Torion Plasma Corporation

6001D-S1-04

Molecular Sieve Drier Bed (Drier Bed)

Features & Benefits

High Efficiency:	4A Molecular Sieve Zeolite
Reusable Drier:	Fully regenerable at 350 °C
Robust:	Package designed for repeated regenerations
Tritium compatible:	Bellow Sealed valves, full Stainless-Steel construction, high leak tightness
Pressure Vessel:	Registered to ASME Section VIII Div 1

Typical Uses

- Reduce tritiated water emissions from process lines
- Extract water vapor from gas streams
- Protect moisture sensitive hydride materials
- Provide quantitative integrated measurements of water loads in flow streams

Overview

The drier bed is a pressure vessel charged with zeolite that has a high capacity for water. As a gas stream containing water vapor passes through the bed, the zeolite adsorbs water molecules within the pores of the absorbent. Dew points below -60˚C are routinely achievable with a regenerated bed.

The mass transfer zone of the drier is short by comparison to the bed length. Once the bed is loaded and the mass transfer zone penetrates the bed exhaust, the dew point of the gas leaving rises gradually which provides sufficient warning to operators that the drier is exhausted. Increasing the operating pressure improves capacity.

Once at capacity, the drier bed can be heated to 350˚C to release the condensate from the bed into a purge gas stream. After regeneration, the bed can be cooled to room temperature and returned to service as a drying medium. The bed is robust and can withstand thousands of drying/regeneration cycles before any performance degradation is observed.

Design Benefits

The drier Bed is designed for robustness. The stainless steel welded vessel, rugged band heater, sheathed thermocouples, insulation and protective stainless-steel jacket ensure a clean package that can operate continuously at 350°C without damage.

The drier Bed comes standard with metal bellows isolation hand valves fitted with copper stem tips and VCR-8 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	100 g Bed	6 kg Bed	8 kg Bed
Carrier gas flow	1 to 10 SLPM	1 to 100 SLPM	1 to 100 SLPM
Water Capacity - Under equilibrium conditions - Under flow conditions	 27 ml of H_2O 15 ml of H_2O	 1.3 L 0.8 L	 1.7 L 1.1 L
Bed Residence time	1 s @ 10 SLPM	8.5 s @ 60 SLPM	11 s @ 60 SLPM
Modified Reynolds number	1.9 @ 10 SLPM	1.6 @ 60 SLPM	2.1 @ 60 SLPM
Pressure	0 – 250 psig		
Temperature	10 – 350ºC		
Humidity	0 – 80% non-condensing		
Pressure Drop	< 0.3 psig at full flow		
Carrier gas composition	Air, Inert gases, Hydrogen NOT recommended: streams containing sulfur and/or potassium, volatile organic compounds		
Maximum Conditions			
Max Operating Pressure	300 psig		
Max Operating Temperature	425˚C		
Physical	**100 g Bed**	**6 kg Bed**	**8 kg Bed**
Dimensions	4.5” Dia x 15” L	8” Dia x 33” L	8” Dia x 41.5” L
Isolation Valves	Bellows sealed, manual, copper stem tip		
Wetted Materials	Zeolite, 304/316L Stainless Steel, Copper stem tip		
Leak Tightness	$1x10^{-9}$ cc/sec helium with 1 atm helium upstream		
Pressure Vessel	ASME Section VIII Div 1		
Electrical	**100 g Bed**	**6 kg Bed**	**8 kg Bed**
Number of Heaters	1	2	3
Heater Power	300 W	600 W	600 W
Heater Current	2.5 A	5 A ea, 10 A Total	5 A ea, 15 A total
Heater Voltage	120 VAC		
Thermocouple	Type K welded, braided wire, standard mini-connector, ungrounded		

Drawings

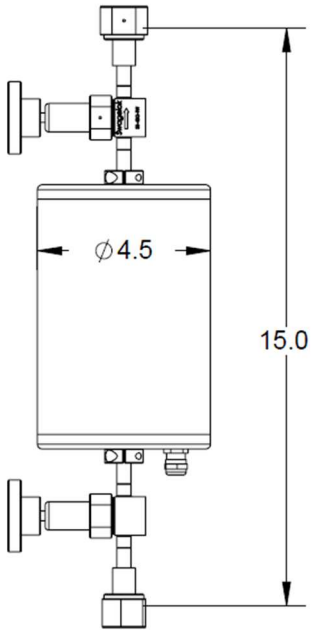

Figure 2: 100g Drier Bed

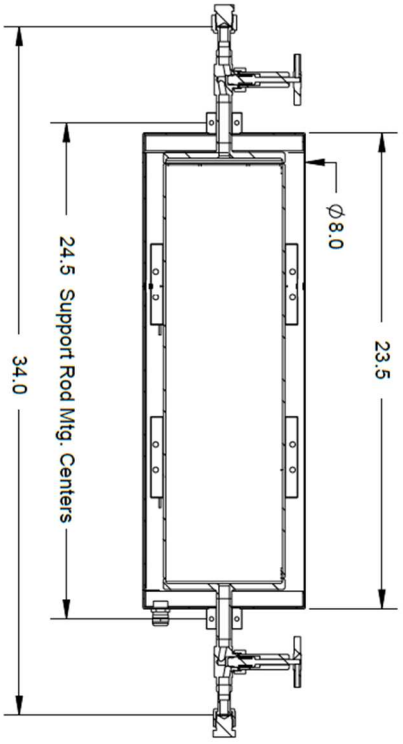

Figure 1: 6kg Drier Bed

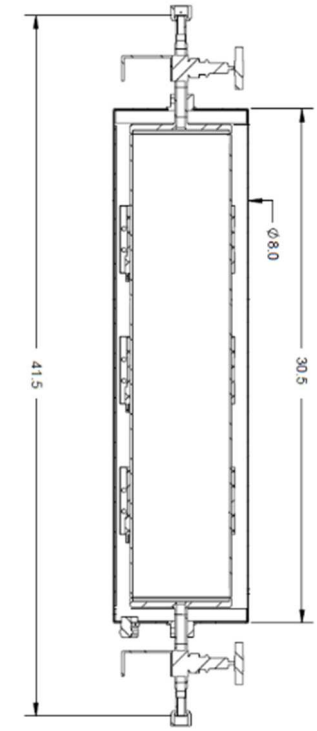

Figure 3: 8kg Drier Bed