



FUNCTIONAL SAFETY CERTIFICATE

This is to certify that the

Valve-Adaptor-Actuator Products Listed in this Certificate

manufactured by

Habonim Industrial Valves & Actuators Ltd

Kibbutz Kfar Hanassi
Galil Elion
12305
Israel

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

IEC 61508-2:2010

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

SIL 2 capable with HFT = 0 (1oo1) and PTI = 8760hrs⁺
SIL 3 capable with HFT = 0 (1oo1) and PTI = 2190hrs⁺

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

+ This certificate does not waive the need for further functional safety verification to establish the achieved Safety Integrity Level (SIL) of the safety related system.

Certification Manager: 
Wayne Thomas
Initial Certification : 29th July 2010
Initial Certification : 29th July 2010
This certificate issued : 17th November 2015
Renewal date : 15th November 2020

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



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Sira Certification Service
Part of CSA Group UK
Unit 6 Hawarden Industrial Park,
Hawarden, CH5 3US, United Kingdom.
Tel: +44 (0) 1244 670900
Email: ukinfo@csagroup.org
Web: www.csagroupuk.org

Product description and scope of certification

The Valves, actuators and adaptors are all mechanical devices which have metal bodies to provide mechanical integrity, compliance with the pressure vessel directive and environmental protection. These valves are intended for a variety of applications that include functional safety. Application for functional safety is generally in a low demand application as an on – off valve emergency shutdown final actuator.

This assessment has considered the two safety applications 'normally open' and 'normally closed' and in a 'Low Demand' mode of operation. Other functions and other modes of operation that might be required for non-safety applications have not been considered.

The basic arrangement that has been assessed consists of a ball valve, a spring return actuator and an adaptor necessary to interface the actuator to the ball valve. The ball valve selected for this assessment is just one of a large range which are all available in combination with a suitable actuator arrangement.

Module in the equipment:

- Spring return pneumatic actuator
- Habonim ball valve
- Actuator to valve interface adapter

Safety Function

The element safety function of the product is defined as follows:

Normally Open Version:

To move the valve to the open position via the spring return actuator

Normally Closed Version:

To move the valve to the closed position via the spring return actuator

Note. The above safety functions are only supported for low demand mode of operation for the complete Valve-Adapter-Actuator complete package. The product is available in two versions (normally open or normally closed).

Certified Data in support of use in safety functions

The assessment has been carried out with reference to the *Conformity Assessment of Safety-related Systems (CASS) methodology*¹ using the Route 1H² approach.

A Failure Mode and Effect Analysis (FMEA) has established the failure modes and failure rates from the products assessed as show in Tables 1a to 2b below. Failure sources have been taken from RIAC NPRD, Item software and Technis Faradip 3.0.

The following results in Table 1a and 1b summarize the Valve-Actuator-Adapter as individual elements in both normally open and normally closed configurations.



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Table 1a: Summary of Failure Data of Valve-Actuator-Adapter as individual elements in normally open configuration

PRODUCT	λ_{NE}	λ_S	λ_D	SFF	PTI *	PFD _{AVG}	SIL _{CAPABLE}
Architectural constraints	HFT=0				TYPE A		
Valves	640	2,191	90	96%	8,760	3.97E-04	SIL 3
					2,190	9.98E-05	SIL 3
Actuator	5,816	3,630	237	94%	8,760	1.04E-03	SIL 2
					2,190	2.61E-04	SIL 3
Adapter	0	2	0.5	80%	8,760	2.19E-06	SIL 2
					2,190	5.48E-07	SIL 2
Package of all the above	See Table 2A on page 4.						

Table 1b: Summary of Failure Data of Valve-Actuator-Adapter as individual elements in normally closed configuration

PRODUCT	λ_{NE}	λ_S	λ_D	SFF	PTI *	PFD _{AVG}	SIL _{CAPABLE}
Architectural constraints	HFT=0				TYPE A		
Valves	640	2,102	181	92%	8,760	7.94E-04	SIL 3
					2,190	2.00E-04	SIL 3
Actuator	5,816	3,630	237	94%	8,760	1.04E-03	SIL 2
					2,190	2.61E-04	SIL 3
Adapter	0	2	0.5	80%	8,760	2.19E-06	SIL 2
					2,190	5.48E-07	SIL 2
Package of all the above	See Table 2B on page 4.						

Note. Failure rates in both tables 1A and 1B above are displayed in FITS ($\times 10^{-9}$ hours).
 *Values of proof test interval (PTI) range from 8760 to 2190 hours and MTTR = 8 hours.

The following results in Table 2a and 2b summarize the Valve-Actuator-Adapter as a package in both normally open and normally closed configurations.



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Table 2a: Summary of Failure Data of Valve-Actuator-Adapter s in a normally open configuration package

Safety Function: 'To move the valve to the open position via the spring return actuator'.					
Summary of Clauses 2/7.4.2 and 2/7.4.4		PTI ¹ = 8760 Hrs	PTI ² = 2190 Hrs	Verdict	
Architectural constraints		HFT=0	HFT=0	Type A	
Safe Failure Fraction (SFF)		95%	95%	SIL 3	
Random hardware failures: [h ⁻¹] (dangerous)	λ _{DD}	0 FIT	0 FIT		
	λ _{DU}	327.5 FIT	327.5 FIT		
Random hardware failures: [h ⁻¹] (safe)	λ _{SD}	0 FIT	0 FIT		
	λ _{SU}	5,823 FIT	5,823 FIT		
Diagnostic coverage (DC)		0.00%	0.00%		
PFD @ PTI MTTR = 8 Hrs		1.44E-03	3.62E-04	PTI ¹ SIL 2	PTI ² SIL 3
Probability of Dangerous failure (High Demand - PFH) [h ⁻¹]		3.27E-07	3.27E-07		
Hardware safety integrity compliance		Route 1 _H			
Systematic safety integrity compliance		See Systematic report R56A30811B.			
Systematic Capability (SC1, SC2, SC3, SC4)		SC3			
Hardware safety integrity achieved ^[4]		SIL 2 with a PTI of 8760 hrs OR SIL 3 with a PTI of 2190 hrs			

Table 2b: Summary of Failure Data of Valve-Actuator-Adapter in a normally closed configuration package

Safety Function: 'To move the valve to the closed position via the spring return actuator'.					
Summary of Clauses 2/7.4.2 and 2/7.4.4		PTI ¹ = 8760 Hrs	PTI ² = 2190 Hrs	Verdict	
Architectural constraints		HFT=0	HFT=0	Type A	
Safe Failure Fraction (SFF)		93%	93%	SIL 3	
Random hardware failures: [h ⁻¹] (dangerous)	λ _{DD}	0 FIT	0 FIT		
	λ _{DU}	418.5 FIT	418.5 FIT		
Random hardware failures: [h ⁻¹] (safe)	λ _{SD}	0 FIT	0 FIT		
	λ _{SU}	2,102 FIT	2,102 FIT		
Diagnostic coverage (DC)		0.00%	0.00%		
PFD @ PTI MTTR = 8 Hrs		1.84E-03	4.62E-04	PTI ¹ SIL 2	PTI ² SIL 3
Probability of Dangerous failure (High Demand - PFH) [h ⁻¹]		4.18E-07	4.18E-07		
Hardware safety integrity compliance		Route 1 _H			
Systematic safety integrity compliance		See Systematic report R56A30811B.			
Systematic Capability (SC1, SC2, SC3, SC4)		See Systematic report R56A30811B.			
Hardware safety integrity achieved ^[4]		SIL 2 with a PTI of 8760 hrs OR SIL 3 with a PTI of 2190 hrs			



Note 1: The failure data:

- 1) Failure rates stated in Tables 1a to 2b are in units of FITS.
- 2) The PFD_{AVG} figure shown is for illustration only assuming a proof test interval of 8760 and 2190 hours and MTTR of 8 hours. Refer to IEC 61508-6 for guidance on PFD_{AVG} calculations from the failure data.
- 3) The internal architecture is of 1oo1 (no redundancy).
- 4) Environment / stress criteria used in the FMEA: 'Ground; stationary; non-weather protected' conditions.
- 5) The verified failure rates used in the safe failure fraction and diagnostic coverage do not include (λ no parts or no effect) failures in the calculation.

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

Table 2

1	Product identification:	Valve-Actuator-Adapter Assembly's in normally open and normally closed configuration.
2	Functional specification:	<u>Normally Open Version:</u> 'To move the valve to the open position via the spring return actuator'. <u>Normally Closed Version:</u> 'To move the valve to the closed position via the spring return actuator'.
3-5	Random hardware failure rates:	Refer to Table 2a and 2b above
6	Environment limits:	Temperature range: Up to +70°C Material dependant
7	Lifetime/replacement limits:	Refer to installation, operation and maintenance (I, O & M) instructions.
8	Proof Test requirements:	Refer to Safety Manual
9	Maintenance requirements:	Refer to Safety Manual
10	Diagnostic coverage:	Refer to Table 2a and 2b above
11	Diagnostic test interval:	Not applicable
12	Repair constraints:	None, other than compliance with the I, O & M instructions
13	Safe Failure Fraction:	Refer to Table 2a and 2b above
14	Hardware fault tolerance (HFT):	Zero (1oo1)
15	Highest SIL (architecture/type A/B):	Type A, SIL 2 or SIL 3 depending on PTI selection.
16	Systematic failure constraints:	None, other than compliance with the I, O & M and maintenance instructions
17	Evidence of similar conditions in previous use:	Not applicable
18	Evidence supporting the application under different conditions of use:	Not applicable
19	Evidence of period of operational use:	Not applicable
20	Statement of restrictions on functionality:	See tables above, for the required safety function.
21	Systematic capability (SC1, SC2, SC3)	SC3 (see report R56A30811B).
22	Systematic fault avoidance measures:	Refer to assessment of the techniques and measures used to avoid systematic failures introduced during the realization lifecycle from 61508-2 Annex B. see report R56A20540B, R56A30811B and R56A30811A. Techniques and measures used in IEC 61508-3 Annexes A & B not available due to SW not being relevant to this assessment.
23	Systematic fault tolerance measures:	Not applicable
24	Validation records:	Documentation that has been validated are stated in report R56A30811A.



Management of functional safety

The assessment has demonstrated that the product is supported by an appropriate functional safety management system that meets the relevant requirements of IEC 61508-1:2010 clause 6. See report R56A20540B and R56A30811B.

Identification of certified equipment

A full list of certified equipment is defined in Table 3 below.

Table 3: Certified Equipment

Product type	Series	Description
Valves	47X, AF47P	three pcs design
	31X, AF31P, 32X, AF32P	#150, #300 flanged valves
	73X, AF73P, 74X, AF74P	#150, #300 full port flanged valves
	77X, AF77P, 78X, AF78P	PN16, PN40 full port flanged valves
	36, AF36	Wafer
	61X, 62X	Multi-port
	H24, H27X, AFH27	High pressure
	47W, 31W, 32W, 73W, 74W, 24W, 27W	HermetiX fire safe
	31G, 47G, 32G, 73G, 74G	HermetiX graphite free – fire safe
Actuators	C15, C20, C25, C30, C35, C45, C60, C75	Spring return pneumatic actuator
Adapter	Mounting Kit	

Conditions of Certification

The validity of the certified base data is conditional on the manufacturer complying with the following conditions:

1. The manufacturer shall analyze 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 program).
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. 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.



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2. 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.

General Conditions and Notes

1. This certificate is based upon a functional safety assessment of the product described in Sira Test & Certification Assessment Reports R7001106, R56A20540B, R56A30811A and any further reports referenced.
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	Report no.	Comment
05	17/11/2015	R7001106	Certificate updated as a result of a successful recertification audit. The range of products in table 3 has also been expanded to include 47W, 47G, 31W, 31G, 32w, 32G, 73W, 73G, 74W, 74G, 24W, 27W variants.



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