

# Certificate



SIL/PL  
Capability

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ID 060000000

**No.: 968/V 1033.00/17**

**Product tested** Sand Probe Relay **Certificate holder** Ruelco, Inc.  
1209 Distributors Row  
New Orleans, LA 70123  
USA

**Type designation** 1S03,  
1SE3

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

**Intended application** Safety Function: The Sand Probe Relay changes state either of a 3-way valve or a micro switch, when process pressure is present at the process port connection.  
The relays 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 items 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.  
A minimum of 40 psi is required for the relay to function.  
  
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 1033.00/17 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 Hüb

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**TÜVRheinland**  
Precisely Right.

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

**Product tested: Sand Probe Relay**  
**Type 1S03 and 1SE3**

**Results of Assessment for mechanical device 1S03**

Route of Assessment		2 <sub>H</sub> / 1 <sub>S</sub>	
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 <sub>D</sub>	4.94 E-08 / h	49 FIT
Lambda Dangerous Undetected assumed Diagnostic Coverage DC = 0 %	λ <sub>DU</sub>	4.94 E-08 / h	49 FIT
Mean Time To Dangerous Failure	MTTF <sub>D</sub>	2.03 E+07 h	2,312 a
<b>Average Probability of Failure on Demand 1oo1</b> assumed Proof Test Interval T <sub>1</sub> = 0.083 (once every month)	<b>PFD<sub>avg</sub>(T<sub>1</sub>)</b>	<b>1.80 E-05</b>	
<b>Average Probability of Failure on Demand 1oo2</b> assumed Proof Test Interval T <sub>1</sub> = 0.083 (once every month) assumed β <sub>1oo2</sub> = 10 %	<b>PFD<sub>avg</sub>(T<sub>1</sub>)</b>	<b>1.80 E-06</b>	

**Results of Assessment for device with micro switch 1SE3**

		SPDT		DPDT	
Lambda Dangerous - AC confidence level of calculation 1-α = 95 %	λ <sub>D_AC</sub>	7.22 E-08 /h	72 FIT	5.06 E-08 /h	51 FIT
Mean Time To Dangerous Failure - AC	MTTF <sub>D_AC</sub>	1,580 a		2,255 a	
<b>Average Probability of Failure on Demand 1oo1 - AC</b> assumed Proof Test Interval T <sub>1</sub> = 0.083 (once every month)	<b>PFD<sub>avg_AC</sub>(T<sub>1</sub>)</b>	<b>2.64 E-05</b>		<b>1.85 E-05</b>	
Lambda Dangerous - DC confidence level of calculation 1-α = 95 %	λ <sub>D_DC</sub>	1.68 E-07 /h	168 FIT	6.02 E-08 /h	60 FIT
Mean Time To Dangerous Failure - DC	MTTF <sub>D_DC</sub>	679 a		1,896 a	
<b>Average Probability of Failure on Demand 1oo1 - DC</b> assumed Proof Test Interval T <sub>1</sub> = 0.083 (once every month)	<b>PFD<sub>avg_DC</sub>(T<sub>1</sub>)</b>	<b>6.14 E-05</b>		<b>2.20 E-05</b>	

**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.