

Certificate



Nr./No.: V 246.20/15

**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°)

**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...xx...x
weitere Varianten siehe Anhang des Zertifikates
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 acc. to 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 Hüb

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	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 GmbH**
Im Katzentach 16-18
76275 Ettlingen, Germany

DR/DL und SC/SO, 00012 bis 10002 (120°)
00013 bis 10003 (135°)
00015 bis 10005 (145°)
00018 bis 10008 (180°)

Product tested **PT052..B..D/S bis PT1002..B..D/S (120°)**
PT053..B..D/S bis PT1003..B..D/S (135°)
PT055..B..D/S bis PT1005..B..D/S (145°)
PT058..B..D/S bis 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

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

Manufacturer **Air Torque GmbH**
Im Katzentach 16-18
76275 Ettlingen, Germany

Product tested **DR/DL00010..U..S to DR/DL10000..U..S**
SC/SO00010..U..S to SC/SO10000..U..S
PT045..B..D..S to PT1000/1/4..B..D..S
PT045..B..S..S to PT1000/1/4..B..S..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.

Quality Management

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

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	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

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

Manufacturer **Air Torque GmbH**
Im Katzentach 16-18
76275 Ettlingen, Germany

Product tested **DR/SC00015...U...D to DR/SC10000...U...D (hydraulic dampened)**
PT PT050/1/4...HC to PT1000/1/4...HC (hydraulic dampened)
DR/SC00018...U...FM to DR/SC10008...U...FM (fail mid)
PT058...FM to PT1008...FM (fail mid)
DR/SC00010...S to DR/SC10000...S (stainless steel)
PT050/1/4...S to PT1000/1/4...S (stainless steel)
DR/SC00018...U...3 to DR/SC10008...U...3 (3 position 180°)
PT058...3P to PT1008...3P (3 position 180°)
DR/SC00015...U...3 to DR/SC10000...U...3 (3 position 90°)
PT050/1/4...3P to 3P/3D PT1000/1/4...3P (3 position 90°)

Device-Specific Values

Probability of Dangerous Failure on Demand	PFD _{spec}	6,39 E-06
Test Interval	Ti	1 a
Confidence Level	1-α	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	λ _S + λ _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.