ROC no 1550
Rev. 0

Manufacturers Declaration

Manufacturer : Emerson Automation Solutions
Actuation Technologies
19200 Northwest Freeway
Houston, TX 77065
United States

Product: Pneumatic Rack & Pinion actuator

Brand: EL-O-Matic

Type: F-Series

Utilisation: Actuators for control of valves in Safety Instrumented Systems (SIS).

Application: EL-O-Matic F-Series pneumatic Rack and Pinion Actuators are suitable for Safety Instrumented Systems up to and including SIL 3 according IEC 61508.

Detailed results are available in TÜV report: RC-0919-SIL-TIC-PC-0010019-18-01

See next pages for a summary of the results of the Failure Modes, Effects, and Diagnostic Analysis (FMEDA) of the EL-O-Matic F-Series pneumatic rack & pinion actuators.

The suitability for of the application can only be determined in conjunction with the assessment of the other components of the Safety Instrumented System.

Signed : _____
Name : E. Schreuder
Position : Engineering Director
Pneumatic Actuators
Emerson Automation Solutions,
Actuation Technologies
Date : 2019-09-30
Place : Oldenzaal, The Netherlands

*Type: Series F / RPE spring return - No PST – Safety function: **1***

Proof test interval (months)				
6	12	24	36	48
5,77E-05	1,15E-04	2,29E-04	3,43E-04	4,57E-04

*Type: Series F / RPE spring return - With PST – Safety function: **1***

		Proof test interval (months)				
		6	12	24	36	48
PST interval (months)	1	1,44E-05	1,95E-05	2,98E-05	4,01E-05	5,04E-05
	2	2,31E-05	2,82E-05	3,85E-05	4,87E-05	5,90E-05
	3	3,17E-05	3,69E-05	4,71E-05	5,74E-05	6,77E-05
	6		6,28E-05	7,31E-05	8,34E-05	9,36E-05
	9				1,09E-04	
	12			1,25E-04	1,35E-04	1,46E-04

*Type: Series F / RPE double acting - No PST – Safety function: **1***

Proof test interval (months)				
6	12	24	36	48
6,17E-05	1,23E-04	2,45E-04	3,67E-04	4,89E-04

*Type: Series F / RPE double acting - With PST – Safety function: **1***

		Proof test interval (months)				
		6	12	24	36	48
PST interval (months)	1	1,54E-05	2,09E-05	3,19E-05	4,29E-05	5,38E-05
	2	2,47E-05	3,02E-05	4,11E-05	5,21E-05	6,31E-05
	3	3,39E-05	3,94E-05	5,04E-05	6,14E-05	7,24E-05
	6		6,72E-05	7,81E-05	8,91E-05	1,00E-04
	9				1,17E-04	
	12			1,34E-04	1,45E-04	1,56E-04

NOTES:

- The above values of PFD_{AVG} are calculated for MRT=24 h and proof test coverage=100%. For other values of MRT, TI, TI_{PS} and/or non-perfect proof test, the PFD_{AVG} values must be re-calculated.
- The PFD_{AVG} values including partial stroke test are calculated considering the use of a commercial automatic partial stroking test system: for further details, see the Safety Manual.

The values in the above tables are compatible with SIL 3.

Assessed documents:
[R1].

8 SUMMARY OF RESULTS

The analysis gives the results summarised in the following table.

Configuration	Safety function	λ_{DU} [1/h]	λ_{DD} [1/h]	λ_S [1/h]
Series F / RPE spring return - No PST	1	2,61E-08	0,00E+00	0,00E+00
Series F / RPE spring return - With PST	1	2,34E-09	2,37E-08	0,00E+00
Series F / RPE double acting - No PST	1	2,79E-08	0,00E+00	0,00E+00
Series F / RPE double acting - With PST	1	2,51E-09	2,53E-08	0,00E+00

NOTES:

- The results in the table are valid for all the configurations listed in par. 6
- The values are worst-case values among all sizes of spring return actuators and among all sizes of double acting actuators
- For definitions of Safety Functions, see par. 5
- For the reason why λ_S=0, see par. 9.1.1.2
- The λ_S values are not divided in λ_{SD} and $\lambda_{SU,}$ as this subdivision would have no relevance for any of the SIL parameters
- As specified in par. 9.1.1.2, failures of components of the cylinder:
  - For spring return actuators, they can generate spurious trips and therefore shall be correctly classified as “No Part” and not “Safe”, being related to components that “play no part in implementing the safety function” (see definition 3.6.16 of [N1] Part 4). The “spurious trip rate” is estimated in: 3,77E-09 [1/h]
  - For double acting actuators, they cannot generate spurious trips. The “spurious trip rate” is therefore 0,00E+00 [1/h]

The results of this report can be used for the assessment of a complete Safety Instrumented System.