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# COMPLIANCE

## with IEC 61508

Certificate No.: C-IS-182065-01

**CERTIFICATE OWNER:** G.T. Attuatori S.r.l.  
Via Leonardo da Vinci, 3  
20090 – Cusago (Milano)

**WE HEREWITH CONFIRM THAT  
 THE PNEUMATIC ROTARY ACTUATORS  
 (DOUBLE ACTING & SINGLE ACTING)  
 MEET THE SIL REQUIREMENTS DETAILED IN THE ANNEXED TABLES  
 FOR THE SAFETY FUNCTION:**

*“Complete switching on demand (open to closed & closed to open) with correct torque as for technical data sheets, in low demand mode of operation”*

**Examination result:** The below described report was found to meet the standard defined requirements of the safety levels detailed in the following tables (T-IS-182065-01) according to IEC 61508 and 61511, under fulfillment of the conditions listed in the Report R-IS-182065-01-Rev.3 dated July 23<sup>rd</sup> 2010 in its currently valid version, on which this Certificate is based

**Examination parameters:** Construction/Functional characteristics and reliability and availability parameters of the above pneumatic rotary actuators

**Official Report No.:** R-IS-182065 – 01-Rev.3

**Expiry Date** July 22<sup>nd</sup> 2013

IT IS TO BE INTENDED THAT THE ABOVE OFFICIAL REPORT AND ITS ANNEXES ARE AN INTEGRAL PART OF THIS DOCUMENT

**Reference Standard** IEC 61508 Part 2, 4, 6, 7

Sesto San Giovanni, July 23<sup>rd</sup> 2010

TÜV ITALIA Srl

TÜV ITALIA Srl  
Industry Service Division  
Director

Gennaro Oliva



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## SUMMARY TABLE T – IS – 182065 - 01

<i>E/EE/EP safety-related system (final element)</i>	Pneumatic rotary actuators double acting series produced by G.T. ATTUATORI		
<i>Size (Class)</i>	<i>Class a (14 Nm &lt; torque &lt; 120 Nm)</i>	<i>Class b (120 Nm &lt; torque &lt; 690 Nm)</i>	<i>Class c (690 Nm &lt; torque &lt; 8000 Nm)</i>
<i>Safety Function Definition</i>	<i>Complete switching on demand (open to closed &amp; closed to open) with correct torque as for technical data sheets in low demand mode of operation</i>		
<i>Max SIL</i>	SIL 3	SIL 3	SIL 3
<i>Additional requirements for the max SIL classification</i>	<i>Execution of Partial Stroke Test with time interval not higher than 6 months AND Full Functional Proof Test with time interval not higher than 36 months</i>	<i>Execution of Partial Stroke Test with time interval not higher than 6 months AND Full Functional Proof Test with time interval not higher than 36 months</i>	<i>Execution of Partial Stroke Test with time interval not higher than 6 months AND Full Functional Proof Test with time interval not higher than 36 months</i>
$\lambda_{TOT}$	1,063-08 h <sup>-1</sup>	1,795E-08 h <sup>-1</sup>	3,609-07 h <sup>-1</sup>
$\lambda_{SD}$	1,025E-08 h <sup>-1</sup>	1,732E-08 h <sup>-1</sup>	3,480E-07 h <sup>-1</sup>
$\lambda_{SU}$	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>
$\lambda_{DD}$	3,782E-10 h <sup>-1</sup>	6,391E-10 h <sup>-1</sup>	1,284E-8 h <sup>-1</sup>
$\lambda_{DD,d}^{(1)}$	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>
$\lambda_{DD,PSI}^{(2)}$	3,138E-10 h <sup>-1</sup>	5,303E-10 h <sup>-1</sup>	1,066E-8 h <sup>-1</sup>
$\lambda_{DD,FPT}^{(3)}$	6,438E-11 h <sup>-1</sup>	1,088E-10 h <sup>-1</sup>	2,186E-9 h <sup>-1</sup>
$\lambda_{DU}$	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>
$SFF^{(4)}$	99,39 %	99,39 %	99,39 %
$DC^{(4)}$	82,98 %	82,98 %	82,98 %
$PFDD^{(5)}$	1,533E-06	2,591E-06	5,207E-05
$\beta$ and $\beta_D$ factor	10%	10%	10%
$MTTR$	0,08 h	0,10 h	0,30 h
<b>Remarks</b>	<p>(1) Portion of the overall failure rate related to dangerous failure modes that can be considered as detectable by diagnostic tests and/or self-detectable, that is it is possible to immediately detect the failure when it occurs (DD,d).</p> <p>(2) Portion of the overall failure rate related to dangerous failure modes that can be detected by means of Partial Stroke Testing (DD,PSI), with characteristics of diagnostics according to the interpretation of IEC EN 61508 (see details in the report, § 2.3).</p> <p>(3) Portion of failure rate related to dangerous failure modes that can be detected only by means of periodical Full Proof Testing (DD,FPT).</p> <p>(4) SFF and DC calculated taking into account the correct and complete performing, with requested time intervals, of Partial Stroke Testing with characteristics of diagnostics according to the interpretation of IEC EN 61508 (see details in the report, § 2.3).</p> <p>(5) PFD of reference calculated on the basis of a Full Functional Proof Test with time interval equal to 36 months AND Partial Stroke Test with time interval equal to 6 months. This time intervals are considered by TÜV as reasonably consistent with the implementation of the equipment for safety related-applications, with reference to the overall range of results shown in the report, where other possible combination of time intervals adequate for a classification up to SIL 3 are reported. Note that, concerning Full Proof Tests, time intervals for higher than 36 months are considered by TÜV as not adequate and consistent for equipment for safety related applications. Concerning Partial Stroke Tests, time intervals lower than 6 months are highly recommended.</p>		

Table 1 – SIL classification according to Standards IEC EN 61508 (Chapters: 2, 4, 6, 7) for the pneumatic rotary actuators double acting produced by G.T. Attuatori S.r.l.

T – IS – 182065 – 01

NOTE : The present table is integral part of the Document: C-IS-182065-01

Date : July, 23rd 2010



Italia

## SUMMARY TABLE T – IS – 182065 - 01

<i>E/EE/EP safety-related system (final element)</i>	<b>Pneumatic rotary actuators single acting series produced by G.T. ATTUATORI</b>		
<i>Size (Class)</i>	<i>Class a (15 Nm &lt; torque &lt; 64 Nm)</i>	<i>Class b (64 Nm &lt; torque &lt; 344 Nm)</i>	<i>Class c (344 Nm &lt; torque &lt; 7860 Nm)</i>
<i>Safety Function Definition</i>	<i>Complete switching on demand (open to closed &amp; closed to open) with correct torque as for technical data sheets in low demand mode of operation</i>		
<i>Max SIL</i>	<b>SIL 3</b>	<b>SIL 3</b>	<b>SIL 3</b>
<i>Additional requirements for the max SIL classification</i>	<i>Execution of Partial Stroke Test with time interval not higher than 6 months AND Full Functional Proof Test with time interval not higher than 36 months</i>	<i>Execution of Partial Stroke Test with time interval not higher than 6 months AND Full Functional Proof Test with time interval not higher than 36 months</i>	<i>Execution of Partial Stroke Test with time interval not higher than 6 months AND Full Functional Proof Test with time interval not higher than 36 months</i>
$\lambda_{TOT}$	3,945E-09 h <sup>-1</sup>	9,137E-09 h <sup>-1</sup>	9,179E-08 h <sup>-1</sup>
$\lambda_{SD}$	3,805E-09 h <sup>-1</sup>	8,812E-09 h <sup>-1</sup>	8,852E-08 h <sup>-1</sup>
$\lambda_{SU}$	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>
$\lambda_{DD}$	1,404E-10 h <sup>-1</sup>	3,252E-10 h <sup>-1</sup>	3,267E-09 h <sup>-1</sup>
$\lambda_{DD,d}^{(1)}$	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>
$\lambda_{DD,PST}^{(2)}$	1,165E-10 h <sup>-1</sup>	2,699E-10 h <sup>-1</sup>	2,711E-09 h <sup>-1</sup>
$\lambda_{DD,FPT}^{(3)}$	2,390E-11 h <sup>-1</sup>	5,536E-11 h <sup>-1</sup>	5,561E-10 h <sup>-1</sup>
$\lambda_{DU}$	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>	0,000 h <sup>-1</sup>
$SFF^{(4)}$	99,39 %	99,39 %	99,39 %
$DC^{(4)}$	82,98 %	82,98 %	82,98 %
$PFDF^{(5)}$	5,693E-07	1,318E-06	1,324E-05
<b><math>\beta</math> and <math>\beta_D</math> factor</b>	10%	10%	10%
<b>MTTR</b>	0,10 h	0,15 h	0,40 h

**Remarks**

- Portion of the overall failure rate related to dangerous failure modes that can be considered as detectable by diagnostic tests and/or self-detectable, that is it is possible to immediately detect the failure when it occurs (DD,d).
- Portion of the overall failure rate related to dangerous failure modes that can be detected by means of Partial Stroke Testing (DD,PST), with characteristics of diagnostics according to the interpretation of IEC EN 61508 (see details in the report, § 2.3).
- Portion of failure rate related to dangerous failure modes that can be detected only by means of periodical Full Proof Testing (DD,FPT).
- SFF and DC calculated taking into account the correct and complete performing, with requested time intervals, of Partial Stroke Testing with characteristics of diagnostics according to the interpretation of IEC EN 61508 (see details in the report, § 2.3).
- PFDF of reference calculated on the basis of a Full Functional Proof Test with time interval equal to 36 months AND Partial Stroke Test with time interval equal to 6 months. This time intervals are considered by TÜV as reasonably consistent with the implementation of the equipment for safety related-applications, with reference to the overall range of results shown in the report, where other possible combination of time intervals adequate for a classification up to SIL 3 are reported. Note that, concerning Full Proof Tests, time intervals for higher than 36 months are considered by TÜV as not adequate and consistent for equipment for safety related applications. Concerning Partial Stroke Tests, time intervals lower than 6 months are highly recommended.

Table 2 – SIL classification according to Standards IEC EN 61508 (Chapters: 2, 4, 6, 7) for the pneumatic rotary actuators single acting produced by G.T. Attuatori S.r.l.

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