



FUNCTIONAL SAFETY CERTIFICATE

This is to certify that the

Hydraulic Series of DN3 3/2 & 2/2 Valves in N/C & N/O Configurations with Exemb Solenoid

manufactured by

Rotork Midland Ltd

Patrick Gregory Rd
Wolverhampton
West Midlands
WV11 3DZ
UK

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

IEC 61508-2:2010

The Product and its associated data contained herein can be considered for use in the design of safety functions up to and including

SIL 2*

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

* The Product that has been certified is not implicit of the achieved Safety Integrity Level (SIL) of the safety related system

Certification Manager:


W Thomas

Initial Certification: 27/04/2012
This certificate issued: 16/02/2017
Renewal date: 15/02/2022

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



Certificate No.: Sira FSP 12005/06
Form 7017 issue 2
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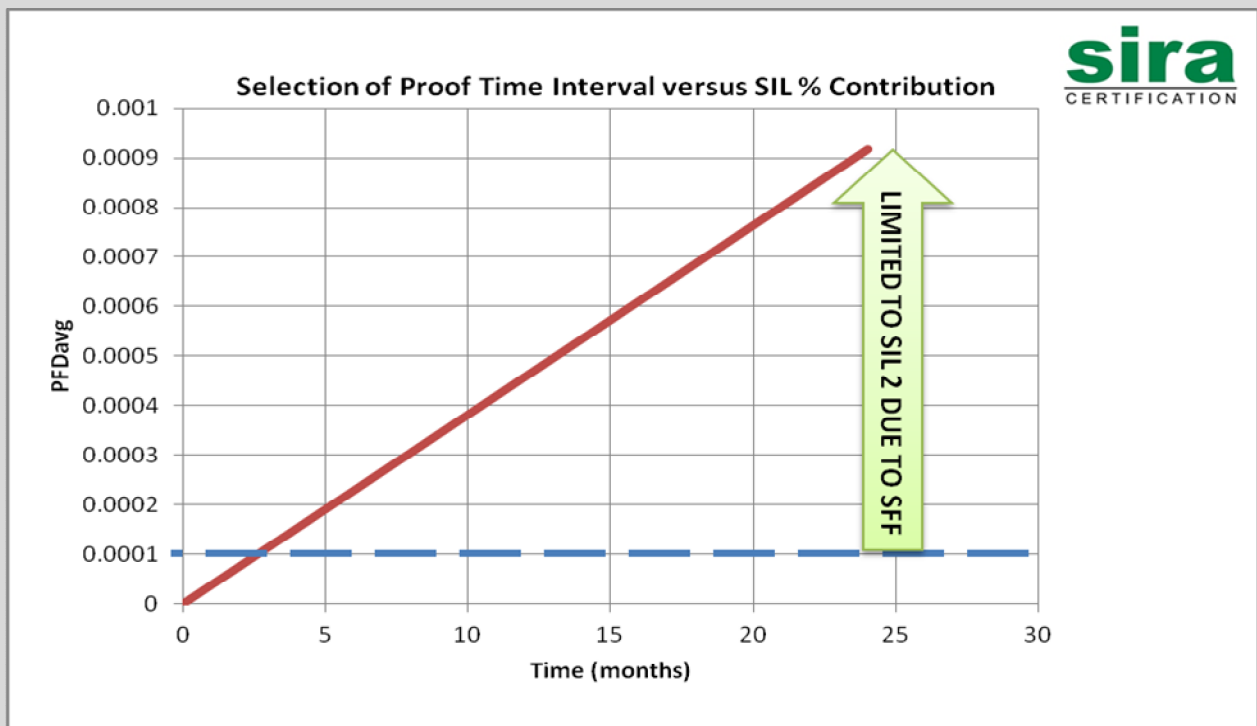


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Product description and scope of certification

| DN3 2/2 and 3/2 NC Valve with Exemb Solenoid | | | |
|---|---|--|-------|
| Safety Function: <i>'Failure of the valve to return to the spring extended position and close when de-energized'</i> | | | |
| Architectural constraints: | Type A HFT=0 SFF = 68% | Proof Test Interval =8760Hrs ^[4] MTTR = 8 Hrs ^[4] | SIL 2 |
| Random hardware failures: | $\lambda_{DD} = 0$ $\lambda_{DU} = 1.05E-07$ | $\lambda_{SD} = 0$ $\lambda_{SU} = 2.30E-07$ | |
| Probability of failure on demand: | PFD _{AVG} =4.59E-04 (Low Demand Mode) | | SIL 3 |
| Probability of Dangerous failure on safety function: | PFH = 1.05E-07 (High Demand Mode) | | SIL 2 |
| Hardware safety integrity compliance ^[1] | Route 1 _H | | |
| Systematic safety integrity compliance ^[1] | Route 1 _s | | |
| Systematic Capability ^[2] | SC 3 | | |
| Overall SIL-capability achieved ^[3] | SIL 2 (Low Demand) | | |
| | SIL 2 (High Demand) | | |



^[1] These are new parameters used in IEC61508 Part 2 Sections 7.4.2 & 7.4.4.

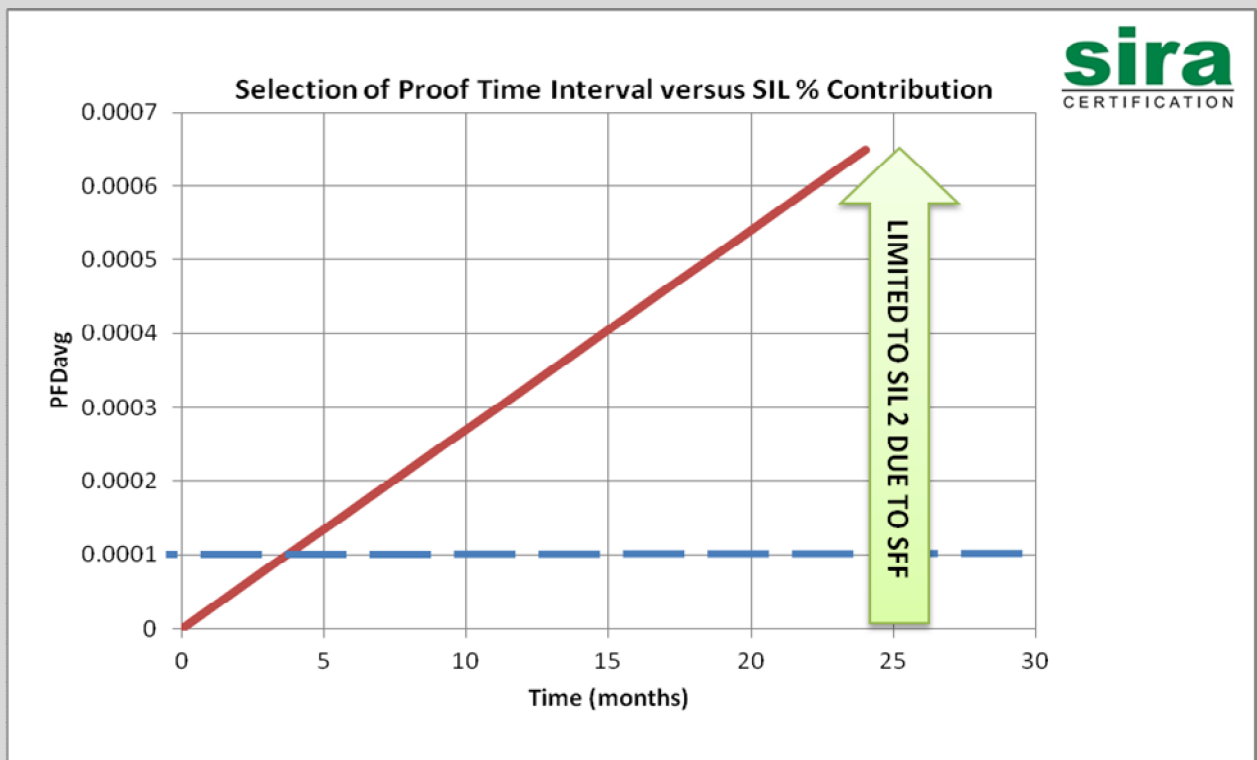
^[2] This is a new measurable scale for the systematic safety integrity level; refer to IEC61508 Part 4 Section 3.5.9.

^[3] This is determined by the lowest SIL indicated by each of the parameters given above.

^[4] These figures are used only for demonstration purposes.



| DN3 2/2 and 3/2 NO Valve with Exemb Solenoid | | | |
|---|---|--|-------|
| Safety Function: 'Failure of the valve to return to the spring extended position and open when de-energized' | | | |
| Architectural constraints: | Type A HFT=0 SFF = 77% | Proof Test Interval =8760Hrs ^[4] MTTR = 8 Hrs ^[4] | SIL 2 |
| Random hardware failures: | $\lambda_{DD} = 0$ $\lambda_{DU} = 7.39E-08$ | $\lambda_{SD} = 0$ $\lambda_{SU} = 2.61E-07$ | |
| Probability of failure on demand: | PFD _{AVG} =3.24E-04 (Low Demand Mode) | | SIL 3 |
| Probability of Dangerous failure on safety function: | PFH = 7.39E-08 (High Demand Mode) | | SIL 3 |
| Hardware safety integrity compliance ^[1] | Route 1 _H | | |
| Systematic safety integrity compliance ^[1] | Route 1 _s | | |
| Systematic Capability ^[2] | SC 3 | | |
| Overall SIL-capability achieved ^[3] | SIL 2 (Low Demand) SIL 2 (High Demand) | | |



[1] These are new parameters used in IEC61508 Part 2 Sections 7.4.2 & 7.4.4.

[2] This is a new measurable scale for the systematic safety integrity level; refer to IEC61508 Part 4 Section 3.5.9.

[3] This is determined by the lowest SIL indicated by each of the parameters given above.

[4] These figures are used only for demonstration purposes.



DN3

The Hydraulic series of DN3 is a ball seated hydraulic control valve. The stainless steel seat and ceramic ball design ensures a leak tight shut off. The DN3 valve design incorporates a balanced internal piloting system and a lever mechanism to enable low powered operators to switch the valve at high pressures.

Element Safety Function(s)¹

The safety function of the 3/2 and 2/2 Normally Closed (N/C) valve is defined as:
'Return to the spring extended position when de-energised and close a normally closed valve'

The safety function of the 3/2 and 2/2 Normally Open (N/O) valve is defined as:
'Return to the spring extended position when de-energised and open a normally open valve'

The *Safe State*¹ of the *EUC*¹ is to be achieved when the product closes a NC or Opens a NO Solenoid valve.

The element safety function is intended for use in low / high or continuous demand *Mode Of Operation*¹ as indicated by the certified failure data overleaf.

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

Table 2: Information supporting the failure rate data

| | | |
|----|--|--|
| 1 | Product identification: | Hydraulic Series of DN3 3/2 and 2/2 solenoid valves in N/C and N/O configurations |
| 2 | Functional specification: | Refer to paragraph above 'Use in safety functions' and full specification in manufacturer's product catalogue. |
| 3 | Environment limits: | Temperature range: -20 to +60°C operational |
| 4 | Lifetime/replacement limits: | Refer to Installation, Operation and Maintenance Manual |
| 5 | Proof Test requirements: | Refer to user manual |
| 6 | Maintenance requirements: | Refer to user manual |
| 7 | Diagnostic coverage: | N/A |
| 8 | Diagnostic test interval: | N/A |
| 9 | Repair constraints: | Refer to user manual |
| 10 | Evidence of similar conditions in previous use: | Compliance Route 2 _H (proven-in-use) not used |
| 11 | Evidence supporting the application under different conditions of use: | Compliance Route 2 _H (proven-in-use) not used |
| 12 | Evidence of period of operational use: | Compliance Route 2 _H (proven-in-use) not used |
| 13 | Statement of restrictions on functionality: | Compliance Route 2 _H (proven-in-use) not used |
| 14 | Systematic capability: | Refer to Systematic Assessment report 56A25037B |
| 15 | Systematic fault avoidance measures: | Refer to Systematic Assessment report 56A25037B |
| 16 | Systematic fault tolerance measures: | Refer to Systematic Assessment report 56A25037B |
| 17 | Validation records: | Refer to Validation Report. |

Identification of certified equipment

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

¹ Refer to IEC 61508-4 for a definition of this term



Table 3: Certified drawings

Hydraulic Series of DN3, 3/2 & 2/2, NC & NO Solenoid Valves

| Description | | |
|--|--------------|-----------------------|
| DN3 3/2 NC Valve with EEX MBE solenoid | | |
| Drawing Description | Issue | Drawing Number |
| DN3 3/2 N/C Exemb Solenoid Operated Valve (3.5 Watts Max) | 10 | C16099-3/2-N/C |
| DN3 3/2 N/C Exemb Solenoid Operated Valve (8 Watts Max) | 12 | C16078-3/2-N/C |
| DN3 3/2 NC Internal Kit | 1 | 19575 |
| Description | | |
| DN3 3/2 NO Valve with EEX MBE Solenoid | | |
| Drawing Description | Issue | Drawing Number |
| DN3 3/2 N/O Exemb Solenoid Operated Valve (3.5 Watts Max) | 9 | C16099-3/2-N/O |
| DN3 3/2 N/O Exemb Solenoid Operated Valve (8 Watts Max) | 12 | C16078-3/2-N/O |
| DN3 3/2 NO Internal Kit | 1 | 19576 |
| Description | | |
| DN3 2/2 NC Valve with EEX MBE Solenoid | | |
| Drawing Description | Issue | Drawing Number |
| DN3 2/2 N/C Exemb Solenoid Operated Valve (3.5 Watts Max) | 9 | C16099-2/2-N/C |
| DN3 2/2 N/C Exemb Solenoid Operated Valve (8 Watts Max) | 4 | C16078-2/2-N/C |
| DN3 2/2 NC Internal Kit | 1 | 19577 |
| Description | | |
| DN3 2/2 NO Valve with EEX MBE Solenoid | | |
| Drawing Description | Issue | Drawing Number |
| DN3 2/2 N/O Exemb Solenoid Operated Valve (3.5 Watts Max) | 9 | C16099-2/2-N/O |
| DN3 2/2 N/O Exemb Solenoid Operated Valve (8 Watts Max) | 10 | C16078-2/2-N/O |
| DN3 2/2 NO Internal Kit | 1 | 19578-LP |



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 (referred to in Table 3 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.

General Conditions and Notes

1. This certificate is based upon a functional safety assessment of the product described in Sira Test & Certification Assessment Report R56A27286A and any further reports referenced in that report (under previous Sira projects).
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 | Project No. | Comment |
|-------|------------|-------------|--|
| 06 | 16/02/2016 | 70113700 | Re-issue of certificate post successful recertification. |



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