Certificate

SIL/PL Capability

TÜVRheinland® CERTIFIED

www.tuv.com
ID 0600000000

No.: 968/V 1152.00/20

Product tested	Metallic sealing, triple eccentric butterfly valves	**Certificate holder**	Zwick Armaturen GmbH Egerstraße 1 58256 Ennepetal Germany
Type designation	TRI-CON and derivatives acc. to revisionlist		
Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010		
Intended application	Safety functions: - Closing on Demand and external tightness - Closing on Demand with leakage class A acc. DIN EN 12266-1 and external tightness - Open on demand and external tightness The 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.		
Specific requirements	The instructions of the associated Installation, Operating and Safety Manual shall be considered.		

Summary of test results see back side of this certificate.

Valid until 2025-05-13

The issue of this certificate is based upon an examination, whose results are documented in Report No. 968/V 1152.00/20 dated 2020-05-13.
This certificate is valid only for products which are identical with the product tested.

Köln, 2020-05-13

TÜV Rheinland Industrie Service GmbH
Bereich Automation
Funktionale Sicherheit
Am Grauen Stein, 51105 Köln
Certification Body Safety & Security for Automation & Grid

Dr.-Ing. Thorsten Gantevoort

TÜV Rheinland Industrie Service GmbH, Am Grauen Stein, 51105 Köln / Germany
Tel.: +49 221 806-1790, Fax: +49 221 806-1539, E-Mail: industrie-service@de.tuv.com

TÜVRheinland®
Precisely Right.

Holder: Zwick Armaturen GmbH
Egerstr. 1
58256 Ennepetal
Deutschland

Product tested: TRI-CON and derivatives

Results of Assessment

Route of Assessment		2_H / 1_S
Type of Sub-system		Type A
Mode of Operation		Low Demand Mode
Hardware Fault Tolerance	HFT	0
Systematic Capability		**SC 3**

Closing on Demand

Dangerous Failure Rate	λ_D	1.53 E-07 / h	**153 FIT**
Average Probability of Failure on Demand 1oo1	$PFD_{avg}(T_1)$	6.70 E-04	
Average Probability of Failure on Demand 1oo2	$PFD_{avg}(T_1)$	6.76 E-05	

Closing in Demand with leakage rate A acc. DIN EN 12266-1

Dangerous Failure Rate	λ_D	3.02 E-07 / h	**302 FIT**
Average Probability of Failure on Demand 1oo1	$PFD_{avg}(T_1)$	1.32 E-03	
Average Probability of Failure on Demand 1oo2	$PFD_{avg}(T_1)$	1.34 E-04	

Open on Demand

Dangerous Failure Rate	λ_D	1.25 E-07 / h	**125 FIT**
Average Probability of Failure on Demand 1oo1	$PFD_{avg}(T_1)$	5.48 E-04	
Average Probability of Failure on Demand 1oo2	$PFD_{avg}(T_1)$	5.51 E-05	

Assumptions for the calculations above: DC = 0 %, T_1 = 1 year, β_{1oo2} = 10 %

Origin of failure rates

The stated failure rates for low demand are the result of an FMEDA with tailored failure rates for the design and manufacturing process.
Furthermore the results have been verified by qualification tests and field-feedback data of the last five years.
Failure rates include failures that occur at a random point in time and are due to degradation mechanisms such as ageing.
The stated failure rates do not release the end-user from collecting and evaluating application-specific reliability data.

Periodic Tests and Maintenance

The given values require periodic tests and maintenance as described in the Safety Manual.
The operator is responsible for the consideration of specific external conditions (e.g. ensuring of required quality of media, max. temperature, time of impact), and adequate test cycles.
A time of usage of more than 20 years is acceptable if given cycles are observed.