

Certificate



No.: V 464.01/15

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|-----------------------|----------------------|---------------------------|---|
| Product tested | Subsea Shuttle Valve | Certificate holder | Bifold Group Broadgate, Oldham Broadway Business Park Chadderton, Greater Manchester OL9 9XA United Kingdom |
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|-------------------------|--------------|
| Type designation | FPS15, FPS30 |
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|----------------------------|----------------------------------|--------------------------|
| Codes and standards | IEC 61508 Parts 1-2 and 4-7:2010 | IEC 61511 Parts 1-3:2004 |
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| Intended application | The safety function of the subsea shuttle valve is to provide sufficient pressure and flow to the consumer interface to enable the safety instrumented function to enter the safe state. |
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The valves are suitable for use in a safety instrumented system up to SIL 2. Under consideration of the minimum required hardware fault tolerance HFT=1 the valves may be used in a redundant structure up to SIL 3.

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| Specific requirements | The instructions of the associated Installation and Operating Manual must be considered. |
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Summary of test results see back side of this certificate.

Valid until 2020-01-19

The issue of this certificate is based upon an examination, whose results are documented in Report No. V 464.01/15 dated 2015-01-19.

This certificate is valid only for products which are identical with the product tested. It becomes invalid at any change of the codes and standards forming the basis of testing for the intended application.

TÜV Rheinland Industrie Service GmbH

Bereich Automation
Funktionale Sicherheit

Am Grauen Stein, 51105 Köln

Köln, 2015-01-19

Certification Body for FS-Products

Dipl.-Ing. Stephan Häb

Manufacturer Bifold Fluidpower Ltd.
 Broadgate, Oldham Broadway
 Business Park, Chadderton,
 Greater Manchester, OL9 9XA. UK

Product tested Subsea Shuttle Valve
 FPS15, FPS30

Device-Specific Values

| | | |
|---|--------------|----------------|
| Probability of Dangerous Failure on Demand | PFD_{spec} | 2.00 E-05 |
| Test Interval | T_i | 1 a |
| Confidence Level | $1-\alpha$ | 95 % |
| Safe Failure Fraction ^(see note) | SFF | 61 % |
| Hardware Fault Tolerance | HFT | 0 |
| Diagnostic Coverage | DC | 0 % |
| Type of Sub System | | Type A |
| Mode of Operation | | Low Demand |
| Proof Test Coverage | PTC | not considered |
| Partial Stroke Test Coverage | PSTC | not considered |

Note

The Safe Failure Fraction (SFF) was estimated by an alternative method with a FMEDA according to EN161:2011/A3:2013.

Derived Values for 1oo1-Architecture

| | | | |
|---|-------------------------------|------------------|---------------|
| Assumed Demands per Year | f_{np} | 1 / a | 1.14 E-04 / h |
| Total Failure Rate | $\lambda_S + \lambda_D$ | 5.85 E-09 / h | 6 FIT |
| Lambda Dangerous Detected | λ_{DD} | 0.00 E+00 / h | 0 FIT |
| Lambda Dangerous Undetected | λ_{DU} | 2.28 E-09 / h | 2 FIT |
| Lambda Safe | λ_S | 3.57 E-09 / h | 4 FIT |
| Mean Time Between Failures | MTBF | 1.71 E+08 h | 19 528 a |
| Mean Time Between Dangerous Failures | MTBF _D | 4.39 E+08 h | 50 072 a |
| Average Probability of Failure on Demand | PFD_{avg} | 9.99 E-06 | |

Time of Usage

A time of usage of more than 20 years (+ 1.5 years of storage) can only be favored under responsibility of the operator, consideration of specific external conditions (securing of required quality of media, max. temperature, time of impact), and adequate test cycles.

Quality Management

These statements are bound to a proven and verified deployment of safety-related quality management of the manufacturer.