



Certificate

Project #: 18-122-VTI2017081

***SIL 3 Capable
Type A, Route 2H***

ValvTechnologies, Inc., V1, ERV, NEXTECH & TRUNTECH Series Ball Valves

Application: Severe unclean [upstream] duty class NU-Naval Unsheltered; this includes the lighter clean process service duty class NU. Naval Unsheltered (non-protected surface ship borne equipment exposed to weather conditions).

Function: Open-to-Close duty. Low Demand Mode. Architectural constraint, Route 2H: HFT= 0 for SIL-2; HFT= 1 for SIL-3.

Verified: Meets the applicable requirements of IEC 61508:2010 Parts 1-7 per the analysis report.

Systematic: Assessed the manufacturer's product development, design, and quality control processes. For SIL-2 and above applications, disassembly, assembly, repair or modification of the valve performed by any party other than the manufacturer invalidates this certification.

Random: Quantitative analysis supported by failure modes effects and criticality analysis.



Ir. Ing. C. P. Willig, Dependable Industrial Automation Consultancy USA LLC



Eloise Roche, SIS-TECH



Valid Date: November 28, 2018

Failure Analysis: The referenced Analysis Report includes a quantification of the product performance as manufactured. For the SIL Certificate to be valid it is mandatory that transport, construction, operation, inspection and maintenance are in full compliance with manufacturer's requirements. The user needs to carefully review the use constraints documented in the Analysis Report and within the product Safety Manual to identify the differences between the use constraints and the intended application. The actual product performance can be significantly different if the use constraints in the analysis report or safety manual are violated, or the product is misapplied or abused, whether intentional or unintentional.

Summary Data Tables:

	MTBF_Dangerous		Failure Rate_D	
	MINIMUM	AVERAGE	AVERAGE	MAXIMUM
	[year]	[year]	[1/hour]	[1/hour]
ASPECT Full Stroke Failure				
ALL DUTIES-MIN, ALL FS, sizes >=2"	2345	2855	4.00E-08	4.87E-08
ALL DUTIES, FS AGREED DUTY, sizes >=2"	3815	4918	2.32E-08	2.99E-08
NORMAL DUTY-MIN, sizes >=2"	2743	8217	1.39E-08	4.16E-08
SEVERE UNCLEAN-MIN, sizes >=2"	1273	3019	3.78E-08	8.97E-08
All failures FS, all ops years, all sizes	14656	17846	6.40E-09	7.79E-09
Confidence level (1-alfa): 90.0%	DIACUSA-VTI-2017-081-R3B4_UC-NXTRNTECH.xlsm			
Fnp: assumed demands per year	Fnp	1.00E+00	[1/year]	

	MTBF_Dangerous		FAILURE RATE_D	
	MINIMUM	AVERAGE	AVERAGE	MAXIMUM
	[year]	[year]	[1/hour]	[1/hour]
ASPECT TSO-Tight Shut Off Failure				
ALL DUTIES-MIN, ALL TSO, sizes >=2"	1153	1321	8.64E-08	9.90E-08
ALL DUTIES, TSO AGREED DUTY, sizes >=2"	1397	1624	7.03E-08	8.17E-08
NORMAL DUTY-MIN, sizes >=2"	1305	2739	4.17E-08	8.75E-08
SEVERE UNCLEAN-MIN, sizes >=2"	660	1208	9.45E-08	1.73E-07
All failures TSO, all ops years, all sizes	7204	8257	1.38E-08	1.58E-08
Confidence level (1-alfa): 90.0%				
Fnp: assumed demands per hour	Fnp	1.14E-04	[1/hour]	

References:

Analysis Report: DIACUSA-VTI-2017-081-R1-SIL_V1_ERV_NT-SIGND.pdf, November 14, 2018.

Safety Manual(s): DIACUSA-VTI-2013-092-R1-SFML_ERV.docx, 1/30/2014; DIACUSA-VTI-2013-092-R2-SFML_NT.docx, 1/29/2014; DIACUSA-VTI-2013-092-R2-SFML_V1.docx, 1/29/2014