

PILOT OPERATED COLD GAS THRUSTERS

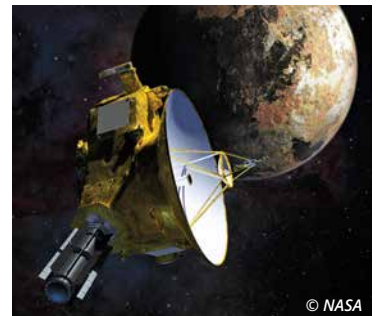
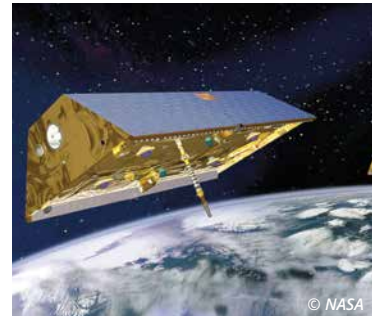


Moog pilot operated valve designs evolved from years of Moog miniature solenoid valve experience. Moog supported high profile Missile Defense Agency programs by designing very small, light-weight and fast acting pilot actuated thruster valves. Moog transferred technology from these programs to develop a family of commercial cold gas thruster valves.

The cold gas triad thruster was also flight qualified for the launch and hypersonic

vehicle markets as the vehicle's attitude and roll control system.

The pilot operated cold gas thruster is a perfect solution for packaging multiple thruster configurations into a single component design, reducing system complexity and integration effort. With all units, thrust is linear with inlet pressure and will continue to operate to low pressures in blowdown cases. The design is flexible and can be configured with canted or right angle side channels with either a simplified block type manifold or custom design, skin integrated configuration.



PILOT OPERATED COLD GAS THRUSTERS

PERFORMANCE CHARACTERISTICS

Model	50-820	50E1289	58E1000	58E166	50E937
Characteristic	Three individual pilot actuated, normally closed, cold gas thrusters packaged into a single housing.	High pressure isolation version of the 50-820.	Single stage, pilot operated, high pressure isolation valve or cold gas thruster.	Single inlet, high flow capable pilot operated, 2 channel cold gas thruster in a "bow tie" configuration.	Three independent, pilot operated cold gas thrusters mounted in a single, skin mounted module, with inlet filtration, integral back-EMF suppression diode board, and electrical connector.
Materials of Construction	Stainless Steel, Aluminum	Mostly Stainless Steel	Mostly Stainless Steel	Aluminum, Stainless Steel	Aluminum, Stainless Steel
MEOP / Proof / Burst Pressure	2500 psig (173.4 bar) / 3750 psig (259.6 bar) / 6250 psig (432 bar)	4000 psig (277 bar) / 9000 psig (622 bar) / 15000 psig (1034 bar)	6000 psia (413 bar) / 9000 psia (620 bar) / 15000 psia (1034 bar)	720 psia (49.6 bar) / 1080 psia (74.5 bar) / 1800 psia (124 bar)	3180 psia (219 bar) / 4770 psia (329 bar) / 7950 psia (548 bar)
Minimum Operating Pressure	100 psid (6.9 bar) max	200 psid (13.8 bar) max	200 psid (13.8 bar) max	100 psid (6.9 bar) max	150 psid (10.3 bar) max
Atmospheric Thrust	Thruster 1&3: 11.75lbf (52N) at 2,000psi Thruster 2 (center): 23.5lbf (105N) at 2,000psi	Thrust can be tuned to meet customer requirement up to 36.5 max lbf.	Thrust can be tuned to meet customer requirement up to 104 max lbf at 4 ksia.	110 lbf (489 N) at 600 psia with GN ₂ (vacuum)	37.5 lbf (167N) at MEOP with GN ₂
Internal Leakage	≤ 10 scc/min GN ₂ per seat	≤ 10 scc/min GN ₂ per seat	< 1 x 10 ⁻³ scc/sec GHe at MEOP	< 20 sccs GN ₂ at MEOP	<12 sccm GN ₂ at MEOP
External Leakage	< 30 scc/min GN ₂ entire module	< 30 scc/min GN ₂ entire module	< 1 x 10 ⁻³ scc/sec GHe at MEOP	< 50 sccs GN ₂ at MEOP	<12 sccm GN ₂ at MEOP
Voltage	24 to 34 vdc for 20 ms	28 Vdc nominal pulse for 20 ms	28 Vdc nominal pulse for 20 ms	28 Vdc nominal pulse for 20 ms	24 to 32.5 Vdc for 20 msec
Hold Voltage	15 Vdc hold	18 Vdc hold open	10 Vdc hold open	12 Vdc hold open	12 Vdc nominal hold for 60 sec max.
Response	<10 msec open and close	<10 msec open and close	<10 msec open and close	< 50 ms open and <20 ms close	<20 ms open and close
Filtration	None	None	None	None	25 micron absolute
Thermal	-105°F to +160°F (-76°C to +71°C)	-40 to 60°C (-40°F to 140°F)	-65 to 240°F (-54 to 116°C) operating (by similarity)	-65 to 160°F (-54 to 71°C)	-11°F to 142°F (-24°C to 61°C)
Cycle Life	>6000	>1000	>5000	>3000	>1500
Mass	0.95 lbm (0.43 kg) max	2.2 lbm (1 kg) max	1 lbm (0.45 kg) max	5 lbm (2.3 kg) max	7 lbm (3.2 kg) max
Options	Thrust levels can be varied by changing its orifice diameters or inlet pressure.	Isolation valve or thruster. Thrust levels can be tuned to customer requirements.	Additional channels can be added to the single channel design. Can be isolation valve or thruster.	Integral 36Vdc Zener diodes in the electrical circuit	Integral diodes in electrical circuit

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