Torion Plasma Corporation

6001H-S1-03

Depleted Uranium Getter Bed (Ubed)

Features & Benefits

Efficient Gas Storage:	High capacity, constant reaction kinetics over a broad hydrogen-to metal ratio, low residual tritium inventory, no aging effects
Easy Gas Recovery:	Low temperature (< 430°C) tritium gas recovery
Minimize Inventory:	Very low tritium gas vapor pressure over DU material
Dual Containment:	Minimize Tritium out gassing during desorption
Pressure Vessel:	Registered to ASME Section VIII Div 1

Typical Uses

- Long term tritium gas storage
- Tritium gas purification from Helium isotopes
- Tritium gas transportation

Overview

The Depleted Uranium Getter bed (Ubed) is a doubly contained pressure vessel filled with depleted uranium (DU) which acts as a hydrogen isotope getter material. Tritium gas is easily absorbed onto the DU to very low partial pressures above the material. This means that most of the tritium gas is absorbed into the material with very little inventory remaining in the vessel volume or piping, thereby minimizing accidental tritium release when opening the Ubed.

The primary vessel supports heaters and thermocouples to allow for the heating of the DU material and the desorption of the tritium gas at modest temperatures below 430 ˚C. The primary vessel and heaters are enclosed in a secondary vessel that is evacuated to provide both thermal insulation and to minimize any tritium permeation from the primary vessel.

The pyrophoricity for DU is passively protected by designed flow conductance and thermal management to restrict the temperature excursion below 250°C in the event of an air ingress into the Ubed.

Design Benefits

The Ubed is designed for robustness. The ability to operate at high temperatures ensures that multiple absorption/desorption cycles will not damage the bed. The stainless steel welded vessels, rugged band heater and sheathed thermocouples ensure a clean package that can operate continuously at temperatures up to 500°C without damage.

The Ubed comes standard with metal bellows isolation hand valves fitted with copper stem tips and VCR-8 or 4 female nuts. The unit is helium leak tight to $1x10^{-9}$ scc/sec at the operating temperature which is suitable for tritium service.

Specifications

Operating Conditions	
Material Quantity	Standard: 90 g of Depleted Uranium Custom quantities upon request
Flow Type	In-line with gas flow through
Gas Capacity	30 kCi of Tritium gas Max: 12.5 sL of Hydrogen Isotopes Nominal: 7.0 sL of Hydrogen Isotopes
Operating Pressure	0 – 100 psig
Operating Temperature	0 – 450 ˚C
Humidity	- 40˚C Dew point
Carrier gas flow	< 2 SLPM
Pressure Drop	< 0.5 psig at full flow
Carrier gas composition	Helium, Argon, or Inert gasses NEVER: air, O2
Maximum Conditions	
Max Operating Pressure	150 psig
Max Operating Temperature	500 ˚C
Physical	
Dimensions	4” Dia x 12.4” Length
Isolation Valves	Bellows sealed, manual, copper stem tip
Wetted Materials	Depleted Uranium, 316L Stainless Steel, Copper
Leak Tightness	$1x10^{-9}$ cc/sec helium with 1 atm helium upstream
Pressure Vessel	ASME Section VIII Div 1
Electrical	
Number of Heaters	1
Heater Power	300 W
Heater Current	2.5 A
Heater Voltage	120 VAC
Thermocouple	2 - Type K welded, standard mini-connector, ungrounded

Drawings

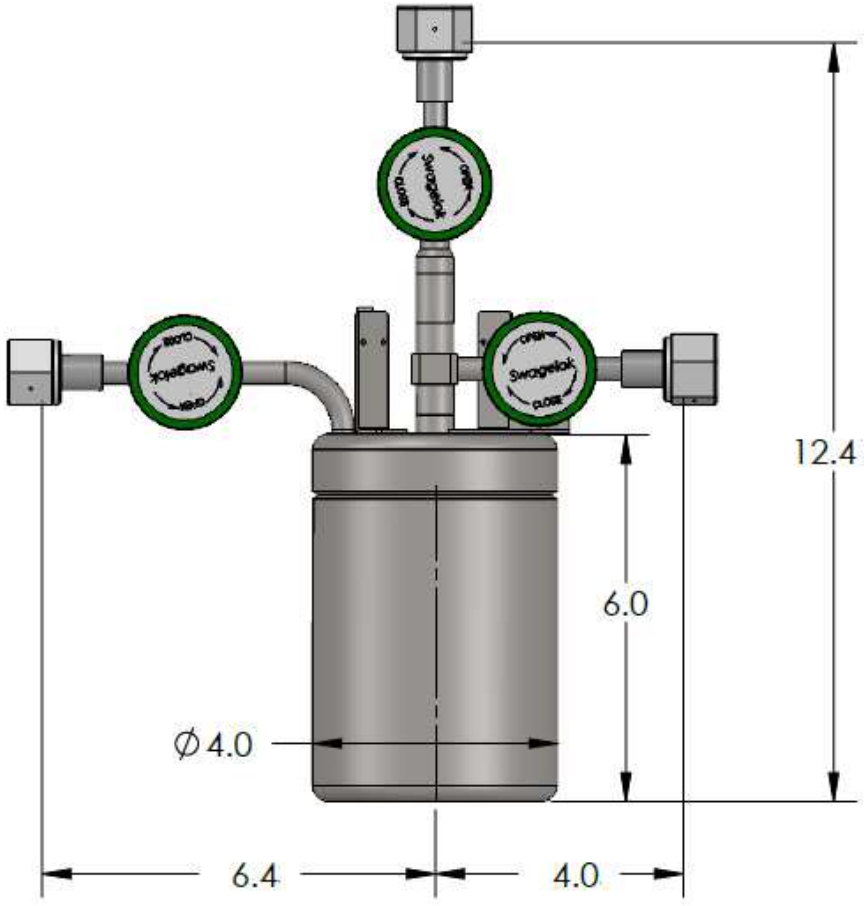

Figure 1: 80g Ubed Dimensions