



Certificate / Certificat Zertifikat / 合格証

Flowserve 1412064 P0038 C001

exida hereby confirms that the:

**Atomac Lined Ball Valves
AD1, AKH2, AKH2.2, AKH2A,
AKH2-300, AKH3, AKH6 and AtoStar**

**Flowserve Ahaus GmbH
Ahaus, Germany**

Have 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 June 2, 2017
Surveillance Audit Due
June 30, 2020



Peter L
Evaluating Assessor

Stevan J. Chase
Certifying Assessor

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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

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*

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Application	Fully closed			Tight shut off			Fully Open		
	λ_{Safe}	λ_{DD}	λ_{DU}	λ_{Safe}	λ_{DD}	λ_{DU}	λ_{Safe}	λ_{DD}	λ_{DU}
Clean service	0	0	487	0	0	1778	194	0	293
Clean Service with PVST	0	191	296	0	191	1587	194	191	102
Severe service	0	0	906	0	0	3488	389	0	517
Severe Service with PVST	0	341	565	0	341	3147	389	341	176

*FIT = 1 failure / 10⁹ hours
PVST = Partial Valve Stroke Test of a final element Device

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: Flowserve 14/12-064-C R009 V1 R0

Safety Manual: : SIL Safety Guide - Atomac® and Durco® Fluoropolymer Lined Valves V1 R0

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