



**BUREAU
VERITAS**

FAILURE MODE EFFECTS ANALYSIS SUMMARY

IT FILE 17.IT.2754999.726 doc. n° TC1256/17/PC/mc rev. 00

Name and address of the manufacturer: PNEUMAX S.p.A. Via Cascina Barbellina 10 – 24050- Lurano (BG)

Type(s) of product and component manufactured: Bistable Pneumatic Valves 3/2 or 5/2 type SS1232C1111x / SS1432C1111x / SS125201111x / SS145201111x

Activity: FMEA requested by PNEUMAX S.p.A.

Safety Function: De-energize and vent (or energize and feed) on demand by the safety system

Product designation: Pneumatic Spool Valves from the Steel Line batch, available in two sizes (from 1/4" to 1/2"), with body and spool made in AISI 316L in full conformance NACE MR0175/ ISO 15156-1, and seals in FPM or NBR.

Reference standards : IEC 61508 part 1 and 2 Ed. 2 2010*

Report: TC1250/17/PC/mc rev.00

RESULTS:

Systematic integrity: SIL 3 capable

Random Integrity: Type A component, Route 1H, HFT=0

PFD_{AVG} and architecture constraints must be verified for each application.

Failure Category	Failure rate (1/h)			
	λ_{su}	λ_{du}	λ_{sd}	λ_{dd}
De-energize and vent to trip	9,00E-08	6,00E-08	0	0
Energize and feed to trip	0	1,50E-07	0	0
De-energize and vent to trip w/ PVST	9,00E-08	6,00E-10	0	5,94E-08
Energize and feed to trip w/ PVST	0	9,06E-07	0	5,94E-08

Applications restrictions

The unit must be properly designed into a Safety Instrumented Function as per manufacturer instructions and safety manual.

The safety integrity level (SIL) of the entire safety instrumented function (SIF) must be verified through calculation of PFD_{AVG} considering appropriate architectures, proof test interval, automatic diagnostics, repair time and specific failure rates of all products of the SIF. Each subsystem must be checked to assure compliance with minimum hardware fault tolerance (HFT) requirements.

The dd values are considered obtained by a perfect diagnostic coverage facility.

Compiled by: M.Cencio

Bureau Veritas Italia S.p.A.

Approved by: P.Capellini



Date of issue: 20th Dec. 2017

* Although this standard is primarily concerned with E/E/PE safety related systems, it could also provide a technical framework for considering any safety related system irrespective of the technology of that system (for example mechanical, hydraulic or pneumatic)