

Certificate



SIL/PL
Capability

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ID 060000000

No.: 968/V 1031.00/17

Product tested Pressure Switches **Certificate holder** Ruelco, Inc.
1209 Distributors Row
New Orleans, LA 70123
USA

Type designation Series SS-4XXX and Model BS

Codes and standards IEC 61508 Parts 1-2 and 4-7:2010

Intended application Safety Function: The pressure switches change state either of a 3-way valve or of a micro switch, when the set trigger pressure is reached.

The switches 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 switches 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. It has to be ensured that the pressure setpoint cannot be changed.

For safety applications the idle current principle has to be applied. The redundant contacts of the DPDT micro switch have to be wired in series.

Summary of test results see back side of this certificate.

Valid until 2022-12-07

The issue of this certificate is based upon an examination, whose results are documented in Report No. 968/V 1031.00/17 dated 2017-12-07.

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, 2017-12-07

Certification Body Safety & Security for Automation & Grid

Dipl.-Ing. Stephan Häb

Holder: Ruelco, Inc.
1209 Distributors Row
NEW ORLEANS LA 70123
USA

Product tested: Pressure Switches
SS - 4xxx and Model BS

Results of Assessment for mechanical devices 4202, 4222(H) and Model BS)

Route of Assessment		2 _H / 1 _S	
Type of Sub-system		Type A	
Mode of Operation		Low Demand Mode	
Hardware Fault Tolerance	HFT	0	
Lambda Dangerous confidence level of calculation 1- α = 95 %	λ_D	4.94 E-08 / h	49 FIT
Lambda Dangerous Undetected assumed Diagnostic Coverage DC = 0 %	λ_{DU}	4.94 E-08 / h	49 FIT
Mean Time To Dangerous Failure	MTTF _D	2.03 E+07 h	2,312 a
Average Probability of Failure on Demand 1oo1 assumed Proof Test Interval T ₁ = 0.083 (once every month)	PFD_{avg}(T₁)	1.80 E-05	
Average Probability of Failure on Demand 1oo2 assumed Proof Test Interval T ₁ = 0.083 (once every month) assumed β_{1oo2} = 10 %	PFD_{avg}(T₁)	1.80 E-06	

Results of Assessment for device with micro switch 4E02

		SPDT		DPDT	
Lambda Dangerous - AC confidence level of calculation 1- α = 95 %	λ_{D_AC}	7.34 E-08 /h	73 FIT	5.18 E-08 /h	52 FIT
Mean Time To Dangerous Failure - AC	MTTF _{D_AC}	1,556 a		2,205 a	
Average Probability of Failure on Demand 1oo1 - AC assumed Proof Test Interval T ₁ = 0.083 (once every month)	PFD_{avg_AC}(T₁)	2.68 E-05		1.89 E-05	
Lambda Dangerous - DC confidence level of calculation 1- α = 95 %	λ_{D_DC}	1.69 E-07 /h	169 FIT	6.14 E-08 /h	61 FIT
Mean Time To Dangerous Failure - DC	MTTF _{D_DC}	674 a		1,860 a	
Average Probability of Failure on Demand 1oo1 - DC assumed Proof Test Interval T ₁ = 0.083 (once every month)	PFD_{avg_DC}(T₁)	6.18 E-05		2.24 E-05	

Origin of values

The stated values are the results of the analysis of field feedback of the last five years. Random and systematic failures which are the responsibility of the manufacturer were examined.

Systematic Capability

The development and manufacturing process and the functional safety management applied by the manufacturer in the relevant lifecycle phases of the product have been audited and assessed as suitable for the manufacturing of products for use in applications with a maximum Safety Integrity Level of 3 (SC 3).

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.