Certificate / Certificat
Zertifikat / 合格証

FLO 1303024 C001

exida hereby confirms that the:

Worcester 44/59/459/599 Series Ball Valves

Flowserve Flow Control

Haywards Heath, West Sussex - UK

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.

The manufacturer may use the mark:

Revision 1.1 August 29, 2016
Surveillance Audit Due
September 1, 2019

Evaluating Assessor

Certifying Assessor

ANSI Accredited Program
PRODUCT CERTIFICATION
#1004

Certificate / Certificat / Zertifikat / 合格証

FLO 1303024 C001

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

Worcester 44/59/459/599 Series 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 in FIT*

Failure rates Worcester A, AW, E, F, 5HP, WK and V44 Series; A, E, and F55 Series; A, E, F and V459 Series; A, E and F599 Series Ball Valves Clean Service

Device	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}	SFF
Full Stroke	0	0	0	468	-
Tight Shut-Off	0	0	0	1334	-
Open on Trip	0	146	0	322	-
Full Stroke with PVST	0	0	162	306	-
Tight Shut-Off with PVST	0	0	162	1172	-
Open on Trip with PVST	146	0	162	160	-

* FIT = 1 failure / 10^9 hours

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 element must be checked to assure compliance with minimum hardware fault tolerance (HFT) requirements.

The following documents are a mandatory part of certification:

Assessment Report: FLO 13-03-024 R001 V1 R3

Safety Manual: FLOSILWOR4459459599-01 Rev 0 or Later

80 N Main St
Sellersville, PA 18960