

COMPLIANCE

with IEC EN 61508

Certificate No.: C – IS – 722194241-02

CERTIFICATE OWNER: PENTA S.r.l.
Via G. Boccaccio, 23
25080 – Molinetto di Mazzano (BS) - Italy

**WE HEREWITH CONFIRM THAT
TRUNNION BALL VALVES SERIES
APT2 – SAT/APT3 – SAT CRIO – 3WAY
MEET THE SIL REQUIREMENTS DETAILED IN THE ANNEXED TABLES
FOR THE SAFETY FUNCTIONS:**

“correct switching on demand (open to closed), and tight for closing phase, in low demand mode of operation”

“correct switching on demand (open to closed), in low demand mode of operation”

“correct switching on demand (closed to open), in low demand mode of operation”

Examination result: The above reported Trunnion Ball Valves were found to meet the standard defined requirements of the safety levels detailed in the following table (T-IS-722194241-02) according to IEC EN 61508, under fulfillment of the conditions listed in the Report R-IS-722194241-02 Rev.1 dated April, 17th 2019 in its currently valid version, on which this Certificate is based

Examination parameters: Construction/Functional characteristics and reliability and availability parameters of the above Trunnion Ball Valves

Official Report No.: R-IS-722194241-02 Rev.1

Expiry Date April, 16th 2022

**IT IS TO BE INTENDED THAT THE ABOVE OFFICIAL REPORT AND ITS ANNEXES ARE AN INTEGRAL PART OF THIS DOCUMENT
THE PRESENT DOCUMENT SUBSTITUTES AND REPEALS THE DOCUMENT C-IS-2690080-02**

Reference Standard IEC EN 61508:2010 Part 2, 4, 6, 7

Sesto San Giovanni, April, 17th 2019



TÜV ITALIA Srl
Industry Service Division
Technical Manager

Paolo Marccone
Paolo Marccone

SUMMARY TABLE

T – IS – 722194241-02



Italia

<i>E/EE/EP safety-related system (final element)</i>	Trunnion Ball Valves produced by PENTA S.r.l.
<i>System type</i>	Type A
<i>Systematic Capability</i>	SC3
<i>Safety Function Definition</i>	<i>SIF1: "Correct switching on demand (open to closed) and tight for closing phase, in low demand mode of operation"</i>
<i>Max SIL⁽¹⁾</i>	SIL3
λ_{TOT}	1,801E-07
λ_{NE}	4,309E-08
λ_S	0,000E+00
$\lambda_{DD,PST}^{(2)}$	8,220E-08
$\lambda_{DU,FPT}$	5,479E-08
<i>β and β_D factor</i>	10%
<i>MRT</i>	8 h
<i>Hardware Safety Integrity</i>	Route 2H
<i>Systematic Safety Integrity</i>	Route 2s
Remarks	
<p><i>(1) The Safety Integrity Level (SIL) of the entire Safety Instrumented Function (SIF) must be verified via a calculation of PFD_{AVG} considering the redundant architectures, proof test interval, proof test effectiveness, any automatic diagnostics, average repair time and the specific failure rates of all products included in the SIF. Each subsystem must be checked to assure compliance with the minimum hardware fault tolerance (HFT) requirements.</i></p> <p><i>(2) Considering an automatic Partial Stroke Testing.</i></p>	

SIL classification according to Standard IEC EN 61508:2010 (Chapters: 2, 4, 6, 7) for Trunnion Ball Valves produced by PENTA S.r.l. – SIF1

SUMMARY TABLE

T – IS – 722194241-02



Italia

<i>E/EE/EP safety-related system (final element)</i>	Trunnion Ball Valves produced by PENTA S.r.l.
System type	Type A
Systematic Capability	SC3
Safety Function Definition	<i>SIF2: "Correct switching on demand (open to closed), in low demand mode of operation"</i>
Max SIL⁽¹⁾	SIL3
λ_{TOT}	1,801E-07
λ_{NE}	1,268E-07
λ_S	0,000E+00
$\lambda_{DD,PST}^{(2)}$	3,654E-08
$\lambda_{DU,FPT}$	1,676E-08
β and β_D factor	10%
MRT	8 h
Hardware Safety Integrity	Route 2H
Systematic Safety Integrity	Route 2s
Remarks	
<p>(1) The Safety Integrity Level (SIL) of the entire Safety Instrumented Function (SIF) must be verified via a calculation of PFD_{AVG} considering the redundant architectures, proof test interval, proof test effectiveness, any automatic diagnostics, average repair time and the specific failure rates of all products included in the SIF. Each subsystem must be checked to assure compliance with the minimum hardware fault tolerance (HFT) requirements.</p> <p>(2) Considering an automatic Partial Stroke Testing.</p>	

SIL classification according to Standard IEC EN 61508:2010 (Chapters: 2, 4, 6, 7) for Trunnion Ball Valves produced by PENTA S.r.l. – SIF2

SUMMARY TABLE
T – IS – 722194241-02



Italia

<i>E/EE/EP safety-related system (final element)</i>	Trunnion Ball Valves produced by PENTA S.r.l.
System type	Type A
Systematic Capability	SC3
Safety Function Definition	<i>SIF3: "Correct switching on demand (closed to open), in low demand mode of operation"</i>
Max SIL⁽¹⁾	SIL3
λ_{TOT}	1,801E-07
λ_{NE}	6,161E-08
λ_S	0,000E+00
$\lambda_{DD,PST}^{(2)}$	8,719E-08
$\lambda_{DU,FPT}$	3,128E-08
β and β_D factor	10%
MRT	8 h
Hardware Safety Integrity	Route 2 _H
Systematic Safety Integrity	Route 2 _s
Remarks	
<p><i>(1) The Safety Integrity Level (SIL) of the entire Safety Instrumented Function (SIF) must be verified via a calculation of PFD_{AVG} considering the redundant architectures, proof test interval, proof test effectiveness, any automatic diagnostics, average repair time and the specific failure rates of all products included in the SIF. Each subsystem must be checked to assure compliance with the minimum hardware fault tolerance (HFT) requirements.</i></p> <p><i>(2) Considering an automatic Partial Stroke Testing.</i></p>	

SIL classification according to Standard IEC EN 61508:2010 (Chapters: 2, 4, 6, 7) for Trunnion Ball Valves produced by PENTA S.r.l. – SIF3