

# CERTIFICATE OF FUNCTIONAL SAFETY ASSESSMENT

This certifies, that the products

**Type designation:** Series LLP by-pass valve  
**Description of product:** LLP™ Turbine Bypass Valve for Low Pressure Bypass Applications

manufactured by

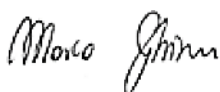
**IMI Critical Engineering Korea**  
**14, Dangdong 2-ro, Munsan-eup, Paju-si,**  
**Gyeonggi-do, 10816, Republic of Korea**

have been assessed and found to meet the requirements of  
**IEC 61508:2010 Part 1, 2, 4, 5, 6 and 7**

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

**SIL 1 capable with HFT = 0 (1oo1) (high demande mode), and**  
**SIL 2 capable with HFT = 0 (1oo2) (low demande mode), and**  
**SIL 3 capable with HFT = 1 (1oo2) (high and low demande mode)**

Registration No 22 22906 01  
Test Report No PS-22906-22-L-01  
File reference 22906-01



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Validity  
from 2022-07-22  
until 2027-07-22

Cerro Maggiore, 2022-07-22  
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## ANNEX 1

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to Certificate-No. **22 22906 01**

Application / Service environment (1)	According to the Safety Manual	According to the Safety Manual
Nominal Size (inches)	from 8" to 14"	from 8" to 14"
Class (ASME)	Class 150, 300, 600	Class 150, 300, 600
Type of Sub-system	Type A	Type A
Mode of Operation	High and Low demand	High and Low demand
Safety Function Definition	Correct switching on demand (open to closed)	Correct switching on demand (closed to open)
Max SIL (with HFT = 0) (high demand)	SIL1	SIL1
Max SIL (with HFT = 0) (low demand)	SIL2	SIL2
Max SIL (with HFT = 1)	SIL3	SIL3
Systematic Capability (SC)	3	3
$\lambda_{TOT}$	2,565E-07	2,565E-07
$\lambda_{SD}$	0,000E+00	0,000E+00
$\lambda_{SU}$	1,500E-07	1,404E-07
$\lambda_{DD}$ (PST)	8,745E-08	9,613E-08
$\lambda_{DU}$ (FPT)	1,902E-08	1,999E-08
PFD <sub>avg</sub> (2)	3,582E-04	3,856E-04
PFH	1,902E-08	1,999E-08
PST interval	≤ 6 months	≤ 6 months
FPT interval	≤ 24 months	≤ 24 months
$\beta$ and $\beta_D$ factor	10%	10%
MRT	See safety manual (depending on size)	See safety manual (depending on size)
Hardware Safety Integrity	Route 2H	Route 2H
Systematic Safety Integrity	Route 2S	Route 2S

(1) Category identified according to specific environment and application. Refer to the product safety manual for the detailed information on the categories.

(2) PFD<sub>avg</sub> of reference calculated on the basis of a Full Functional Proof Test and Partial Proof Test with time intervals reported for HFT = 0 configuration only. This time intervals are considered by TÜV NORD as reasonably consistent with the implementation of the equipment for safety related-applications, with reference to the overall range of results shown in the report, where other possible combination of time intervals adequate for a classification up to the SIL reported. Calculation is only for information purposes, in that the actual Probability of Failure shall be evaluated after integration of equipment inside the final element.

