Certificate

Type Approved

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No.: V 473.01/15

Product tested	Ball valves	**Certificate holder**	Vastas Valf Armatur Sanayi Ticaret Anonom Sirketi OSB Sabanci Caddesi No: 22 Cerkezkoy 59500 Tekirdag Turkey
Type designation	E60M... full welded body, E600... split body Size: 2" to 56"		
Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010	IEC 61511 Parts 1-3:2004	
Intended application	The safety function of the test item consists of: 1. Opening and closing within specified time 2. Keep up external tightness at any time The ball valves are suitable for use in a safety instrumented system up to SIL 2. Under consideration of the minimum required hardware fault tolerance HFT = 1 the valves may be used in a redundant structure up to SIL 3 (Details see page 2).		
Specific requirements	The instructions of the associated Installation and Operating Manual shall be considered.		

Summary of test results see back side of ths certificate.

Valid until 2020-01-16

The issue of this certificate is based upon an examination, whose results are documented in Report No. V 473.01/15 dated 2015-01-16.
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, 2015-01-16

Certification Body for FS-Products

Dipl.-Ing. Stephan Häb

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Manufacturer	**Vastas Valf Armatur Sanayi Ticaret Anonom Sirketi** **OSB Sabancı Caddesi No 22** **Cerkezkoy Tekirdag** **Turkey**
Product tested	**E600….. Split body ball valves (2" to 56")** **E60M…. Full welded ball valves (2" to 56")**

Device-Specific Values		**E600**	**E60M**
Probability of Dangerous Failure on Demand	PFD_{spec}	9,03 E-05	9,03 E-05
Test Interval	Ti	1 a	1 a
Confidence Level	1-α	95 %	95 %
Safe Failure Fraction (see note)	SFF	70,25 %	71,03 %
Hardware Fault Tolerance	HFT	0	0
Diagnostic Coverage	DC	0 %	0
Type of Sub System		Type A	Type A
Mode of Operation		Low Demand	Low Demand
Proof Test Coverage	PTC	not considered	not considered
Partial Stroke Test Coverage	PSTC	not considered	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		**E600**		**E60M**	
Assumed Demands per Year	f_{np}	1 / a	1,14 E-04 / h	1 / a	1,14 E-04 / h
Total Failure Rate	$\lambda_S + \lambda_D$	3,46 E-08 / h	35 FIT	3,56 E-08 / h	36 FIT
Lambda Dangerous Detected	λ_{DD}	0,00 E+00 / h	0 FIT	0,00 E+00 / h	0 FIT
Lambda Dangerous Undetected	λ_{DU}	1,03 E-08 / h	10 FIT	1,03 E-08 / h	10 FIT
Lambda Safe	λ_S	2,43 E-08 / h	24 FIT	2,53 E-08 / h	25 FIT
Mean Time Between Failures	MTBF	2,89 E+07 h	3.296 a	2,81 E+07 h	3.209 a
Mean Time Between Dangerours Failures	$MTBF_D$	9,70 E+07 h	11.079 a	9,70 E+07 h	11.079 a
Average Probability of Failure on Demand	**PFD_{avg}**	**4,51 E-05**		**4,51 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.