Certificate / Certificat
Zertifikat / 合格証

MAR 091051 C002

exida hereby confirms that the:

Series 33
3-Way Ball Valves

Mars Valve Co., Ltd.
Taichung, Taiwan – R.O.C.

Has been assessed per the relevant requirements of:

IEC 61508 : 2010 Parts 1-7

and meets requirements providing a level of integrity to:

Systematic Capability: SC 3 (SIL 3 Capable)

Random Capability: Type A, Route 2_H Device

PFD_{AVG} and Architecture Constraints must be verified for each application

Safety Function:
The Ball Valve will move to the designed safe position per the actuator design within the specified safety time.

Application Restrictions:
The unit must be properly designed into a Safety Instrumented Function per the Safety Manual requirements.

Evaluating Assessor

Certifying Assessor

The manufacturer may use the mark:

Revision 3.1 April 18, 2017
Surveillance Audit Due
May 1, 2020

ANSI Accredited Program
ISO/IEC 17065
PRODUCT CERTIFICATION BODY
#1004

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Systematic Capability: SC 3 (SIL 3 Capable)

Random Capability: Type A, Route 2_H Device

PFD_{AVG} and Architecture Constraints must be verified for each application

Series 33 3-Way Ball Valves

Systematic Capability :

The product has met manufacturer design process requirements of Safety Integrity Level (SIL) 3. These are intended to achieve sufficient integrity against systematic errors of design by the manufacturer.

A Safety Instrumented Function (SIF) designed with this product must not be used at a SIL level higher than stated.

Random Capability:

The SIL limit imposed by the Architectural Constraints must be met for each element. This Device meets *exida* criteria for Route 2_H.

IEC 61508 Failure Rates, Clean Service in FIT[1]

Application/Configuration	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}
Full Stroke, Floating	0	0	0	451
Tight Shut-Off, Floating	0	0	0	1199
Open on Trip, Floating	0	128	0	323
Full Stroke with PVST[2], Floating	0	0	167	284
Tight Shut-Off with PVST, Floating	0	0	167	1032
Open on Trip with PVST, Floating	127	1	167	156
Full Stroke, Trunnion	0	0	0	502
Tight Shut-Off, Trunnion	0	0	0	1266
Open on Trip, Trunnion	0	132	0	370
Full Stroke with PVST, Trunnion	0	0	196	306
Tight Shut-Off with PVST, Trunnion	0	0	196	1070
Open on Trip with PVST, Trunnion	131	1	196	174

[1] FIT = 1 failure / 10^9 hours
[2] PVST = Partial Valve Stroke Test

SIL Verification:
The Safety Integrity Level (SIL) of an entire Safety Instrumented Function (SIF) must be verified via a calculation of PFD_{AVG} considering 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 minimum hardware fault tolerance (HFT) requirements.

The following documents are a mandatory part of certification:

Assessment Report: MAR Q091051 R004 V3R2 or later

Safety Manual: 25-04-07 Safety Manual 3-Way Ball Valve

80 N Main St
Sellersville, PA 18960