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IEC 61508 Functional Safety Capability Statement

ROSS Pneumatrol Ltd, C (VA2), E (VA0) and T (VA4) Series Solenoid Valve

Manufacturer:	ROSS Pneumatrol Ltd Blackburn Rd, Oswaldtwistle, Accrington BB5 4WZ
Product:	Solenoid Valve
Model:	C (VA2), E (VA0) and T (VA4) Series

Application:	Low Demand Mode Safety Instrumented Function
Safety Function:	Upon detection of a failure/fault, action is initiated to move valve to the designated safe state within the specified time for both De-Energise To Trip (DETT) and Energise To Trip (ETT) (Sensing, logic solver and additional final element subsystems not part of this analysis)
Applied standard:	IEC 61508 Ed2 2010 Parts 1-3 & IEC 61511 Ed1
Systematic Capability:	Suitable up to SIL 2
Applicable report:	ERM Report: F127_SV001 rev. 6

Assessment Route:	1_H
Hardware Fault Tolerance:	0 or 1
Type:	A
Application restrictions:	None

Model No.		λDU (/hr)	λDD (/hr)	λS (/hr)	SFF	SIL AC (HFT = 0)	SIL AC (HFT = 1)	SIL SC
C Series (VA2) + Terminal Box EXN (SA1/SA2/SA3)	DETT	7.2E-08	0.0E+00	3.9E-07	85%	SIL 2	SIL 3	SC 2
	ETT	3.7E-07	0.0E+00	7.6E-09	2%	SIL 1	SIL 2	SC 1
C Series (VA2) + Terminal Box EXM (SA4/SA5)	DETT	7.2E-08	0.0E+00	4.0E-07	85%	SIL 2	SIL 3	SC 2
	ETT	3.7E-07	0.0E+00	8.6E-09	2%	SIL 2	SIL 2	SC 1
C Series (VA2) + Terminal Box IA (S0#)	DETT	7.2E-08	0.0E+00	4.0E-07	85%	SIL 2	SIL 3	SC 2
	ETT	3.7E-07	0.0E+00	9.6E-09	3%	SIL 1	SIL 2	SC 1

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Model No.		λDU (/hr)	λDD (/hr)	λS (/hr)	SFF	SIL AC (HFT = 0)	SIL AC (HFT = 1)	SIL SC
C Series (VA2) + Terminal Box Exd (SXD/SXH)	DETT	2.4E-07	0.0E+00	8.9E-07	79%	SIL 2	SIL 3	SC 2
	ETT	9.5E-07	0.0E+00	0.0E+00	0%	SIL 1	SIL 2	SC 1
C Series (VA2) + Terminal Box SB6	DETT	2.6E-07	0.0E+00	3.9E-07	60%	SIL 2	SIL 3	SC 2
	ETT	4.1E-07	0.0E+00	1.0E-08	2%	SIL 1	SIL 2	SC 1
E Series (VA0) + Terminal Box EXN (SA1/SA2/SA3)	DETT	8.9E-08	0.0E+00	5.1E-07	85%	SIL 2	SIL 3	SC 2
	ETT	3.7E-07	0.0E+00	7.6E-09	2%	SIL 1	SIL 2	SC 1
E Series (VA0) + Terminal Box EXM (SA4/*SA5)	DETT	8.9E-08	0.0E+00	5.1E-07	85%	SIL 2	SIL 3	SC 2
	ETT	3.7E-07	0.0E+00	8.6E-09	2%	SIL 1	SIL 2	SC 1
E Series (VA0) + Terminal Box IA (S0#)	DETT	8.9E-08	0.0E+00	5.1E-07	85%	SIL 2	SIL 3	SC 2
	ETT	3.7E-07	0.0E+00	9.6E-09	3%	SIL 1	SIL 2	SC 1
E Series (VA0) + Terminal Box Exd (SXD/SXH)	DETT	2.6E-07	0.0E+00	1.0E-06	80%	SIL 2	SIL 3	SC 2
	ETT	9.5E-07	0.0E+00	0.0E+00	0%	SIL 1	SIL 2	SC 1
E Series (VA0) + Terminal Box SB6	DETT	2.7E-07	0.0E+00	5.1E-07	65%	SIL 2	SIL 3	SC 2
	ETT	4.1E-07	0.0E+00	1.0E-08	2%	SIL 1	SIL 2	SC 1
T Series (VA4) + Terminal Box EXN (SA1/SA2/SA3)	DETT	1.1E-07	0.0E+00	4.9E-07	82%	SIL 2	SIL 3	SC 2
	ETT	3.7E-07	0.0E+00	7.6E-09	2%	SIL 1	SIL 2	SC 1
T Series (VA4) + Terminal Box EXM (SA4/SA5)	DETT	1.1E-07	0.0E+00	4.9E-07	82%	SIL 2	SIL 3	SC 2
	ETT	3.7E-07	0.0E+00	8.6E-09	2%	SIL 1	SIL 2	SC 1
T Series (VA4) + Terminal Box IA (S0#)	DETT	1.1E-07	0.0E+00	4.9E-07	82%	SIL 2	SIL 3	SC 2
	ETT	3.7E-07	0.0E+00	9.6E-09	3%	SIL 1	SIL 2	SC 1
T Series (VA4) + Terminal Box Exd (SXD/SXH)	DETT	2.8E-07	0.0E+00	9.9E-07	78%	SIL 2	SIL 3	SC 2
	ETT	9.5E-07	0.0E+00	0.0E+00	0%	SIL 1	SIL 2	SC 1

Model No.		λDU (/hr)	λDD (/hr)	λS (/hr)	SFF	SIL AC (HFT = 0)	SIL AC (HFT = 1)	SIL SC
T Series (VA4) + Terminal Box SB6	DETT	2.9E-07	0.0E+00	4.9E-07	62%	SIL 2	SIL 3	SC 2
	ETT	4.1E-07	0.0E+00	1.0E-08	2%	SIL 1	SIL 2	SC 1

SIL AC (Architectural Constraints): Represents the maximum allowable SIL of each hardware element, assuming Hardware Fault Tolerance (HFT) = 0 or 1.

SIL SC (Systematic Capability): A measure of confidence (expressed on a scale of SC 1 to SC 4) of the confidence that the systematic safety integrity of a device meets the requirements of the specified SIL.

It should be noted that for a device to meet a required SIL that the SIL AC and SIL SC of the device needs to both be met. In addition to this, the required Probability of Failure on Demand (PFD) value for the complete Safety Instrumented Function (SIF) needs to adhere to the SIL PFDavg ranges.

IMPORTANT: It should be noted that this assessment considers only the ROSS Pneumatrol Ltd, C (VA2), E (VA0) and T (VA4) Series Solenoid Valve and does not include confirmation of the response time of the device(s).

The ROSS Pneumatrol Ltd, C (VA2), E (VA0) and T (VA4) Series Solenoid Valve has been assessed and is considered capable for use in a low demand mode safety function up to (and including) SIL 1 (ETT) / SIL 2 (DETT) with regards to random hardware failures, architectural constraints and Systematic Capability.

Note 1: The SIL of a complete SIF (sensor, logic solver and final element subsystems) must be verified to calculate the required PFD / Probability of Failure per Hour (PFH), considering any redundancy, Proof Test Interval (PTI), Proof Test Coverage (PTC), Mission Time and Mean Time To Restoration (MTTR) for all elements included in the SIF. Each subsystem should be verified to ensure compliance with the minimum HFT requirements.

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