



FUNCTIONAL SAFETY CERTIFICATE

This is to certify that the

DXN Valvetop

manufactured by

Topworx Inc.

3300 Fern Valley Road
Louisville
Kentucky
40213
USA

have been assessed by Sira Certification Service with reference to the
CASS methodologies and found to meet the requirements of

IEC 61508-2:2010
Routes 1_H & 1_S
Systematic Capability (SC3)

as an element/subsystem suitable for use in safety related systems performing safety
functions up to and including

SIL 2 capable with HFT=0 (1oo1)*
SIL 3 capable with HFT=1 (1oo2)*

when used in accordance with the scope and conditions of this certificate.

* This certificate does not waive the need for further functional safety verification to
establish the achieved Safety Integrity Level (SIL) of the safety related system

Certification Manager:

James Lynskey

Initial Certification : 18/11/2019
This certificate re-issued : 19/08/2024
Renewal date : 17/11/2029

Certificate No.: Sira FSP 19014/01
Form 7016 issue 5
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Product description and scope of certification

The DXN Valvetop is a discrete valve position monitor/indicator. It is one of Topworx's D-series Valvetop. It is qualified for use in containment and for quarter-turn Automatic Opening Vents (AOVs). It contains two GO Switches to give open/close indication, a ceramic terminal block for quick and easy wiring and it mounts directly onto the actuator for a seamless valve package. The GO switch provides versatile position sensing solution when conventional switches fail. It detects like a proximity switch and functions like a limit switch providing high reliability in extreme weather conditions and environment.

The DXN Valvetop is intended to be used as part of a safety instrumented system (SIS) at a suitable safety integrity level.



Figure 1: Typical Assembly of the DXN Valvetop

Element Safety Function

The element safety function of the DXN Valvetop is defined as follows:

To provide electrical signal outputs which correspond to the position of an attached valve.

Certified Data in support of use in safety functions

As part of the product assessment and supporting evidence of conformity in with respect to 'hardware safety integrity' against the requirements of IEC 61508-2; Topworx have submitted the DXN Valvetop for FMEA assessment to attain SIL capability. The component failure rates and modes for the DXN Valvetop have been extracted from or calculated using Quanterion Automated Databook, Item Toolkit and Faradip 3.0. Table 1 summarises the FMEA assessment for the DXN Valvetop.

Table 1.1: FMEA Summary for the DXN Valvetop in single mode (1oo1) [Monitoring Normally Closed Contacts]

<u>Safety Function:</u>		
To provide electrical signal outputs which correspond to the position of an attached valve.		
Summary of IEC 61508-2 Clauses 7.4.2 and 7.4.4		DXN Valvetop
Architectural constraints & Type of product A/B		HFT = 0 Type A
Safe Failure Fraction (SFF)		27%
Random hardware failures: [h ⁻¹]	λ_{DD}	1.99E-08
	λ_{DU}	5.33E-08
Random hardware failures: [h ⁻¹]	λ_{SD}	0.00E+00
	λ_{SU}	1.15E-07
Diagnostic coverage (DC)		72%
PFD @ PT1 = 8760 Hrs. MTTR = 8 Hrs.		2.34E-04
Probability of Dangerous failure (High Demand - PFH) [h ⁻¹]		5.33E-08
Hardware safety integrity compliance		Route 1 _H
Systematic safety integrity compliance		Route 1 _s See report TOPWORX_FSM_70005301
Systematic Capability (SC1, SC2, SC3, SC4)		SC 3
Hardware safety integrity achieved		SIL 2



Table 1.2: FMEA Summary for the DXN Valvetop in single mode (1oo1) [Monitoring Normally Open Contacts]

Safety Function:		
To provide electrical signal outputs which correspond to the position of an attached valve.		
Summary of IEC 61508-2 Clauses 7.4.2 and 7.4.4		DXN Valvetop
Architectural constraints & Type of product A/B		HFT = 0 Type A
Safe Failure Fraction (SFF)		70%
Random hardware failures: [h ⁻¹]	λ_{DD}	1.99E-08
	λ_{DU}	5.25E-08
Random hardware failures: [h ⁻¹]	λ_{SD}	0.00E-00
	λ_{SU}	1.03E-07
Diagnostic coverage (DC)		27%
PFD @ PT1 = 8760 Hrs. MTTR = 8 Hrs.		2.30E-04
Probability of Dangerous failure (High Demand - PFH) [h ⁻¹]		5.25E-08
Hardware safety integrity compliance		Route 1 _H
Systematic safety integrity compliance		Route 1 _s See report TOPWORX_FSM_70005301
Systematic Capability (SC1, SC2, SC3, SC4)		SC 3
Hardware safety integrity achieved		SIL 2

Note 1: The failure data:

- 1) The PFD_{AVG} figure shown is for illustration only assuming a proof test interval of 8760 hours and MTTR of 8 hours. Refer to IEC 61508-6 for guidance on PFD_{AVG} calculations from the failure data.
- 2) The verified failure rates used in the safe failure fraction and diagnostic coverage do not include (λ no parts or no effect) failures in the calculation.

The failure data above is supported by the base information given in Table 2 below.

Table 2: Base information for the DXN Valvetop

1	Product identification:	DXN Valvetop
2	Functional specification:	<i>To provide electrical signal outputs which correspond to the position of an attached valve.</i>
3-5	Random hardware failure rates:	Refer to table 1.1 & 1.2 of this certificate.
6	Environment limits:	Operating temperature: -20 to +60 °C.
7	Lifetime/replacement limits:	20 years
8	Proof Test requirements:	Refer to safety manual
9	Maintenance requirements:	Refer to safety manual
10	Diagnostic coverage:	0% diagnostic coverage.
11	Diagnostic test interval:	Refer to safety manual
12	Repair constraints:	Refer to safety manual
13	Safe Failure Fraction:	Refer to table 1.1 & 1.2 of this certificate.
14	Hardware fault tolerance (HFT):	Refer to table 1.1 & 1.2 of this certificate.
15	Highest SIL (architecture/type A/B):	Type A, SIL2.



16	Systematic failure constraints:	The hardware safety integrity assessment was based on a proof test interval of 1 year
17	Evidence of similar conditions in previous use:	Not applicable.
18	Evidence supporting the application under different conditions of use:	Not applicable.
19	Evidence of period of operational use:	Not applicable.
20	Statement of restrictions on functionality:	See systematic report R80010141B.
21	Systematic capability (SC1, SC2, SC3):	SC2 - See systematic report R80010141B.
22	Systematic fault avoidance measures:	Compliance with techniques and measures from IEC 61508-2 Annex B to SIL 2 - See systematic report R80010141B.
23	Systematic fault tolerance measures:	Compliance with techniques and measures from IEC 61508-2 Annex A to support the SFF achieved – see hardware safety integrity report R80010141B.
24	Validation records:	All documents that have been used in support of the hardware have been documented in section 5.24 of report R80010141B.

Management of functional safety

The assessment has demonstrated that the product is supported by an appropriate functional safety management system that meets the relevant requirements of IEC 61508-1:2010 clause 6, see report R80010141B.

Identification of certified equipment

The certified equipment and its safe use is defined in the manufacturer's documentation listed in Table 3 below.

Table 3: Certified documents

Document no.	Pages	Rev	Date	Document description
DXN-LNZDNES	1	1	24/4/2012	DXN Valvetop Drawing
DXN-LNZDNES BOM	5		18/7/2019	Bill of Materials
C-ES-01655-1	1	3	6/1/2011	DXN Master Assembly
ES-01672-1	18	AF	16/07/2024	Installation, Operation and Maintenance Manual

Conditions of Certification

The validity of the certified base data is conditional on the manufacturer complying with the following conditions:

1. The manufacturer shall analyse failure data from returned products on an on-going basis. Sira Certification Service shall be informed in the event of any indication that the actual failure rates are worse than the certified failure rates. (A process to rate the validity of field data should be used. To this end, the manufacturer should co-operate with users to operate a formal field-experience feedback programme).
2. Sira shall be notified in advance (with an impact analysis report) before any modifications to the certified equipment or the functional safety information in the user documentation is carried out. Sira may need to perform a re-assessment if modifications are judged to affect the product's functional safety certified herein.
3. On-going lifecycle activities associated with this product (e.g., modifications, corrective actions, field failure analysis) shall be subject to surveillance by Sira in accordance with 'Regulations Applicable to the Holders of Sira Certificates'.

Conditions of Safe Use

The validity of the certified base data in any specific user application is conditional on the user complying with the following conditions:

1. The user shall comply with the requirements given in the manufacturer's user documentation in regard to all relevant functional safety aspects such as application of use, installation, operation, maintenance, proof tests, maximum ratings, environmental conditions, and repair.
2. Selection of this product for use in safety function and the installation, configuration, overall validation, maintenance and repair shall only be carried out by competent personnel, observing all the manufacturer's conditions and recommendations in the user documentation.
3. All information associated with any field failures of this product should be collected under a dependability management process (e.g., IEC 60300-3-2) and reported to the manufacturer.
4. The safety device is to have an independent power supply, it must not share the same power supply as non-safety devices that may cause a fault to the safety device.
5. A proof test interval of 1 year.

General Conditions and Notes

1. This certificate is based upon a functional safety assessment of the product described in Sira Test & Certification Assessment Report R80010141A and any further reports referenced.
2. If the certified product or system is found not to comply, Sira Certification Service should be notified immediately at the address shown on this certificate.
3. The use of this Certificate and the Sira Certification Mark that can be applied to the product or used in publicity material are subject to the 'Regulations Applicable to the Holders of Sira Certificates' and 'Supplementary Regulations Specific to Functional Safety Certification'.
4. This document remains the property of Sira and shall be returned when requested by the issuer.
5. No part of the Functional safety related aspects stated in the instruction manual shall be changed without approval of the certification body.
6. This certificate will remain valid subject to completion of two surveillance audits within the five year certification cycle, and upon receipt of acceptable response to any findings raised during this period. This certificate can be withdrawn if the manufacturer no longer satisfies scheme requirements.

Certificate History

Issue	Date	Report no.	Comment
0	18/11/2019	R80010141A R80010141B	The release of prime certificate.
1	19/08/2024	R80222747	Certificate reissued following successful recertification audit and updated ES-01672-1 in Table 3.