Certificate

Nr./No.: V 246.23/15

Prüfgegenstand **Product tested**	Pneumatischer Schwenkantrieb für Armaturen mit Sicherheitsfunktion Pneumatic actuator for valves with safety function (std. 90° single / double acting, travel stop)	**Zertifikats-inhaber** **Certificate holder**	Air Torque GmbH Im Katzentach 16-18 76275 Ettlingen Germany
Typbezeichnung **Type designation**	DR/DLxxxxx..x...x, SC/SOxxxxx..x...x, PTxxxx/x/x..xx..x weitere Varianten siehe Anhang des Zertifikates further variations see annex of certificate		
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. Der Nachweis erfolgte auf Basis von Betriebsbewährtheit und einer FMEA des getesteten Produktes. 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 acc. to IEC 61508. Constraints concerning the requested HFT defined in the relevant application standards e.g. IEC 61511 have to be considered. This statement is based on proven in use data and a FMEA of the tested product.		
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 246.23/15 vom 21.07.2015 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 246.23/15 dated 2015-07-21.
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, 2015-07-21

Certification Body for FS-Products

Dr.-Ing. Thorsten Gantevoort

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Precisely Right.

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Manufacturer	**Air Torque GmbH** **Im Katzentach 16-18** **76275 Ettlingen, Germany**
Product tested	**DR/DL00010..U.. to DR/DL10000..U..** **SC/SO00010..U.. to SC/SO10000..U..** **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 (see note)	SFF	90 %
Hardware Fault Tolerance	HFT	0
Diagnostic Coverage	DC	0 %
Type of Sub System		Type A
Mode of Operation		High Demand
Proof Test Coverage	PTC	not considered
Partial Stroke Test Coverage	PSTC	not considered

Note

The Safe Failure Fraction (SFF) was estimated by an alternative method with a FMEA according to EN 161:2011/A3:2013.

Derived Values for 1oo1-Architecture

Maximum Number of Demands per Year	f_{np}	50 / a	5,71 E-03 / h
Total Failure Rate	$\lambda_S + \lambda_D$	7,54 E-08 / h	75 FIT
Lambda Dangerous Detected	λ_{DD}	0,00 E+00 / h	0 FIT
Lambda Dangerous Undetected	λ_{DU}	7,54 E-09 / h	8 FIT
Lambda Safe	λ_S	6,79 E-08 / h	68 FIT
Mean Time Between Failures	MTBF	1,33 E+07 h	1.514 a
Mean Time Between Dangerous Failures	$MTBF_D$	1,33 E+08 h	15.136 a
Average Frequency of a Dangerous Failure per Hour	**PFH**	**7,54 E-09 / h**	

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.

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Manufacturer	**Air Torque GmbH** **Im Katzentach 16-18** **76275 Ettlingen, Germany**
Product tested	**DR/DL00010..U..B to DR/DL10000..U..B** **SC/SO00010..U..B to SC/SO10000..U..B** **PT045..B..D..B to PT1000/1/4..B..D..B** **PT045..B..S..B to PT1000/1/4..B..S..B** **(travel stop, single / double acting)**

Device-Specific Values

Probability of Dangerous Failure on Demand	PFD_{spec}	7,99 E-05
Test Interval	Ti	1 a
Confidence Level	1-α	95 %
Safe Failure Fraction (see note)	SFF	90 %
Hardware Fault Tolerance	HFT	0
Diagnostic Coverage	DC	0 %
Type of Sub System		Type A
Mode of Operation		High Demand
Proof Test Coverage	PTC	not considered
Partial Stroke Test Coverage	PSTC	not considered

Note

The Safe Failure Fraction (SFF) was estimated by an alternative method with a FMEA according to EN 161:2011/A3:2013.

Derived Values for 1oo1-Architecture

Maximum Number of Demands per Year	f_{np}	50 / a	5,71 E-03 / h
Total Failure Rate	$\lambda_S + \lambda_D$	4,56 E-06 / h	4.559 FIT
Lambda Dangerous Detected	λ_{DD}	0,00 E+00 / h	0 FIT
Lambda Dangerous Undetected	λ_{DU}	4,56 E-07 / h	456 FIT
Lambda Safe	λ_S	4,10 E-06 / h	4.103 FIT
Mean Time Between Failures	MTBF	2,19 E+05 h	25 a
Mean Time Between Dangerous Failures	$MTBF_D$	2,19 E+06 h	250 a
Average Frequency of a Dangerous Failure per Hour	**PFH**	**4,56 E-07 / h**	

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.