRheinland®
Precisely Right.

Holder: **Air Torque SpA**
Via dei Livelli di Sopra, 11
I – 24060 – Costa di Mezzate (BG)
Italy

Product tested: **Heavy Duty Pneumatic and Hydraulic Actuators**
AT-HD - SR/DA
Models: 065, 085, 100, 130, 160, 200

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		
	Power module	**Pneumatic without tie rod**	**Pneumatic with tie rod**	**Hydraulic**
		Single Acting		
Lambda Dangerous confidence level of calculation 1-α = 95 %	λ_D	226 FIT	226 FIT	160 FIT
Average Probability of Failure on Demand assumed Diagnostic Coverage DC = 0 % assumed Proof Test Interval T_1 = 1 year assumed β_{1oo2} = 10 %	**1oo1 $PFD_{avg}(T_1)$**	**9.91 E-04 / h**	**9.91 E-04 / h**	**7.03 E-04 / h**
	1oo2 $PFD_{avg}(T_1)$	**1.04 E-04 / h**	**1.04 E-04 / h**	**7.09 E-05 / h**
		Double Acting		
Lambda Dangerous confidence level of calculation 1-α = 95 %	λ_D	317 FIT	302 FIT	125 FIT
Average Probability of Failure on Demand assumed Diagnostic Coverage DC = 0 % assumed Proof Test Interval T_1 = 1 year assumed β_{1oo2} = 10 %	**1oo1 $PFD_{avg}(T_1)$**	**1.39 E-03 / h**	**1.32 E-03 / h**	**5.46 E-04 / h**
	1oo2 $PFD_{avg}(T_1)$	**1.41 E-04 / h**	**1.34 E-04 / h**	**5.49 E-05 / h**

Available Options

If an actuator is used with an override system the following failure rates have to be added:

If an pneumatic actuator is used with Quick & Damper System (Q & D) the following failure rate has to be added:

	Override Systems		Quick & Damper
	Bevel Gear	Hydr. Pump	
λ_D	127 FIT	57 FIT	
λ_D			53 FIT

Origin of values

The stated values are the results of extensive qualification tests on the reliability of the safety function under critical conditions and a FMEDA. 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 (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.