

# Fill and Drain Valve

- Spacecraft propulsion system coupling for standard fluids



**Flight Half Coupling**

The Fill and Drain Valve (FDV) or Fill and Vent Valve (FVV) is a generic design of valve capable of sealing liquid propellant or gas across a wide pressure range.

The Fill and Drain Valve was developed as a generic valve capable of sealing all propellant media and has been selected for use on a number of major international satellite

programs, employing monopropellant, bipropellant and electric propulsion systems.

The Fill and Drain Valve flight unit [FHC] consists of a Titanium alloy housing incorporating a stainless screw mechanism providing the primary seal. This seal is formed by a silicon nitride ball making point contact with the screw mechanism minimising friction and ensuring only axial movement is transmitted.

The ball mates with a conical land in the housing that forms the seal. Redundant seals are located within the Titanium alloy cap.

The Fill and Drain Valve is operated using a dedicated Ground Half Coupling

(GHC) which is screwed on to the flight half providing series seals to prevent external leakage.

The internal screw mechanism is opened by applying a counter clockwise rotation to the actuating shaft of the GHC until the primary seal is fully open as indicated by the position indicator. After fuelling or venting is complete the valve is closed by applying a clockwise rotation. The GHC may then be removed and the cap re-fitted and torqued closed.

The Fill and Drain Valve has flown on a variety of platforms, including:

- SpaceBus 4000
- AlphaSat
- Vega Upper Stage AVUM



**Ground Half Coupling, capped**



**Flight Half Coupling, capped**

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Operating Media	GXe, GN <sub>2</sub> , GHe, NTO, MMH, N <sub>2</sub> H <sub>4</sub>
Maximum Operating Pressure	328 bar
Operational Temperature	-35°C to +72°C
Proof Pressure	656 bar
Burst Pressure	1312 bar
Flow Rate / Pressure Drop	<0.05mbar with 5.5mg/s GXe at 20°C
Internal Leakage	<< 1 x 10 <sup>-4</sup> scc/s GHe
External Leakage	< 1 x 10 <sup>-6</sup> scc/s GHe
Cycle Life	100 open/close (qualified)
Robustness	100 FH/GHC assembly /disassembly (qualified)
Wetted Materials	Titanium Alloy, Stainless Steel, PTFE, Silicon Nitride
Hardware Mass	< 50 gram
Envelope (Overall length)	78.5mm including stub tube, for FHC
Fluidic Interface	1/4" or 3/8" tube stub (weldable) or threaded AS4395 fitting
Options	Interface can be fully customised
Technology Readiness Level	Flight Qualified, TRL9



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