



MXa SIL Certification

SIL 3 capable for your critical applications

Safety is vital in applications with potential to expose people and expensive equipment to random failures and their ramifications. This is especially true for equipment that employs microprocessors and programmable logic. Users want not only assurances, but also hard proof that confirm the equipment purchased for critical safety installations is safe, thus meeting the stipulations of IEC 61508. The MXa has been awarded its SIL certification by exida Certification Services and meets the requirements to provide a level of systematic integrity up to SIL 3. The MXa is identified as SIL 3 capable, meaning it is suitable for any safety integrity levels up to SIL 3.

SIL 2 identified as Basic ESD and PST (moves when commanded) in a “1oo1” configuration (one out of one means that only one actuator is required to ensure the SIL 2 requirement is achieved).

SIL 3 identified as Stay-put (no uncommanded movement), Enhanced ESD and PST in a “1oo2” configuration (one out of two means that two actuators and valves are required to ensure the SIL 3 requirement is achieved).



Experience In Motion



SIL 3 Capable Certificate

The manufacturer may use the track.



Certificate / Certificat / Zertifikat / 合格証
Zertifikat / 合格証
 FLO 081012 C001
 exida hereby confirms that the:

MXa Electronic Valve Actuator

**Flowserve Limatorque
 Lynchburg, VA - USA**

Has been assessed per the relevant requirements of:
IEC 61508 : 2000 Parts 1-7
 and meets requirements providing a level of integrity to:



Systematic Integrity: SIL 3 Capable
Random Integrity: Type A Element
PFD_{avg} and Architecture Constraints must be verified for each application

Safety Function:
 The Electronic Valve Actuator will move to the designed safe state per the actuator design within the specified safety time.

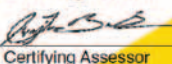
Application Restrictions:
 The unit must be properly designed into a Safety Instrumented Function per the Safety Manual requirements.

Reports:
 FLO 08-10-12 R002 V1R1 IEC 61508 Assessment MXa Report
 FLO 08-01-45 R002 V1 R4 FMEDA Report

Validity:
 This assessment is valid for the MXa Electronic Valve Actuator.
 This assessment is valid until February 1, 2015.
 Revision 1.1, January 10, 2012

Evaluating Assessor



Certifying Assessor

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Certificate / Certificat / Zertifikat / 合格証
 FLO 081012 C001

Systematic Integrity: SIL 3 Capable
Random Integrity: Type A Element
PFD_{avg} and Architecture Constraints must be verified for each application


SIL 3 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 without "prior use" justification by end user or diverse technology redundancy in the design.

IEC 61508 Failure Rates in FIT*

Device	λ_{DU}	λ_{DU}	λ_{DU}	λ_{DU}
MXa Electronic Valve Actuator ESU Valve Open/Close Applications No Partial Stroke Test	404 FIT	962 FIT	1,920 FIT	974 FIT
MXa Electronic Valve Actuator ESU Valve Open/Close Applications with Partial Stroke Test	461 FIT	905 FIT	2,510 FIT	388 FIT

Device	λ_{DU}
MXa Electronic Valve Actuator Continuous Demand Mode	399 FIT

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.
 * FIT = 1 failure / 10⁶ hours



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081008	2.7.3	Mar 2011

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Additionally, the MXa achieved a SIL rating for the actuator including all of the standard controls such as status contacts and torque sensing. Failure in time (FIT) metrics are improved when a partial stroke test is utilized (PST). Refer to the table below.

PFD_{avg} (Probability of Failure on Demand) for MXa Actuator Without PST

Mission Time	Proof Test Interval		
	1 year	3 years	5 years
10 yr	5.24 E-3	1.28 E-2	2.18 E-2
15 yr	5.45 E-3	1.38 E-2	2.20 E-2
20 yr	5.66 E-3	1.36 E-2	2.23 E-2

PFD_{avg} for MXa Actuator With Monthly PST

Mission Time	Proof Test Interval		
	1 year	3 years	5 years
10 yr	2.96 E-3	5.93 E-3	9.52 E-3
15 yr	3.22 E-3	6.51 E-3	9.77 E-3
20 yr	3.47 E-3	6.60 E-3	1.00 E-2

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