Certificate

No.: V 516.01/16

Product tested	Top Entry Double Eccentric Ball Valves	**Certificate holder**	AE Valves Rue de Gelée, 20 4800 Verviers Belgium
Type designation	^{2}XC-ball		
Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010	IEC 61511 Parts 1-3:2004	
Intended application	Safety Function: - Open and Close upon demand - Keep up external tightness The valves are suitable for use in a safety instrumented system in low demand applications 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.		
Specific requirements	The instructions of the associated Safety, Installation and Operating Manual must be considered.		

Summary of test results see back side of this certificate.

Valid until 2021-04-12

The issue of this certificate is based upon an examination, whose results are documented in Report No. V 516.01/16 dated 2016-04-12.
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.

Köln, 2016-04-12

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Manufacturer

AE Valves
Rue de Gelée, 20
B-4800 Verviers
Belgium

Product tested **²XC C-ball Top Entry Double Eccentric Valves**

Device-Specific Values

Probability of Dangerous Failure on Demand	p	1,48 E-04
Confidence Level	1-α	95 %
Safe Failure Fraction (see note)	SFF	83 %
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 FMEA according to EN 161:2011/A3:2013.

Derived Values for 1oo1-Architecture

Assumed Demands per Year	n_{op}	1 / a	1,14 E-04 / h
Assumed Test Interval	T_i	8760 h	1 a
Total Failure Rate	$\lambda_S + \lambda_D$	9,93 E-08 / h	99 FIT
Lambda Dangerous Detected	λ_{DD}	0,00 E+00 / h	0 FIT
Lambda Dangerous Undetected	λ_{DU}	1,69 E-08 / h	17 FIT
Lambda Safe	λ_S	8,24 E-08 / h	82 FIT
Mean Time To Failure	MTTF	1,01 E+07 h	1.149 a
Mean Time To Dangerous Failure	$MTTF_D$	5,92 E+07 h	6.760 a
Average Probability of Failure on Demand	**PFD_{avg}**	**7,40 E-05**	

Useful Lifetime
A time of usage of more than 5 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.