



FUNCTIONAL SAFETY CERTIFICATE

This is to certify that the

D-Series Switchbox

Manufactured by

Topworx Emerson Machinery Equipment (Shenzhen) Co. Ltd

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Louisville
Kentucky 40213
USA*

*101 Building 2, COFCO Park,
Honglang North 2nd Road,
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Emerson AFCP Poland Sp. z o. o Asco Valve (Shanghai) Co. Ltd

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Ascoval Indústria e Comércio Ltda

*Rua Goiatuba 81, Jardim Mutinga – Barueri
São Paulo, 06465-010y, Brazil*

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

IEC 61508-2:2010

Systematic Capability (SC3)

As an element suitable for use in safety related systems performing safety functions up to and including

Use as a Controller – up to and including SIL 2*

Use as an Indicator – up to and including SIL 3*

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: 19th June 2012
This certificate re-issued: 25th March 2024
Renewal date: 18th June 2027

This certificate may only be reproduced in its entirety without any change.

Certificate No.: Sira FSP 11018/13
Form 7016 issue 3
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Sira Certification Service CSA Group UK

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Report Summary

D-Series Discrete Valve Controller			
Safety Function: "TO CLOSE OFF (RELIEVE) PNEUMATIC PRESSURE TO THE SPOOL VALVE"			
Architectural constraints:	Type A HFT=0 SFF 74%	Proof Test Interval = 8760Hrs MTTR = 8 Hrs	SIL2
Random hardware failures:	$\lambda_{DD} = 0$ $\lambda_{DU} = 2.90E-08$	$\lambda_{SD} = 0$ $\lambda_{SU} = 8.40E-08$	
Probability of failure on demand:	PFD _{AVG} = 1.27E-04 (Low Demand Mode)		SIL3
Average Frequency of Dangerous failure on safety function:	PFH = 2.90E-08 (High Demand Mode)		SIL3
Hardware safety integrity compliance	Route 1 _H		
Systematic safety integrity compliance	Route 1 _S		
Systematic Capability	SC 3 (See report R56A24114B)		
Overall SIL-capability achieved	SIL 2 (Low Demand) SIL 2 (High Demand)		

Selection of Proof Time Interval versus SIL % Contribution

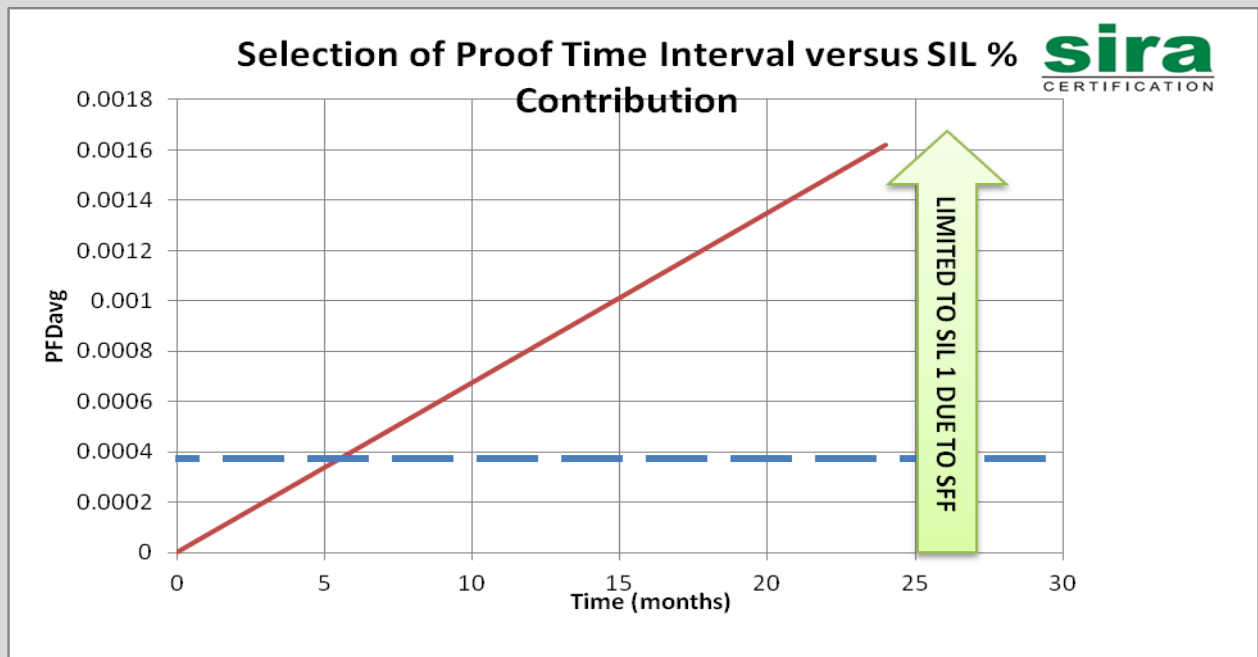
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CERTIFICATION

D-Series Discrete Valve Controller

Safety Function:

"TO OPEN (ADMIT) PNEUMATIC PRESSURE TO THE SPOOL VALVE"

Architectural constraints:	Type A HFT=0 SFF 29%	Proof Test Interval =8760Hrs MTTR = 8 Hrs	SIL1
Random hardware failures:	$\lambda_{DD} = 0$ $\lambda_{DU} = 1.85E-07$	$\lambda_{SD} = 0$ $\lambda_{SU} = 7.04E-08$	
Probability of failure on demand:	PFD _{AVG} =8.10E-04 (Low Demand Mode)		SIL3
Average Frequency of Dangerous failure on safety function:	PFH = 1.85E-07 (High Demand Mode)		SIL2
Hardware safety integrity compliance	Route 1 _H		
Systematic safety integrity compliance	Route 1 _s		
Systematic Capability	SC 3 (See report R56A24114B)		
Overall SIL-capability achieved	SIL 1 (Low Demand) SIL 1 (High Demand)		

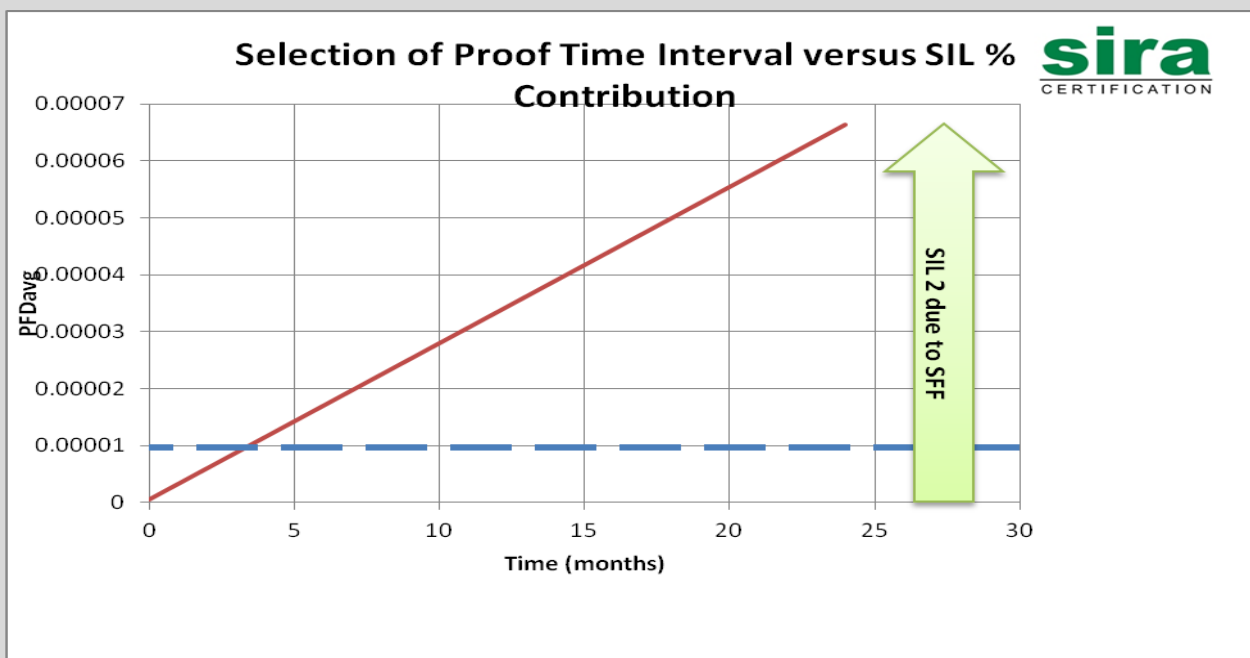


D-Series Switchboxes used as Indicators

Safety Function:

"TO PROVIDE AN INDICATION OF THE MONITORED VALVE POSITION"

Architectural constraints:	Type A HFT=0 SFF=89%	Proof Test Interval =8760Hrs MTTR = 8 Hrs	SIL2
Random hardware failures:	$\lambda_{DD} = 6.74E-08$ $\lambda_{DU} = 7.50E-09$	$\lambda_{SD} = 0.00E-00$ $\lambda_{SU} = 0.00E-00$	
Probability of failure on demand:	PFD _{AVG} =3.34E-05 (Low Demand Mode)		SIL4
Average Frequency of Dangerous failure on safety function:	PFH = 7.50E-09 (High Demand Mode)		SIL4
Hardware safety integrity compliance	Route 1 _H		
Systematic safety integrity compliance	Route 1 _s		
Systematic Capability	SC 3 (See report R56A24114B)		
Overall SIL-capability achieved	SIL 2 (Low Demand) SIL 2 (High Demand)		

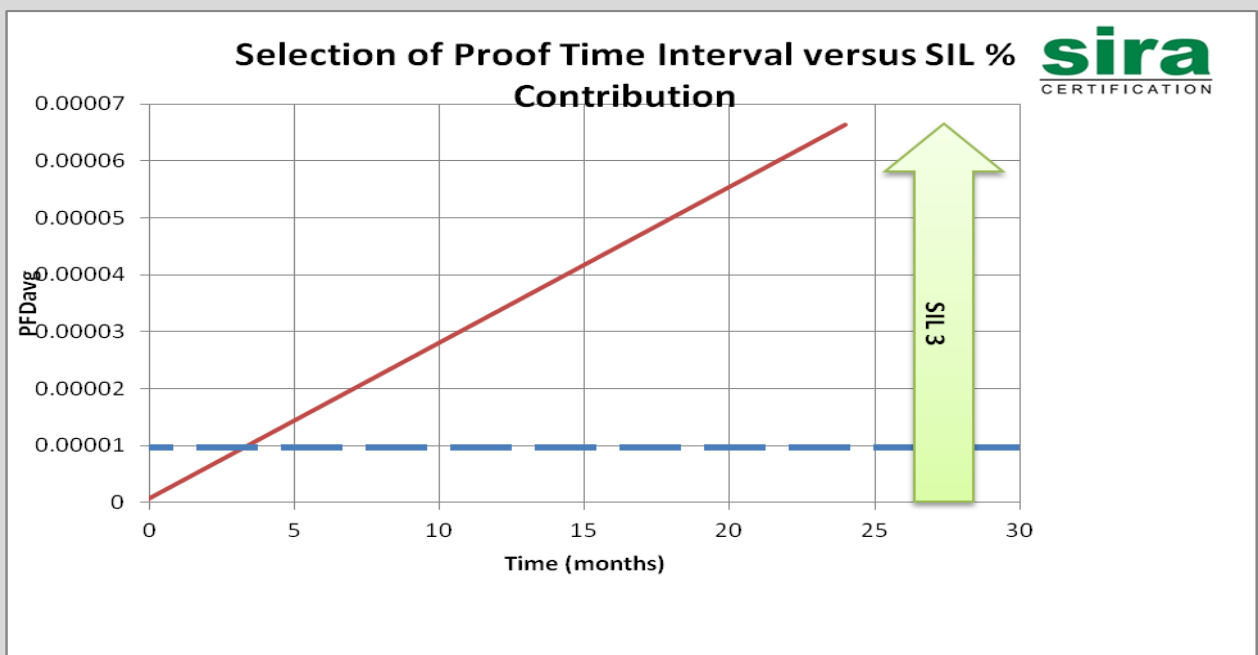


D-Series Indicator using GO switches (Z series, L series and 35 series)

Safety Function:

"TO PROVIDE AN INDICATION OF THE MONITORED VALVE POSITION"

Architectural constraints:	Type A HFT=0 SFF=91%	Proof Test Interval =8760Hrs MTTR = 8 Hrs	SIL3
Random hardware failures:	$\lambda_{DD} = 7.07E-08$ $\lambda_{DU} = 7.50E-09$	$\lambda_{SD} = 0.00E-00$ $\lambda_{SU} = 0.00E-00$	
Probability of failure on demand:	PFD _{AVG} =3.35E-05 (Low Demand Mode)		SIL4
Average Frequency of Dangerous failure on safety function:	PFH = 7.50E-09 (High Demand Mode)		SIL4
Hardware safety integrity compliance	Route 1 _H		
Systematic safety integrity compliance	Route 1 _s		
Systematic Capability	SC 3 (See report R56A24114B)		
Overall SIL-capability achieved	SIL 3 (Low Demand) SIL 3 (High Demand)		



Product description and scope of certification



On/Off Valve controllers and Indicators (D-Series)

D-Series discrete valve controllers are certified for use in every world area. They carry IECEX, ATEX, and UL certifications in a single model, making it easier for global customers to standardize across plants in multiple world areas.

The D-Series consists of three models. DXP, DXS, and DXR variants are all capable of incorporating a pilot valve and position sensors with the enclosure differing per model type depending on the application requirements

Modules in the D-Series Valve Controller

The D-Series Valve Controller consists of the following modules:

- Pilot Valve
- Spool Valve
- Shaft (only plays part in indicator safety function)
- Sensor Module (see Annex A for a full list of sensor module options covered by this certificate)
- Indicator Beacon (only plays part in indicator safety function)

D-Series Safety Functions

The safety functions of the D-Series Valve Controller are defined as:

D-Series as a controller:

- To relieve pneumatic pressure to the spool valve by de-energising the solenoid valve allowing the actuator to perform its safety function.
- To admit pneumatic pressure to the spool valve by energising the solenoid valve allowing the actuator to perform its safety function.

D-Series as an Indicator:

- To provide an accurate indication of the monitored valve position.

Product identification and configuration

The product is defined in the manufacturer's drawings listed in Table 1 below.

Table 1: Certified product drawings

Document no.	Re v	Date	Document description
ES-01141-1	7	3/15/2012	D series final assembly drawing
ES-01857-1	13	-	D Series master installation, operation and maintenance manual
ES-02292-1	1	-	D series (DXP) configuration document
ES-02293-1	1	-	D series (DXS) configuration document
ES-04900-1	6	10/30/2017	HART Module Assembly

The assessment has produced the supporting information given in Table 2 below.

Table 2: Base Information

1	Product identification:	D-Series as described in manufacturer's product catalogue
2	Functional specification:	Refer to paragraph above 'Use in safety functions' and full specification in manufacturer's product catalogue.
3-5	Random hardware failure rates:	Refer to table in report summary
6	Environment limits:	Temperature range: Solenoid option:-20 to +100°C for the D-Series GO switch option:-60 to +100°C for the D-Series
7	Lifetime/replacement limits:	Refer to IOM manual D-Series – ES-01857-1 R13
8	Proof Test requirements:	
9	Maintenance requirements:	
10	Diagnostic coverage:	NA
11	Diagnostic test interval:	
12	Repair constraints:	
13	Safe Failure Fraction:	Refer to table in report summary
14	Hardware fault tolerance (HFT):	
15	Highest SIL (architecture/type A/B):	
16	Systematic failure constraints:	The requirements of this clause are contained in the relevant IOM Manual D-Series – ES-01857-1 R13
17	Evidence of similar conditions in previous use:	Compliance Route 2 _H (proven-in-use) not used
18	Evidence supporting the application under different conditions of use:	
19	Evidence of period of operational use:	
20	Statement of restrictions on functionality:	
21	Systematic capability:	
22	Systematic fault avoidance measures:	This assessment is based on an element which is to be used in a SRS and is not a full SRS design related assessment.
23	Systematic fault tolerance measures:	
24	Validation records:	

Additional Manufacturing Facilities

The following locations have been assessed by CSA Group UK and were found to be in conformance to IEC61508:2010 and follow the same level of rigor and process quality and control as TopWorx Inc (USA).



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Conditions of Certification

The validity of the certified 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 data 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 (referred to in Table 2 above) in regard to all relevant functional safety aspects such as application of use, installation, operation, maintenance, proof tests, maximum ratings, environmental conditions, repair, etc;
2. Selection of this equipment for use in safety functions 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 unit should be tested at regular intervals to identify any malfunctions; in accordance with the safety manual.



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General Conditions and Notes

1. This certificate is based upon a functional safety assessment of the product described in Sira Test & Certification Assessment Report R56A24114A.
2. If 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.

Certificate History

Issue	Date	Document no.	Comment
05	15/06/2015	SIRA FSP 11018	Certificate updated to include additional manufacturing faculties as a result of successful audit – report R70005298.
06	23/01/2017	SIRA FSP 11018	Certificate updated to correct incorrect SFF value in results tables 1 and 2.
07	27/06/2017	R70118946A	Certificate reissued as a result of successful recertification.
08	04/01/2018	70168119	Certificate updated to include documentation for HART v7 module. Note. HART transmitter in Annex A refers to the new HART v7 module.
09	04/09/2018	-	Minor changes to reflect systematic capability.
10	24/06/2022	-	3-month certificate extension for recertification audit.
11	23/09/2022	R80132073A	Certificate renewed following successful recertification audit.
12	07/11/2023	80129810 - 3 80129810 - 2	Added Emerson AFCP Poland Sp. z o. o. and Asco Valve (Shanghai) Co. Ltd. manufacturing locations. Shenzhen location address has been updated and added to the cover and also "Additional Manufacturing Facilities" section has been updated with shanghai and Poland locations and removed Hungary location as requested by the customer.
13	25/03/2024	80129810 - 1	Added Ascoval Indústria e Comércio Ltda manufacturing location to the certificate and updated "Additional Manufacturing Facilities" section.



Annex A

Below is a list of switch module configurations supported by this certificate:

00 - No switches
0A - No switches w/ 0-1K potentiometer
0B - No switches w/ 0-10K potentiometer
0H - HART transmitter
0X - 4-20mA transmitter
31 - (1) P+F NJ5-30GK-S1N
32 - (2) P+F NJ5-30GK-S1N
42 - (2) P+F NBB2-V3-E2
44 - (2) P+F NBB2-V3-E2
52 - (2) P+F NBB3-V3-Z4
54 - (4) P+F NBB3-V3-Z4
ss62 - 2-wire N/O 0-253V 200mA
72 - 3-wire PNP 0-60VDC 200mA
82 - (2) ITW mechanical DPDT
83 - (3) ITW mechanical DPDT
84 - (4) ITW mechanical DPDT
B2 - (2) P+F NJ2-12GK-SN
B3 - (3) P+F NJ2-12GK-SN
E1 - (1) P+F NJ2-V3-N inductive NAMUR
E2 - (2) P+F NJ2-V3-N inductive NAMUR
E3 - (3) P+F NJ2-V3-N inductive NAMUR
E4 - (4) P+F NJ2-V3-N inductive NAMUR
E6 - (6) P+F NJ2-V3-N inductive NAMUR
EH - HART transmitter w/ P+F NJ2-V3-N inductive NAMUR
ES - ESD/PST module w/ GO™ Switch
EX - 4-20mA transmitter w/ P+F NJ2-V3-N inductive NAMUR
F2 - (2) P+F NJ2-12GK-N
J1 - (1) P+F NJ2-11-SN-G
J2 - (2) P+F NJ2-11-SN-G
K2 - (2) Mechanical SPDT gold contacts
K4 - (4) Mechanical SPDT gold contacts
K6 - (6) Mechanical SPDT gold contacts
KH - HART transmitter w/ mechanical SPDT gold contacts
KX - 4-20mA transmitter w/ mechanical SPDT gold contacts
L1 - (1) GO™ Switch SPDT hermetic seal
L2 - (2) GO™ Switches SPDT hermetic seal



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L3 - (3) GO™ Switches SPDT hermetic seal
L4 - (4) GO™ Switches SPDT hermetic seal
LH - HART transmitter w/ GO™ Switch SPDT
LX - 4-20mA transmitter w/ GO™ Switch SPDT
M2 - (2) Mechanical SPDT
M4 - (4) Mechanical SPDT
M6 - (6) Mechanical SPDT
MA - (2) Mechanical SPDT switches w/ 0-1K potentiometer
MH - HART transmitter w/ mechanical SPDT
MX - 4-20mA transmitter w/ mechanical SPDT
N2 - Namur switches
PN - (2) SPDT module w/o LEDs, 1A max
PS - (2) SPDT module w/ LEDs, 250mA max
T2 - (2) Mechanical DPDT
TX - 4-20mA transmitter w/ mechanical DPDT
V1 - (1) P+F NJ3-18GK-S1N
V2 - (2) P+F NJ3-18GK-S1N
V3 - (3) P+F NJ3-18GK-S1N
Z1 - (1) GO™ Switch DPDT hermetic seal
Z2 - (2) GO™ Switches DPDT hermetic seal
Z3 - (3) GO™ Switches DPDT hermetic seal
Z4 - (4) GO™ Switches DPDT hermetic seal
ZH - HART transmitter w/ GO™ Switch DPDT
ZX - 4-20mA transmitter w/ GO™ Switch DPDT



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