

Random Hardware Reliability and Systematic Assessment Certificate

Functional Safety of Safety-Related Programmable Electronic Systems

The **BEL Valves Ltd, Slab Gate Valves T36019-V (ETAP No: XXV-823033) and T36020-V (ETAP No: XXV-823032)** (along with their actuators and associated Hydraulic Control Panel (HCP)) have been assessed for use in a low demand Safety Function up to (and including) SIL 2 with regards to systematic, random hardware failures and architectural constraints.

The assessment was carried out to determine compliance with IEC 61508 (2010 Edition) with regards to:

- Random Hardware Failure (Predicted PFD as shown in Table below) with a Mean Down Time (MDT) of 168 hours, a Proof Test Interval (PTI) of 1 year (8760 hours), a Proof Test Coverage (PTC) of 100% or 95% and an Overhaul Interval of 11 years (96360 hours);
- Random Hardware Failure with Achieved PFH = 4.2E-07 (for a 1oo1 configuration), 4.4E-08 (for a 1oo2 configuration);
- Random Hardware Failure with Achieved $\lambda_{DD} = 0.0E+00$ (/hr)
- Random Hardware Failure with Achieved $\lambda_{DU} = 4.2E-07$ (/hr)
- Architectural Constraints (Type A, 60%-90%);
- Systematic Capability of SC 2.

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

- **Engineering Safety Consultants Ltd Report: L250_ FM001 rev. 4.**

The products were assessed against the following failure mode:

- **Ability to close gate valve and isolate pipework & equipment downstream.**

The assessment results are as follows:

HFT = 0				
Description	Proof Test Coverage (PTC)	Assumed Proof Test Interval	PFD Achieved	Type
T36019-V (ETAP Tag No XXV-823033) + HCP	95%	1 year	2.8E-03	A
	100%	1 year	1.9E-03	A
T36020-V (ETAP Tag No XXV-823032) + HCP	95%	1 year	2.8E-03	A
	100%	1 year	1.9E-03	A
HFT = 1				
Description	Proof Test Coverage (PTC)	Assumed Proof Test Interval	PFD Achieved	Type
T36019-V (ETAP Tag No XXV-823033) + HCP	95%	1 year	2.9E-04	A
	100%	1 year	1.9E-04	A
T36020-V (ETAP Tag No XXV-823032) + HCP	95%	1 year	2.9E-04	A
	100%	1 year	1.9E-04	A

Page 1 of 2



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IMPORTANT: It should be noted that this assessment does not include confirmation of the response time of the devices. For response times (along with any relevant assumptions) reference should be made to the Safety Manual of each device and the total SIF response time **MUST** be compared against the process safety time for the specific application.

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Page 2 of 2

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