Certificate

SIL/PL Capability

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ID 0600000000

No.: 968/V 1222.00/21

Product tested	D-Series Neles Ball Valves	**Certificate holder**	Neles Finland Oy Vanha Porvoontie 229 FI-01380 Vantaa Finland
Type designation	D Center split body, trunnion mounted, bonnet D2, D1(F) Full bore, flanged D3 Full bore, weld ends D4 Reduced bore, weld ends D5 Reduced bore, flanged		
Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010		
Intended application	Safety Functions: - Close on Demand - Open on Demand The valves are suitable for use in a safety instrumented system up to SIL 2 (low demand mode). Under consideration of the minimum required hardware fault tolerance HFT = 1 the valves may be used in a redundant architecture 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.

The issue of this certificate is based upon an examination, whose results are documented in Report No. 968/V 1222.00/21 dated 2021-03-01.
This certificate is valid only for products which are identical with the product tested.

TÜV Rheinland Industrie Service GmbH
Bereich Automation
Funktionale Sicherheit
Am Grauen Stein, 51105 Köln

Köln, 2021-03-01	Certification Body Safety & Security for Automation & Grid	Dipl.-Ing. (FH) Wolf Rückwart

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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

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Holder: **Neles Finland Oy**
Vanha Porvoontie 229
FI-01380, Vantaa
Finland

Product tested: **Trunnion Mounted Ball Valves**
D-Series

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	3.15 E-07 / h	**315 FIT**
Average Probability of Failure on Demand 1oo1	$PFD_{avg}(T_1)$	1.40 E-03	
Average Probability of Failure on Demand 1oo2	$PFD_{avg}(T_1)$	1.42 E-04	

Open on Demand

Dangerous Failure Rate	λ_D	2.56 E-07 / h	**256 FIT**
Average Probability of Failure on Demand 1oo1	$PFD_{avg}(T_1)$	1.14 E-03	
Average Probability of Failure on Demand 1oo2	$PFD_{avg}(T_1)$	1.15 E-04	

Assumptions for the calculations above: DC = 0 %, T_1 = 1 year, MRT = 72 h, 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 field-feedback data.
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.