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IEC 61508 Functional Safety Capability Statement

Emerson Automation Solutions, Bettis RGS-Q Series Quarter Turn Actuator

Manufacturer:	Emerson Automation Solutions Unit 72, Dunboyne Business Park, Dunboyne, Co. Meath, A86 AC84, Ireland
Product:	Quarter Turn Actuator
Model:	RGS-Q Series (Spring Return, Double Piston (up to 4 springs), Spring Return, Double Piston (up to 2 springs), Spring Return, Single Piston (up to 2 springs), Spring Return, SD Model, Double Acting, Double Piston and Double Acting, Single Piston

Application:	Low Demand Mode Safety Instrumented Function
Safety Function:	Upon failure to generate required torque to operate connected valve, output action is initiated (Sensing, logic 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 3
Applicable report:	ERM Report: C119_SV001 rev. 7

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
RGS-Q Series (RGS/RGD-Series) (with XRC Partial Stroke Test (PST))	Double Acting Actuator	1.0E-06	4.2E-07	0.0E+00	29%	SIL 1	SIL 2	SC 3
	Spring Return Actuator (2 Springs)	1.9E-07	5.8E-08	5.8E-07	77%	SIL 2	SIL 3	SC 3
	Spring Return Actuator (4 Springs)	3.0E-07	6.4E-08	5.8E-07	68%	SIL 2	SIL 3	SC 3

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Model No.		λDU (/hr)	λDD (/hr)	λS (/hr)	SFF	SIL AC (HFT = 0)	SIL AC (HFT = 1)	SIL SC
	Spring Return Actuator (SD Model)	1.8E-07	4.9E-08	5.9E-07	78%	SIL 2	SIL 3	SC 3
	Spring Return Actuator (single piston)	1.3E-07	7.0E-08	6.6E-07	85%	SIL 2	SIL 3	SC 3
	Double Acting Actuator (single piston)	7.3E-07	3.0E-07	0.0E+00	29%	SIL 1	SIL 2	SC 3
RGS-Q Series (RGS/RGD-Series) (with PSTD)	Double Acting Actuator	4.6E-07	9.8E-07	0.0E+00	68%	SIL 2	SIL 3	SC 3
	Spring Return Actuator (2 Springs)	1.3E-07	1.2E-07	5.8E-07	84%	SIL 2	SIL 3	SC 3
	Spring Return Actuator (4 Springs)	1.8E-07	1.9E-07	5.8E-07	81%	SIL 2	SIL 3	SC 3
	Spring Return Actuator (SD Model)	9.9E-08	1.2E-07	5.9E-07	88%	SIL 2	SIL 3	SC 3
	Spring Return Actuator (single piston)	9.8E-08	1.0E-07	6.6E-07	89%	SIL 2	SIL 3	SC 3
	Double Acting Actuator (single piston)	3.0E-07	7.4E-07	0.0E+00	71%	SIL 2	SIL 3	SC 3

Model No.		λDU (/hr)	λDD (/hr)	λS (/hr)	SFF	SIL AC (HFT = 0)	SIL AC (HFT = 1)	SIL SC
RGS-Q Series (RGS/RGD- Series) (without PSTD)	Double Acting Actuator	1.0E-06	4.2E-07	0.0E+00	0%	SIL 1	SIL 2	SC 3
	Spring Return Actuator (2 Springs)	1.9E-07	5.8E-08	5.8E-07	70%	SIL 2	SIL 3	SC 3
	Spring Return Actuator (4 Springs)	3.0E-07	6.4E-08	5.8E-07	61%	SIL 2	SIL 3	SC 3
	Spring Return Actuator (SD Model)	1.8E-07	4.9E-08	5.9E-07	72%	SIL 2	SIL 3	SC 3
	Spring Return Actuator (single piston)	1.3E-07	7.0E-08	6.6E-07	77%	SIL 2	SIL 3	SC 3
	Double Acting Actuator (single piston)	7.3E-07	3.0E-07	0.0E+00	0%	SIL 1	SIL 2	SC 3

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 specified 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.

XRC PST – Automated partial stroke testing using QTRCO XRCISER.

PSTD - Automated partial stroke testing (with or without QTRCO XRCISER) that produces a valve signature (comparing air pressure/torque against valve movement).

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IMPORTANT: It should be noted that this assessment considers only the Emerson Automation Solutions Bettis RGS-Q Series Quarter Turn Actuator and does not include confirmation of the response time of the device(s).

The Emerson Automation Solutions Bettis RGS-Q Series Quarter Turn Actuator has been assessed and is considered capable for use in a low demand mode safety function up to (and including) SIL 3 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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