

# Statement of Performance

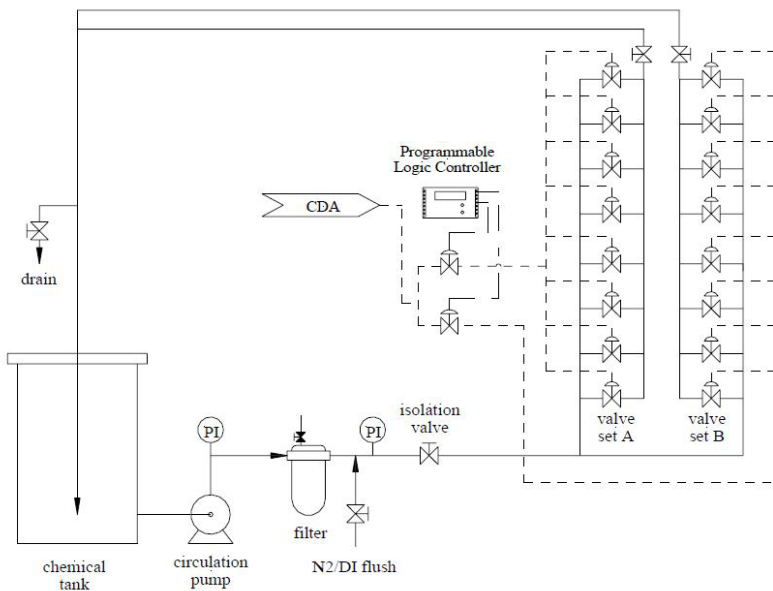
## Furon® UPX Normally Closed (NC) Reliability in 49%wt Hydrofluoric Acid (HF)

Furon UPX 2-way valves, normally closed (NC), were tested for reliability in 49 wt% hydrofluoric acid (HF) by an independent test lab<sup>1</sup> using the protocol of a major US OEM manufacturer.

### Accelerated Life Test Method

Eight Furon UPX 2-way valves were assembled in a manifold (valve set A in Figure 1) allowing two parallel flow paths through each set of 8 valves. Each set was cycled 3 seconds open and 3 seconds closed at room temperature with an actuator pressure of 80 psig. One set was opened as the other set was closed to maintain a constant flow of acid through the system at 76-80 psig. Valves were inspected every workday for leaks.

Figure 1 - Accelerated Life Test Schematic



The accelerated life test was performed on a set of eight valves in 49% HF. Cleanroom grade HF was used. The acid was replaced halfway through the test to ensure that full chemical strength was maintained.

Valves were tested for cracking pressure internal leakage and external leakage port-to-port leakage throughout the test. Internal leak testing was conducted by positioning the valve in a vertical orientation with the test port down. Degassed ultrapure water then flowed upward through the valve. The valve was opened and closed several times and agitated to evacuate air bubbles. The valve was then left closed. The downward facing test port was drained of water and pressurized with 110 psi Clean Dry Air (CDA). The upward facing port was plumbed to a scale attached to logging software. Any air leaks past the seat would displace water from the upward facing port to the scale for measurement. This procedure was repeated for both the inlet and outlet ports of each valve.

External leak testing was conducted by opening the valve, capping one port, and pressurizing the valve with the other port using 110 psi CDA. The same degassed ultrapure water system and scale were plumbed to the weep port of the test valve to measure any leakage past the diaphragm.

Crack pressure testing was conducted by plumbing a variable pressure CDA supply to the test port of a closed valve, and a pressure gage to the other port. CDA pressure was slowly increased to a maximum of 125 psi, or until the pressure gage at the other port increased, indicating bypass. The CDA pressure required to cause bypass was then recorded. The valve failed the test if the cracking pressure was less than 110% of the specification in this case it would be 110 PSIG.

## Results

**Table 1 – Accelerated Life Test Results in HF**

Valve ID	As Received			150,000 Cycles			300,000 Cycles			450,000 Cycles		
	Cracking Pressure (psig)		10 min ΔP OUT>>IN @ 100 psig (ΔP ≤ 0.8 psi)	Cracking Pressure (psig)		10 min ΔP OUT>>IN @ 100 psig (ΔP ≤ 0.8 psi)	Cracking Pressure (psig)		10 min ΔP OUT>>IN @ 100 psig (ΔP ≤ 0.8 psi)	Cracking Pressure (psig)		10 min ΔP OUT>>IN @ 100 psig (ΔP ≤ 0.8 psi)
	IN>>OUT	OUT>>IN		IN>>OUT	OUT>>IN		IN>>OUT	OUT>>IN		IN>>OUT	OUT>>IN	
4247082	>125	>125	0.2	>125	>125	0.3	>125	>125	0.2	>125	>125	0.3
4247083	>125	>125	0.7	>125	>125	0.3	>125	>125	0.2	>125	>125	0.4
4247084	>125	>125	0.3	>125	>125	0.4	>125	>125	0.3	>125	>125	0.3
4247085	>125	>125	0.3	>125	>125	0.3	>125	>125	0.3	>125	>125	0.3
4247086	>125	>125	0.4	>125	>125	0.4	>125	>125	0.3	>125	>125	0.3
4247087	>125	>125	0.5	>125	>125	0.5	>125	>125	0.3	>125	>125	0.3
4247088	>125	>125	0.4	>125	>125	0.3	>125	>125	0.3	>125	>125	0.3
4247089	>125	>125	0.3	>125	>125	0.7	>125	>125	0.3	>125	>125	0.3

**Table 2 – Accelerated Life Test Results in HF**

Valve ID	600,000 Cycles			750,000 Cycles			900,000 Cycles			1,050,000 Cycles		
	Cracking Pressure (psig)		10 min ΔP OUT>>IN @ 100 psig (ΔP ≤ 0.8 psi)	Cracking Pressure (psig)		10 min ΔP OUT>>IN @ 100 psig (ΔP ≤ 0.8 psi)	Cracking Pressure (psig)		10 min ΔP OUT>>IN @ 100 psig (ΔP ≤ 0.8 psi)	Cracking Pressure (psig)		10 min ΔP OUT>>IN @ 100 psig (ΔP ≤ 0.8 psi)
	IN>>OUT	OUT>>IN		IN>>OUT	OUT>>IN		IN>>OUT	OUT>>IN		IN>>OUT	OUT>>IN	
4247082	>125	>125	0.3	>125	>125	0.3	>125	>125	0.3	>125	>125	0.2
4247083	>125	>125	0.3	>125	>125	0.3	>125	>125	0.2	>125	>125	0.2
4247084	>125	>125	0.3	>125	>125	0.3	>125	>125	0.2	>125	>125	0.3
4247085	>125	>125	0.3	>125	>125	0.3	>125	>125	0.3	>125	>125	0.2
4247086	>125	>125	0.3	>125	>125	0.3	>125	>125	0.2	>125	>125	0.3
4247087	>125	>125	0.4	>125	>125	0.3	>125	>125	0.3	>125	>125	0.4
4247088	>125	>125	0.0	>125	>125	0.3	>125	>125	0.3	>125	>125	0.3
4247089	>125	>125	0.3	>125	>125	0.3	>125	>125	0.3	>125	>125	0.3

## Summary

Eight Furon UPX valves, normally closed, were successfully exposed to 1,050,000 cycles accelerated life cycle test in 49 wt% HF without suffering any major performance loss and all tested parameters completed at fixed intervals were acceptable.

## References

<sup>1</sup>CT Associates, Inc., 1721 Shady Oak Road, Eden Prairie, MN 55344.

The data provided here were obtained under defined test conditions. The tests were designed to mimic use or worst case conditions. However, Saint-Gobain makes no specific claims about the performance of the components in other chemicals or systems.



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