Functional Safety
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SIL assessment (summary)

The element safety function(s) of the

SAUNDERS® DN8 to DN100

S360 Pneumatically Actuated Diaphragm Valves (with accessories)

are suitable for use in SIL 2 safety functions according to IEC 61508-2:2010 when integrated and used in accordance with the manufacturer's safety manual *

The following element safety functions have been assessed:

- Close on demand (spring closed)

The above products meet the requirements of IEC 61508-2 for a 'type A' device with systematic capability SC 2.
Failure data (established by 'Route 1_H'), assumptions used in the FMEDA, conditions and important notes for the integrator/user are shown overleaf.
The safety manual shall be complied with when integrating the valves into safety functions, and for all post-integration lifecycle activities.

* The achieved SIL of a safety function that uses these valves shall be verified considering all relevant factors outside the scope of this assessment.

Manufacturer:	CRANE Process Flow Technologies
Full report:	RPT23015-1 assessment report for CRANE rev 1.0
Safety manual:	SIL_SM_001 rev 1
Date of issue:	15th March 2024
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cass
Assessor ID: 23003

Functional safety information in this document is based on an assessment using the CASS methodology

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F U N C T I O N A L S A F E T Y A S S E S S M E N T

Silmetric Ltd, Chester, United Kingdom

Form: FSA012-1

Summary of assessment and conditions

SUMMARY OF FAILURE DATA (ALL SIZES)			
SAFETY FUNCTION: CLOSE ON DEMAND			
Dangerous undiagnosed failure rate	λ_{DU}	4.5E-07	
Dangerous diagnosed failure rate	λ_{DD}	5.8E-07	*See Note 3*
Safe failure rate	λ_{S}	8.5E-07	
No-effect failure rate	λ_{NE}	1.0E-06	
Safe failure fraction	SFF	76%	*See Note 3*
Device 'type'	A or B	Type A	*See Note 4*
Probability of failure on demand	PFD_{AVG}	2.0E-03	*See Note 5*
Average frequency of dangerous failure per hour	PFH	4.5E-07	*See Note 6*
SIL capability in low demand mode of operation		SIL 2	*See Note 7*
SIL capability in high demand mode of operation		SIL 2	*See Note 8*

General notes, assumptions and conditions regarding the failure data in table(s) above

1) Mechanical failure modes and basis for failure rates are described in confidential FMEDA report RPT23015-2.
2) The failure data applies equally across the range of DN8 through DN100 Lite/Strong valves, and to the PTFE or rubber diaphragm materials.
3) The estimated diagnostics coverage (and hence SFF) assumes switchbox signals are used to confirm correct actuator movement. See also Note 6 below.
4) The device type is defined according to IEC 61508-2 clause 7.4.4.1.2 and 7.4.4.1.3 (type A is generally a non-complex device).
5) The PFD_{AVG} calculation assumes the proof test interval (T) is 8,760h, the mean repair time (MRT) is 24h, and mean time to restoration (MTTR) is 24h.
6) The PFH and PFD_{AVG} calculations assume the diagnostic (switchbox) signals are used, and the test interval is significantly shorter than the expected interval between demands for the application.
7) 'SIL capability' in low demand mode is limited by the PFD_{AVG}, architectural constraints (SFF, type A device, and HFT 0), and systematic capability (SC 2).
8) 'SIL capability' in high demand mode is limited by the PFH, architectural constraints (SFF, type A device, and HFT 0), and systematic capability (SC 2).
9) Accessories: The solenoid valve with switch box (ASCO 3/2 Way Pilot Operated Solenoid with Signalling Unit) must be integrated and used in accordance with its SIL capability specifications (ref. certificate 568326-C01) and instruction manual.
10) Refer to product specification CPE-SAUNDERS-HC4-S360-BU-EN-A4-2019_10_02-web for details of the actuated diaphragm valves and accessories, and CPE-SAUNDERS-HC4-S360-IM-EN-A4-2019_10_02-web for details of installation and maintenance.