

Certificate



No.: V 470.01/14

Product tested	Pneumatic and hydraulic quarter turn actuators	Certificate holder	Flowbus Corporation Main Office 67, Okgucheonse-ro, 185 beon-gil Siheung-si Gyeonggi-do, 429-848 South Korea
Type designation	Pneumatic: EPR and EPRY series (both single or double acting) Hydraulic: EHT and EHA series (both single or double acting)		
Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010	IEC 61511 Parts 1-3:2004 (in extracts)	
Intended application	The valve actuators have a safety capability of SC 3 for use in a safety instrumented system. The requested hardware fault tolerance has to be selected according to the application standard.		
Specific requirements	The instructions of the associated Installation and Operating Manual shall be considered.		

Summary of test results see back side of this certificate.

Valid until 2019-11-28

The issue of this certificate is based upon an examination, whose results are documented in Report No. V 470.01/14 dated 2014-11-28.

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, 2014-11-28

Certification Body for FS-Products

Dipl.-Ing. Stephan Hüb

Manufacturer **Flowbus Corporation**
7F, Insu Bldg, 205-4, Bangi-Dong, Songpa-Gu,
Seoul, 138-050,
Korea

Product tested **EPR, EPRY, EHA, EHT**

Device-Specific Values

Probability of Dangerous Failure on Demand	PFD_{spec}	1,25 E-05
Test Interval	T_i	1 a
Confidence Level	$1-\alpha$	95 %
Safe Failure Fraction ^(see note)	SFF	93 %
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	$\lambda_S + \lambda_D$	2,04 E-08 / h	20 FIT
Lambda Dangerous Detected	λ_{DD}	0,00 E+00 / h	0 FIT
Lambda Dangerous Undetected	λ_{DU}	1,42 E-09 / h	1 FIT
Lambda Safe Detected	λ_{SD}	0,00 E+00 / h	0 FIT
Lambda Safe Undetected	λ_{SU}	1,89 E-08 / h	19 FIT
Mean Time Between Failures	MTBF	4,91 E+07 h	5 609 a
Mean Time Between Dangerous Failures	MTBF _D	7,02 E+08 h	80 125 a
Average Probability of Failure on Demand	PFD_{avg}	6,24 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.