



The manufacturer  
may use the mark:



Valid until October 1, 2016  
Revision 2.0 October 4, 2013



ANSI Accredited Program  
PRODUCT CERTIFICATION  
#1004

# Certificate / Certificat Zertifikat / 合格証

FLO 091050 C008

*exida* hereby confirms that the:

## Worcester Series C4/C44/C51 Ball Valves

**Flowserve Corporation  
Cookeville, TN - USA**

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<sub>H</sub> Device**

**PFD<sub>AVG</sub> and Architecture Constraints  
must be verified for each application**

Safety Function:

The 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

**Worcester Series  
C4/C44/C51 Ball  
Valves**



64 N Main St  
Sellersville, PA 18960

T-061, V1R2-3

# Certificate / Certificat / Zertifikat / 合格証

FLO 091050 C008

**Systematic Capability: SC 3 (SIL 3 Capable)**

**Random Capability: Type A, Route 2<sub>H</sub> Device**

**PFD<sub>AVG</sub> and Architecture Constraints  
must be verified for each application**

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<sub>H</sub>.

## IEC 61508 Failure Rates in FIT\*

Application	$\lambda_{SD}$	$\lambda_{SU}$	$\lambda_{DD}$	$\lambda_{DU}$
Full Stroke	0	0	0	508
Tight Shut-Off	0	0	0	1404
Open on Trip	0	172	0	336
Full Stroke with PVST	0	0	168	340
Tight Shut-Off with PVST	0	0	168	1236
Open on Trip with PVST	172	0	168	168

\* FIT = 1 failure / 10<sup>9</sup> hours

SIL Verification:

The Safety Integrity Level (SIL) of an entire Safety Instrumented Function (SIF) must be verified via a calculation of PFD<sub>AVG</sub> 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: FLO 09-10-50 R015 V3R1 Assessment Cookeville Rotary Valves

Safety Manual: SIL Safety Guide Worcester Ball Valves