

# Certificate



Functional  
Safety

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ID 0600000000

**No.: 968/FSP 1070.02/19**

|                       |                         |                           |   |
|-----------------------|-------------------------|---------------------------|---|
| <b>Product tested</b> | Vortex/Swirl Flow Meter | <b>Certificate holder</b> | ABB Engineering (Shanghai) Ltd.<br>No. 4528, Kangxin Highway<br>Pudong New District<br>Shanghai, 201319<br>P.R. China |
|-----------------------|-------------------------|---------------------------|---|

|                         |   |
|-------------------------|---|
| <b>Type designation</b> | VortexMaster FSV450 / FSV430 (with output signal H5)<br>SwirlMaster FSS450 / FSS430 (with output signal H5) |
|-------------------------|---|

|                            |   |                    |
|----------------------------|---|--------------------|
| <b>Codes and standards</b> | IEC 61508 Parts 1-7:2010<br>EN 50178:1997 | IEC 61326-3-1:2017 |
|----------------------------|---|--------------------|

|                             |  |
|-----------------------------|--|
| <b>Intended application</b> | Flow measuring of gas, steam and liquids in pipes as part of a Safety Instrumented System (SIS).<br>The flow meter complies with the requirements for SIL 2 / SC 2 acc. to IEC 61508 and can be used in a SIS up to SIL 2 acc. to IEC 61508 / IEC 61511.<br>Further details see page 2 of certificate. |
|-----------------------------|--|

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| <b>Specific requirements</b> | The instructions of the associated Installation and Operating Manual shall be considered. |
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Valid until 2024-02-22

The issue of this certificate is based upon an examination, whose results are documented in Report No. 968/FSP 1070.02/19 dated 2019-02-22.

This certificate is valid only for products which are identical with the product tested.

**TÜV Rheinland Industrie Service GmbH**  
Bereich Automation  
Funktionale Sicherheit  
Am Grauen Stein, 51105 Köln

Köln, 2019-02-22

Certification Body Safety & Security for Automation & Grid

Dipl.-Ing. Thomas Steffens

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**TÜVRheinland**  
Precisely Right.

**Safety function:** Measuring of the flow rate and output of an analog signal 4 – 20 mA proportional to the volume flow rate. The total valid range of the output signal shall be configured to a minimum of 3.8 mA and a maximum of 20.5 mA (Factory Default).  
 The safety related function of the transmitter is the safe monitoring of the volume flow rate with a tolerance of  $\pm 4\%$  of the span (16 mA). The safe state is that the output current is lower than 3.6 mA or greater than 21 mA.  
 The downstream safety device must be configured to recognize the configured high alarms or low alarms as a malfunction detection.

| Characteristics as per IEC 61508               | Value   |                 |           |               |          |           |                 |        |           |                 |
|--|---|-----------------|-----------|---------------|----------|-----------|-----------------|--------|-----------|-----------------|
| SIL  | SIL 2 (single-channel architecture 1oo1, HFT = 0)   |                 |           |               |          |           |                 |        |           |                 |
| HFT  | 0   |                 |           |               |          |           |                 |        |           |                 |
| Device Type                                    | B   |                 |           |               |          |           |                 |        |           |                 |
| Mode of operation                              | Low demand mode   |                 |           |               |          |           |                 |        |           |                 |
| SFF  | <table> <tr> <td>CB board</td> <td>94.3 %</td> </tr> <tr> <td>FE board</td> <td>97.7 %</td> </tr> <tr> <td>Total:</td> <td>97.07 %</td> </tr> </table>  | CB board        | 94.3 %    | FE board      | 97.7 %   | Total:    | 97.07 %         |        |           |                 |
| CB board                                       | 94.3 %  |                 |           |               |          |           |                 |        |           |                 |
| FE board                                       | 97.7 %  |                 |           |               |          |           |                 |        |           |                 |
| Total:   | 97.07 %   |                 |           |               |          |           |                 |        |           |                 |
| Recommended time interval for proof-testing T1 | 2 years   |                 |           |               |          |           |                 |        |           |                 |
| PFD <sub>avg</sub> for T1 = 2 years            | <table> <tr> <td>CB board</td> <td>1.00 E-03</td> <td>10 % of SIL 2</td> </tr> <tr> <td>FE board</td> <td>1.46 E-03</td> <td>14.6 % of SIL 2</td> </tr> <tr> <td>Total:</td> <td>2.47 E-03</td> <td>24.7 % of SIL 2</td> </tr> </table> | CB board        | 1.00 E-03 | 10 % of SIL 2 | FE board | 1.46 E-03 | 14.6 % of SIL 2 | Total: | 2.47 E-03 | 24.7 % of SIL 2 |
| CB board                                       | 1.00 E-03   | 10 % of SIL 2   |           |               |          |           |                 |        |           |                 |
| FE board                                       | 1.46 E-03   | 14.6 % of SIL 2 |           |               |          |           |                 |        |           |                 |
| Total:   | 2.47 E-03   | 24.7 % of SIL 2 |           |               |          |           |                 |        |           |                 |
| $\lambda_{sd}$                                 | 1520 FIT  |                 |           |               |          |           |                 |        |           |                 |
| $\lambda_{su}$                                 | 2730 FIT  |                 |           |               |          |           |                 |        |           |                 |
| $\lambda_{dd}$                                 | 5080 FIT  |                 |           |               |          |           |                 |        |           |                 |
| $\lambda_{du}$                                 | 282 FIT   |                 |           |               |          |           |                 |        |           |                 |
| $\lambda_{tot}$                                | 9612 FIT  |                 |           |               |          |           |                 |        |           |                 |

1 FIT = 1 E-09 1/h

**Remark:** Failure rates of the electronic components as per Siemens SN 29500, calculated based upon an ambient temperature of 100 °C.