

## CRYOGENIC POPPET VALVES



Moog produces a variety of fluid control components used in space launch vehicles as part of their cryogenic fluid control systems. These components manage both cryogenic hydrogen and oxygen, including propellant isolation valves for rocket engine propellant feed systems and venting valves for propellant tank ullage pressure management. These valves are pneumatically-operated, using nitrogen or helium to provide actuation pressure. They are

poppet-style valves, which provide a lower cost option to ball valves while still providing a sufficiently low pressure drop and acceptable weight.

### FLOW AND PRESSURE CAPABILITIES INCLUDE

- Operating pressures up to 500 psig MEOP
- Mass flow rates up to 40 lbm/sec (LO<sub>2</sub> at 10 psid)



# CRYOGENIC POPPET VALVES

## PERFORMANCE CHARACTERISTICS



Valve	Model 50X1385 LOx Isolation Valve	Model 50X1462 LOx Isolation Valve	Model 50X1460 LH <sub>2</sub> Isolation Valve	Model 54X135 LOx Isolation Valve
Media	Liquid Oxygen	Liquid Oxygen	Liquid Hydrogen	Liquid Oxygen
Unit Mass	8.5 lbm	9.5 lbm	12 lbm	9.0 lbm (not flight optimized)
Dimensions (L W H)	5.0" x 5.0" x 11.0"	3.25" x 3.25" x 8.0"	7.4" x 5.2" x 12.0"	8.0" x 5.5" x 5.5"
MEOP	500 psig	55 psig	55 psig	2000 psig (gas); 500 psig (cryo fluid)
Actuation Pressure	500 psig	600 psig	600 psig	300 psig (minimum)
Factors of Safety	Proof: 1.5x MEOP; Burst: 2.5x MEOP	Proof: 1.5x MEOP; Burst: 2.5x MEOP	Proof: 1.5x MEOP; Burst: 2.5x MEOP	Proof: 1.5x MEOP; Burst: 2.5x MEOP
Valve Flow Sizing	$C_v = 83 - 100$	$C_v \geq 15.8$	$C_d A = 2.0 \text{ in}^2$ minimum	$C_d A = 0.98 \text{ in}^2$ minimum
Max Flowrate at $\Delta P$	40 lbm/s LOx @ 10 psid	0.339 lbm/s LOx @ -314°F, 50 psia, DP=1 psid (@ $C_v = 19.5$ )	.153 lbm/s LH <sub>2</sub> @ -423°F, 55 psia, DP=0.1 psid @ $C_v = 52.9$ )	29 lbm/sec. (H <sub>2</sub> O) @ 25.0 psid
Internal Leakage	25 scc/minute GHe (@ -300°F)	200 SCIM GHe	50 SCIM GHe	< 150 scc/minute GHe
External Leakage	400 scc/minute GHe (@ -300°F)	20 SCIM GHe	20 SCIM GHe	$2.0 \times 10^{-3}$ scc/minute GHe ambient
Response Time	250 msec (open or close)	$1 \pm 0.5$ sec (open or close)	Open: < 500 msec; Close: < 770 msec	Open: < 100 msec; Close: < 175 msec
Operating Temperature	-320°F – 160°F	-320°F – 160°F	-423°F – 100°F	-320°F – 160°F
Operating Voltage	N/A	N/A	N/A	28 VDC
Pull-in/Drop Out	N/A	N/A	N/A	0.4 Amp / 0.04 Amp
Random Vibration	31 Grms	14 Grms	16 Grms	TBD
Shock	1000 G	1000 G	1000 G	TBD
Cycle Life	500 cycles	200 cycles	700 cycles	300 cycles
Materials of Construction	Aluminum, 13-8, Vespel, PCTFE	Aluminum, CRES, Vespel, PCTFE	Aluminum, CRES, Vespel, PCTFE	Aluminum, CRES, Vespel, PCTFE

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