



RWTÜV Italia S.r.l.

PFD ASSESSMENT REPORT N. 233J04001

Pibiviesse Ball Valves Series:

WO, W1, W3, T1, T3, E, E0, E1, E3, E5, EP, EZ0, EZ1, EZ, EZ3, CV

Date:2004-12-21

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Probability of Failure on Demand (PFD)

Project:

Ball Valves Series:

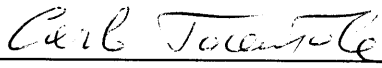
WO, W1, W3, T1, T3, E, E0, E1, E3, E5, EP, EZ0, EZ1, EZ, EZ3, CV

Customer:

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0. SUMMARY

This report summarizes the results of a PFD evaluation of the Pibiviesse Ball Valves Series WO, W1, W3, T1, T3, E, E0, E1, E3, E5, EP, EZ0, EZ1, EZ, EZ3, CV.

A "proven-in-use" evaluation was performed, according to IEC 61508-2 and IEC 61511-1, to evaluate the λ values and, consequently, the SFF and the PFD_{AVG} values of the Ball Valves series.

The PFD evaluation according to IEC 61508-2 is one of the steps to be taken to achieve functional safety certification according to IEC 61508 of a device. Failure rates and Safe Failure Fraction are determined. The PFD evaluation described in this report concerns only the hardware of the product, electrical and mechanical. For full functional safety certification purposes all the requirements of IEC 61508 (Part 1÷7) must be considered.

The Valves object of this assessment report are trunnion mounted Ball Valves, designed to be used in a Safety Instrumented System for use in low demand application (Emergency Shut Down).

The Valves are classified as Type A devices according to IEC 61508, having an hardware fault tolerance of 0.

The analysis gives the results summarized in Table 1.

λ_{sd}	λ_{su}	λ_{dd}	λ_{du}	SFF	PFD_{AVG}	MTBF
163 FIT	108 FIT	7,87 FIT	5,25 FIT	98,15%	$0,9 \cdot 10^{-4}$	402 years

Table 2: Failure rates, SFF, PFD_{AVG} and MTBF values of Pibiviesse Ball Valves Series according to IEC 61508

These values are determined with the following input values of the parameters¹:

• Time Inspection _(manual) TI	36 months
• Time inspection _(automatic) TI _{PS}	6 months
• Diagnostic Coverage _(for Partial Stroke Test) DC	60%

As per these values, the Pibiviesse Ball Valves Series WO, W1, W3, T1, T3, E, E0, E1, E3, E5, EP, EZ0, EZ1, EZ, EZ3, CV can be used up to SIL 3 as a single device.

A user of the Pibiviesse Ball Valves Series WO, W1, W3, T1, T3, E, E0, E1, E3, E5, EP, EZ0, EZ1, EZ, EZ3, CV can utilize this failure rates in a probabilistic model of a Safety Instrumented Function (SIF) to determine suitability in part for Safety Instrumented System (SIS) usage in a particular Safety Integrity Level (SIL).

¹ For a full table of results for different values of TI and TI_{PS}, see section 6 of the present document.