

# Certificate



**No.: V 360.02/15**

<b>Product tested</b>	Linear Actuators	<b>Certificate holder</b>	Automation Technology, LLC. 4950 Cranswick Rd. Houston, TX 77041 USA
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<b>Type designation</b>	Pneumatic: HDLSRE, HDLSRR, HDLDA, LSRE, LSRR, LDA Hydraulic: HDHSRE, HDHSRR, HDHDA, HSRE, HSRR, HDA
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<b>Codes and standards</b>	IEC 61508 Parts 1-2 and 4-7:2010	IEC 61511 Parts 1-3:2004
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<b>Intended application</b>	Safety Function: Return into default position (open or closed) when control medium is cut off and vented (spring return), maintain functionality under all conditions to move actuator into application dependend safe position by means of control medium (double acting).
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The actuators are suitable for use in a safety instrumented system up to SIL 2. Under consideration of the minimum hardware fault tolerance HFT=1 the actuators may be used in a redundant structure up to SIL 3.

<b>Specific requirements</b>	The instructions of the associated Installation, Operating and Safety Manual have to be considered.
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Summary of test results see annex to this certificate.

Valid until 2020-06-08

The issue of this certificate is based upon an examination, whose results are documented in Report No. V 360.02/15 dated 2015-06-08.

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, 2015-06-08

Certification Body for FS-Products

Dipl.-Ing. Stephan Häb

Automation Technology, LLC  
 4950 Cranswick Road  
 Houston, Tx. 77041  
 USA

HDL- / L-Series of Pneumatic Linear Actuators  
 Product tested (Types HDLSRE, HDLSRR, LSRE, LSRR)  
 (pneumatic spring return extend / retract)

### Device-Specific Values

Probability of Dangerous Failure on Demand	$PFD_{spec}$	7.97 E-04
Test Interval	$T_i$	1 a
Confidence Level	$1-\alpha$	95 %
Safe Failure Fraction	SFF	83.7 %
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

### Derived Values for 1oo1-Architecture

Assumed Demands per Year	$f_{np}$	1 / a	1.14 E-04 / h
Total Failure Rate	$\lambda_S + \lambda_D$	5.58 E-07 / h	558 FIT
Lambda Dangerous Detected	$\lambda_{DD}$	0.00 E+00 / h	0 FIT
Lambda Dangerous Undetected	$\lambda_{DU}$	9.10 E-08 / h	91 FIT
Lambda Safe	$\lambda_S$	4.67 E-07 / h	467 FIT
Mean Time To Failures	MTTF	1.79 E+06 h	205 a
Mean Time To Dangerous Failures	MTTF <sub>D</sub>	1.10 E+07 h	1,255 a
<b>Average Probability of Failure on Demand</b>	<b><math>PFD_{avg}</math></b>	<b>3.98 E-04</b>	

### Time of Usage

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.

### Quality Management

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

Manufacturer **Automation Technology, LLC**  
**4950 Cranswick Road**  
**Houston, Tx. 77041**  
**USA**

Product tested **HDL- / L-Series of Pneumatic Linear Actuators**  
**(Types HDLDA, LDA)**  
**(pneumatic double acting)**

### Device-Specific Values

Probability of Dangerous Failure on Demand	$PFD_{spec}$	4.34 E-04
Test Interval	$T_i$	1 a
Confidence Level	$1-\alpha$	95 %
Safe Failure Fraction	SFF	83.6 %
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

### Derived Values for 1oo1-Architecture

Assumed Demands per Year	$f_{np}$	1 / a	1.14 E-04 / h
Total Failure Rate	$\lambda_S + \lambda_D$	3.02 E-07 / h	302 FIT
Lambda Dangerous Detected	$\lambda_{DD}$	0.00 E+00 / h	0 FIT
Lambda Dangerous Undetected	$\lambda_{DU}$	4.96 E-08 / h	50 FIT
Lambda Safe	$\lambda_S$	2.53 E-07 / h	253 FIT
Mean Time To Failures	MTTF	3.31 E+06 h	378 a
Mean Time To Dangerous Failures	MTTF <sub>D</sub>	2.02 E+07 h	2,302 a
<b>Average Probability of Failure on Demand</b>	<b><math>PFD_{avg}</math></b>	<b>2.17 E-04</b>	

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### Quality Management

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Automation Technology, LLC  
 4950 Cranswick Road  
 Houston, Tx. 77041  
 USA

Manufacturer  
 Product tested **HD- / H-Series of Hydraulic Linear Actuators**  
**(Types HDHSRE, HDHSRR, HSRE, HSRR)**  
**(pneumatic spring return extend / retract)**

### Device-Specific Values

Probability of Dangerous Failure on Demand	$PFD_{spec}$	2.63 E-03
Test Interval	$T_i$	1 a
Confidence Level	$1-\alpha$	95 %
Safe Failure Fraction	SFF	90.6 %
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

### Derived Values for 1oo1-Architecture

Assumed Demands per Year	$f_{np}$	1 / a	1.14 E-04 / h
Total Failure Rate	$\lambda_S + \lambda_D$	3.19 E-06 / h	3,191 FIT
Lambda Dangerous Detected	$\lambda_{DD}$	0.00 E+00 / h	0 FIT
Lambda Dangerous Undetected	$\lambda_{DU}$	3.00 E-07 / h	300 FIT
Lambda Safe	$\lambda_S$	2.89 E-06 / h	2,891 FIT
Mean Time To Failures	MTTF	3.13 E+05 h	36 a
Mean Time To Dangerous Failures	MTTF <sub>D</sub>	3.33 E+06 h	381 a
<b>Average Probability of Failure on Demand</b>	<b><math>PFD_{avg}</math></b>	<b>1.31 E-03</b>	

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### Quality Management

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Manufacturer **Automation Technology, LLC**  
**4950 Cranswick Road**  
**Houston, Tx. 77041**  
**USA**

Product tested **HDH- / H-Series of Hydraulic Linear Actuators**  
**(Types HDHDA, HDA)**  
**(hydraulic double acting)**

### Device-Specific Values

Probability of Dangerous Failure on Demand	$PFD_{spec}$	1.76 E-03
Test Interval	$T_i$	1 a
Confidence Level	$1-\alpha$	95 %
Safe Failure Fraction	SFF	83.6 %
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

### Derived Values for 1oo1-Architecture

Assumed Demands per Year	$f_{np}$	1 / a	1.14 E-04 / h
Total Failure Rate	$\lambda_S + \lambda_D$	1.22 E-06 / h	1,224 FIT
Lambda Dangerous Detected	$\lambda_{DD}$	0.00 E+00 / h	0 FIT
Lambda Dangerous Undetected	$\lambda_{DU}$	2.01 E-07 / h	201 FIT
Lambda Safe	$\lambda_S$	1.02 E-06 / h	1,024 FIT
Mean Time To Failures	MTTF	8.17 E+05 h	93 a
Mean Time To Dangerous Failures	MTTF <sub>D</sub>	4.98 E+06 h	568 a
<b>Average Probability of Failure on Demand</b>	<b><math>PFD_{avg}</math></b>	<b>8.80 E-04</b>	

### Time of Usage

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### Quality Management

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