

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

Certification Body for FS-Products

Köln, 2015-02-02

Dipl.-Ing. Stephan Häb

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CERTIFICATE OF CONFORMITY CERTIFICATO DI CONFORMITA'

FUNCTIONAL SAFETY SICUREZZA FUNZIONALE

Certificate Number
Certificato numero : 350379900.01

Issued to
Rilasciato a :

Air Torque S.p.a.

Manufacturer
Costruttore : **Air Torque S.p.a.**
Via dei Livelli di Sopra, 8/11,
I-24060 Costa di Mezzate Bergamo, Italy

Product Type
Tipo prodotto : **Scotch Yoke Actuators**

Model reference
Riferimento Modello : **AT-HD Series**

Technical report No.
Rapporto Tecnico Nr. : **350379900.50 Revision 0 of August , 05th , 2014 and 350379900.60 of December 22, 2015**

Requirements
Requisiti : **IEC 61508 ed. 2.0 (2010); Functional safety of electrical/electronic/programmable electronic safety-related systems**

Safety Function
Funzione di sicurezza : **The actuator will move to the designed safe position when de-energized/energized within the specified safety time.**

SIL3 capable - HFT=0 - Type A Subsystem

The undersigned declares that the above described product meets the above mentioned technical specification. This attestation of conformity is issued based on the results of the assessment as laid down in the referred Technical Report.
Il sottoscritto dichiara che il prodotto di cui sopra è conforme ai requisiti tecnici menzionati. Questo attestato di conformità è rilasciato sulla base dei risultati delle valutazioni riferite nel rapporto sopra menzionato.

**This certificate replaces the one having same No, dated 2014/10/07 (Attachment to the Certificate has been amended)
Questo certificato sostituisce quello avente stesso numero, datato 07/10/2014 (l' Allegato al certificato è stato emendato)**

Date of issue
Emesso in data : 22/12/2015

Expires on
Scade il : 21/12/2018

This certificate consists of this page and 1 page Attachment

Franco Vasta
Certification manager



Attachment to/Allegato al

Certificate Number
Certificato numero : **350379900.01**

The certification includes the following test segments successfully completed:

- Functional safety management (FSM) und safety lifecycle
- Hardwarefault behaviour
- Safety-related clauses of the user manual
- Quality assurance in production and product care / maintenance

Failure rates for AT-HD ACTUATORS SERIES per IEC 61508 ed.2.0 - year 2010 (FIT=1failure/10⁹ hours):

Application	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}
AT-HD Series HYDRAULIC DOUBLE ACTING	257	0	123	122
AT-HD Series HYDRAULIC SPRING RETURN	0	257	0	245
AT-HD Series PNEUMATIC DOUBLE ACTING	237	0	123	122
AT-HD Series PNEUMATIC SPRING RETURN	0	237	0	225

Double acting components must be checked with Partial Valve Stroke Test.

Low Demand mode of operation		High Demand mode of operation (**)	
Number of operation /year	(*)	MTBFd (h)	Hydraulic 4.081.633 Pneumatic 4.444.444
PFD _{avg} (No Partial Stroke Test)	5,23 10 ⁻⁴	PFH _{avg}	5,23 10 ⁻⁸
PFD _{avg} (Partial Stroke Test 6 months)	6,36 10 ⁻⁵		
PFD _{avg} (Partial Stroke Test 12 months)	7,43 10 ⁻⁵		
PFD _{avg} (Partial Stroke Test 24 months)	7,78 10 ⁻⁵		
PFD _{avg} (Partial Stroke Test 36 months)	8,94 10 ⁻⁵		
SFF	> 90%	SFF	> 90%
SIL	3	SIL/PL	3 / 'c'

(*) Low demand mode, as defined in 3.5.16 of IEC 61508-4, is where the frequency of demands for operation made on a safety-related system is no greater than one per year.

(**) High demand or continuous mode, as defined in 3.5.16 of IEC 61508-4, is where the frequency of demands for operation made on a safety-related system is greater than one per year. Continuous is regarded as very high demand.

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	Ti	1 a
Confidence Level	1- α	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.