ENGINEERING SAFETY CONSULTANTS
The Global Provider of Functional Safety Expertise and Technical Consultancy

IEC 61508 Safety Integrity Level Capability Certificate

Functional Safety of Safety-Related Programmable Electronic Systems

The **QTRCO Inc., Q-Series Quarter Turn Actuator** has been assessed and is considered capable for use in a low demand Safety Function up to (and including) SIL 3, with respect to random hardware failures, architectural constraints and systematic capability.

The assessment was based on the assumptions, data provided, and recommendations given in:

- **Engineering Safety Consultants Ltd Report: C119_SV001 rev.5;**
- **Renewal Letter from QTRCO Inc., signed by Greyson Jackson, Engineering Manager, dated 23rd February 2023.**

The product was assessed against the following failure mode:

- **Failure to generate required torque to operate connected valve.**

The product assessed includes the following variants:

- 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;
- Double Acting, Single Piston.

The assessment was carried out to determine compliance with IEC 61508 (2010 Edition) with regards to:

- Calculation of the Dangerous Detected (λ_{DD}), Dangerous Undetected (λ_{DU}) and Safe (λ_S) failure rates to be used in PFD_{avg} calculations (refer to Table below);
- Architectural Constraints via Route 1_H;
- Systematic capability (product regarded as proven in use) via Route 2_S.

Model no.	Type	λ_{DU} (/hr)	λ_{DD} (/hr)	λ_S (/hr)	SFF (%)	Device Type	Max Allowable SIL (HFT = 0)	Max Allowable SIL (HFT = 1)
Q-Series (RGS/RGD-Series) (with XRC Partial Stroke Test (PST))	Double Acting Actuator	1.0E-06	4.2E-07	0.0E+00	29%	A	SIL 1	SIL 2
	Spring Return Actuator (2 Springs)	1.9E-07	5.8E-08	5.8E-07	77%	A	SIL 2	SIL 3
	Spring Return Actuator (4 Springs)	3.0E-07	6.4E-08	5.8E-07	68%	A	SIL 2	SIL 3
	Spring Return Actuator (SD Model)	1.8E-07	4.9E-08	5.9E-07	78%	A	SIL 2	SIL 3
	Spring Return Actuator (single piston)	1.3E-07	7.0E-08	6.6E-07	85%	A	SIL 2	SIL 3

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Model no.	Type	λ_{DU} (/hr)	λ_{DD} (/hr)	λ_S (/hr)	SFF (%)	Device Type	Max Allowable SIL (HFT = 0)	Max Allowable SIL (HFT = 1)
	Double Acting Actuator (single piston)	7.3E-07	3.0E-07	0.0E+00	29%	A	SIL 1	SIL 2
Q-Series (RGS/RGD-Series) (with PSTD)	Double Acting Actuator	4.6E-07	9.8E-07	0.0E+00	68%	A	SIL 2	SIL 3
	Spring Return Actuator (2 Springs)	1.3E-07	1.2E-07	5.8E-07	84%	A	SIL 2	SIL 3
	Spring Return Actuator (4 Springs)	1.8E-07	1.9E-07	5.8E-07	81%	A	SIL 2	SIL 3
	Spring Return Actuator (SD Model)	9.9E-08	1.2E-07	5.9E-07	88%	A	SIL 2	SIL 3
	Spring Return Actuator (single piston)	9.8E-08	1.0E-07	6.6E-07	89%	A	SIL 2	SIL 3
	Double Acting Actuator (single piston)	3.0E-07	7.4E-07	0.0E+00	71%	A	SIL 2	SIL 3
Q-Series (RGS/RGD-Series) (without PSTD)	Double Acting Actuator	1.4E-06	0.0E+00	0.0E+00	0%	A	SIL 1	SIL 2
	Spring Return Actuator (2 Springs)	2.5E-07	0.0E+00	5.8E-07	70%	A	SIL 2	SIL 3
	Spring Return Actuator (4 Springs)	3.6E-07	0.0E+00	5.8E-07	61%	A	SIL 2	SIL 3
	Spring Return Actuator (SD Model)	2.2E-07	0.0E+00	5.9E-07	72%	A	SIL 2	SIL 3
	Spring Return Actuator (single piston)	2.0E-07	2.2E-07	6.6E-07	77%	A	SIL 2	SIL 3
	Double Acting Actuator (single piston)	1.0E-06	0.0E+00	0.0E+00	0%	A	SIL 1	SIL 2

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Note 1: The SIL of a complete SIF (sensor, logic solver and final element subsystems) must be verified to calculate the required PFD / 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.

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).

IMPORTANT: It should be noted that this assessment does not include confirmation of the response time of the device. For response times (along with any relevant assumptions) reference should be made to the Safety Manual of each device and the total SIF response time **MUST** be compared against the process safety time for the specific application.

Managing Director: Simon Burwood
Assessment Date: March 2014
Renewal Date: March 2023, valid to March 2025
Certificate: C119_CT001 rev. 6