



Certificate of Conformity to IEC 61508

Functional Safety of Safety-Related Programmable Electronic Systems

The **Moto Mecánica Argentina S.A., mSafe 3M Electro-Hydraulic Assembly**, has been assessed and is considered capable for use in a low demand Safety Function up to SIL 2.

The assessment was carried out to determine compliance with IEC 61508 with regards to:

- Random Hardware Failure (predicted failure rates).
- Architectural Constraint / Type B element / Route 1_H (HFT = 0).

The assessment was based on the assumptions, data provided, and recommendations given in:

[1] Gefran KX Series TUV Rheinland State of conformity no: 28713306, Certificate.

The product was assessed against the following safety function:

- When the Pressure Transmitter detects the configured alarm settings the Logic Solver (PCB L03-60590-01) will cause de-energising and opening of solenoid relief valve;
- The response time of the Safety Function is of less than 1 second; this does not consider the actuation time of a well actuator/valve, as it is not part of the analysed assembly. In order to calculate the response time of a function intended to isolate a well, the response time of the well valve would have to be considered;
- The output of the Logic Solver is normally energised.

The system will also be configured to react to the following fault conditions:

- The Pressure Transmitter is to be configured in such a way that any self-detected fault or out of range (high or low) causes de-energising and opening of solenoid relief valve via Logic Solver (PCB L03-60590-01);
- Any self-detected fault in the Logic Solver will cause de-energising and opening of solenoid relief valve.

The Electro-hydraulic assembly assessed comprises the following sub-elements / functional blocks:

- Pressure Transmitters (Gefran KX).
- Printed Circuit Board (PCB L03-60590-01): consisting of a power supply, an analogue input, a microcontroller, an external memory and a digital output (See ESC Ltd Report: L115_FM001 Rev.1);
- Hydraulic Assembly: Assessed via FMECA technique (See ESC Ltd Report: L290_FM001 Rev.1).

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body

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ENGINEERING SAFETY CONSULTANTS

The Global Provider of Functional Safety Expertise and Technical Consultancy

Random Capability:

Predicted Failure Rates

Component	Pressure Transmitter	PCB			Hydraulic Assembly
		Power Supply / Analogue Input	Microcontroller / Memory	Digital Output	
λ_{DU} (/hr)	6.81E-08	2.48E-09	1.50E-08	2.72E-08	4.80E-08
λ_{DD} (/hr)	1.55E-08	3.83E-08	5.75E-08	0.00E00	0.00E00
λ_s (/hr)	7.00E-08	9.00E-08	8.27E-08	1.31E-07	9.83E-06
SFF (%)	91%	98%	90%	83%	99.5%
HFT	0	0	0	0	0
Device Type	B	A	B	A	A
Max. SIL (Arch)	2	3	2	2	3

The components of the assembly achieve SIL 2 requirements in terms of random failures and architectural constraints.

The Safety Integrity Level (SIL) of an entire Safety Instrumented Function (SIF) must be verified via calculations of PFD_{avg} / PFH (considering Proof Test interval and effectiveness, automatic diagnostics and average repair times) and architectural constraints for each application.

Systematic Capability:

Systematic Capability has not been considered as part of this certificate.

Managing Director: Simon Burwood
 Member of IEC 61508 (MT61808-1-2) & IEC 61511 (MT61511) Maintenance Committees
 Assessment Date: April 2022, valid to April 2024
 Certificate: L290_CT001_Eng. Rev.1

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