

Certificate



Nr./No.: V 246.21/15

Prüfgegenstand Product tested	Pneumatischer Schwenkantrieb für Armaturen mit Sicherheitsfunktion Pneumatic actuator for valves with safety function (std. 90° single / double, rotation angle 120°/135°/145°/180°, fast acting, travel stop, hydr. dampened, fail mid, stainless steel, 3 position 180°/90°)	Zertifikatsinhaber Certificate holder	Air Torque S.p.A. Via dei Livelli di Sopra, 11 24060 Costa di Mezzate Italy
Typbezeichnung Type designation	xxx xxx AT/PT xxx x x..xx weitere Varianten siehe Anhang des Zertifikats further variations see annex of certificate		
Prüfgrundlagen Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010	IEC 61511 Parts 1-3:2004	
Bestimmungsgemäße Verwendung Intended application	Sicherheitsfunktion: Verfahren einer Armatur in eine Sicherheitsposition Die ermittelten Kennwerte zur Ausfallwahrscheinlichkeit lassen einen Einsatz in sicherheitsgerichteten Systemen bis SIL 3 nach IEC 61508 zu. Einschränkungen hinsichtlich der erforderlichen Hardware-Fehlertoleranz (HFT) aus den zutreffenden Anwendungsnormen wie z.B. IEC 61511 müssen für den konkreten Einsatz berücksichtigt werden. Safety function: Actuate a valve into a safety position The achieved failure rates allow the usage of the actuators in safety related systems up to SIL 3 according IEC 61508. Constraints concerning the requested HFT defined in the relevant application standards e.g. IEC 61511 have to be considered.		
Besondere Bedingungen Specific requirements	Die Hinweise in der zugehörigen Installations- und Betriebsanleitung sind zu beachten. The instructions of the associated Installation and Operating Manual shall be considered.		
Zusammenfassung der Testergebnisse siehe Anhang. Summary of test results see annex of this certificate.			
Gültig bis / Valid until 2020-02-02			

Der Ausstellung dieses Zertifikates liegt eine Prüfung zugrunde, deren Ergebnisse im Bericht Nr. V 246.20/15 vom 02.02.2015 dokumentiert sind.

Dieses Zertifikat ist nur gültig für Erzeugnisse, die mit dem Prüfgegenstand übereinstimmen. Es wird ungültig bei jeglicher Änderung der Prüfgrundlagen für den angegebenen Verwendungszweck.

The issue of this certificate is based upon an examination, whose results are documented in Report No. V 246.20/15 dated 2015-02-02.

This certificate is valid only for products which are identical with the product tested. It becomes invalid at any change of the codes and standards forming the basis of testing for the intended application.

TÜV Rheinland Industrie Service GmbH

Bereich Automation
Funktionale Sicherheit

Am Grauen Stein, 51105 Köln

Köln, 2015-02-02

Certification Body for FS-Products

Dipl.-Ing. Stephan Häb

Manufacturer **Air Torque S.P.A.**
Via dei Livelli di 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..B D to PT1000/1/4..B D
PT045..B S to PT1000/1/4..B S
(STD 90°, single / double acting)

Device-Specific Values

Probability of Dangerous Failure on Demand	PFD_{spec}	1.32 E-06
Test Interval	T_i	1 a
Confidence Level	$1-\alpha$	95 %
Safe Failure Fraction	SFF	90 %
Hardware Fault Tolerance	HFT	0
Diagnostic Coverage	DC	0 %
Type of Sub System		Type A
Mode of Operation		Low Demand
Proof Test Coverage	PTC	not considered
Partial Stroke Test Coverage	PSTC	not considered

Note

Derived Values for 1oo1-Architecture

Assumed Demands per Year	f_{np}	1 / a	1.14 E-04 / h
Total Failure Rate	$\lambda_S + \lambda_D$	1.37 E-09 / h	1 FIT
Lambda Dangerous Detected	λ_{DD}	0.00 E+00 / h	0 FIT
Lambda Dangerous Undetected	λ_{DU}	1.51 E-10 / h	0 FIT
Lambda Safe	λ_S	1.22 E-09 / h	1 FIT
Mean Time Between Failures	MTBF	7.29 E+08 h	83 249 a
Mean Time Between Dangerous Failures	MTBF _D	6.63 E+09 h	756 810 a
Average Probability of Failure on Demand	PFD_{avg}	6.61 E-07	

Time of Usage

A time of usage of more than 5 years (+ 1.5 years of storage) can only be favored under responsibility of the operator, consideration of specific external conditions (securing of required quality of media, max. temperature, time of impact), and adequate test cycles.

Quality Management

These statements are bound to a proven and verified deployment of safety-related quality management of the manufacturer.

Manufacturer **Air Torque S.P.A.**
Via dei Livelli di Sopra 11
24060 Costa di Mezzate (Bergamo), Italy

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

Device-Specific Values

Probability of Dangerous Failure on Demand	PFD_{spec}	1.44 E-04
Test Interval	T_i	1 a
Confidence Level	$1-\alpha$	95 %
Safe Failure Fraction	SFF	90 %
Hardware Fault Tolerance	HFT	0
Diagnostic Coverage	DC	0 %
Type of Sub System		Type A
Mode of Operation		Low Demand
Proof Test Coverage	PTC	not considered
Partial Stroke Test Coverage	PSTC	not considered

Derived Values for 1oo1-Architecture

Assumed Demands per Year	f_{np}	1 / a	1.14 E-04 / h
Total Failure Rate	$\lambda_S + \lambda_D$	5.48 E-08 / h	55 FIT
Lambda Dangerous Detected	λ_{DD}	0.00 E+00 / h	0 FIT
Lambda Dangerous Undetected	λ_{DU}	1.64 E-08 / h	16 FIT
Lambda Safe	λ_S	3.83 E-08 / h	38 FIT
Mean Time Between Failures	MTBF	1.83 E+07 h	2 084 a
Mean Time Between Dangerous Failures	MTBF _D	6.09 E+07 h	6 948 a
Average Probability of Failure on Demand	PFD_{avg}	7.20 E-05	

Time of Usage

A time of usage of more than 5 years (+ 1.5 years of storage) can only be favored under responsibility of the operator, consideration of specific external conditions (securing of required quality of media, max. temperature, time of impact), and adequate test cycles.

Quality Management

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Manufacturer **Air Torque S.P.A.**
Via dei Livelli di 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..B D to FA PT1000/1/4..B D
FA PT045..B S to FA PT1000/1/4..B S
(fast acting, single / double acting)

Device-Specific Values

Probability of Dangerous Failure on Demand	PFD_{spec}	2.16 E-04
Test Interval	T_i	1 a
Confidence Level	$1-\alpha$	95 %
Safe Failure Fraction	SFF	90 %
Hardware Fault Tolerance	HFT	0
Diagnostic Coverage	DC	0 %
Type of Sub System		Type A
Mode of Operation		Low Demand
Proof Test Coverage	PTC	not considered
Partial Stroke Test Coverage	PSTC	not considered

Derived Values for 1oo1-Architecture

Assumed Demands per Year	f_{np}	1 / a	1.14 E-04 / h
Total Failure Rate	$\lambda_S + \lambda_D$	2.24 E-07 / h	224 FIT
Lambda Dangerous Detected	λ_{DD}	0.00 E+00 / h	0 FIT
Lambda Dangerous Undetected	λ_{DU}	2.47 E-08 / h	25 FIT
Lambda Safe	λ_S	2.00 E-07 / h	200 FIT
Mean Time Between Failures	MTBF	4.46 E+06 h	509 a
Mean Time Between Dangerous Failures	$MTBF_D$	4.05 E+07 h	4 626 a
Average Probability of Failure on Demand	PFD_{avg}	1.08 E-04	

Time of Usage

A time of usage of more than 5 years (+ 1.5 years of storage) can only be favored under responsibility of the operator, consideration of specific external conditions (securing of required quality of media, max. temperature, time of impact), and adequate test cycles.

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Manufacturer **Air Torque S.P.A.**
Via dei Livelli di 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 AT045..B D to R50/100 AT1000/1/4..B D
R50/100 AT045..B S to R50/100 AT1000/1/4..B S
(travel stop, single / double acting)

Device-Specific Values

Probability of Dangerous Failure on Demand	PFD_{spec}	7.99 E-05
Test Interval	T_i	1 a
Confidence Level	$1-\alpha$	95 %
Safe Failure Fraction	SFF	90 %
Hardware Fault Tolerance	HFT	0
Diagnostic Coverage	DC	0 %
Type of Sub System		Type A
Mode of Operation		Low Demand
Proof Test Coverage	PTC	not considered
Partial Stroke Test Coverage	PSTC	not considered

Derived Values for 1oo1-Architecture

Assumed Demands per Year	f_{np}	1 / a	1.14 E-04 / h
Total Failure Rate	$\lambda_S + \lambda_D$	8.29 E-08 / h	83 FIT
Lambda Dangerous Detected	λ_{DD}	0.00 E+00 / h	0 FIT
Lambda Dangerous Undetected	λ_{DU}	9.12 E-09 / h	9 FIT
Lambda Safe	λ_S	7.38 E-08 / h	74 FIT
Mean Time Between Failures	MTBF	1.21 E+07 h	1 377 a
Mean Time Between Dangerous Failures	MTBF _D	1.10 E+08 h	12 521 a
Average Probability of Failure on Demand	PFD_{avg}	3.99 E-05	

Time of Usage

A time of usage of more than 5 years (+ 1.5 years of storage) can only be favored under responsibility of the operator, consideration of specific external conditions (securing of required quality of media, max. temperature, time of impact), and adequate test cycles.

Quality Management

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Manufacturer **Air Torque S.P.A.**
Via dei Livelli di 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 PT1000/1/4 (3 position 90°)

Device-Specific Values

Probability of Dangerous Failure on Demand	PFD_{spec}	6.39 E-06
Test Interval	T_i	1 a
Confidence Level	$1-\alpha$	90 %
Safe Failure Fraction	SFF	90 %
Hardware Fault Tolerance	HFT	0
Diagnostic Coverage	DC	0 %
Type of Sub System		Type A
Mode of Operation		Low Demand
Proof Test Coverage	PTC	not considered
Partial Stroke Test Coverage	PSTC	not considered

Derived Values for 1oo1-Architecture

Assumed Demands per Year	f_{np}	1 / a	1.14 E-04 / h
Total Failure Rate	$\lambda_S + \lambda_D$	6.63 E-09 / h	7 FIT
Lambda Dangerous Detected	λ_{DD}	0.00 E+00 / h	0 FIT
Lambda Dangerous Undetected	λ_{DU}	7.29 E-10 / h	1 FIT
Lambda Safe	λ_S	5.90 E-09 / h	6 FIT
Mean Time Between Failures	MTBF	1.51 E+08 h	17 214 a
Mean Time Between Dangerous Failures	MTBF _D	1.37 E+09 h	156 495 a
Average Probability of Failure on Demand	PFD_{avg}	3.20 E-06	

Time of Usage

A time of usage of more than 5 years (+ 1.5 years of storage) can only be favored under responsibility of the operator, consideration of specific external conditions (securing of required quality of media, max. temperature, time of impact), and adequate test cycles.

Quality Management

These statements are bound to a proven and verified deployment of safety-related quality management of the manufacturer.