BETTIS™

Molecular Sieve Desiccant Dehydrator For Natural Gas

- Effective Water & H_2S Adsorption
- Regenerable Desiccant Bed
- Conformance to NACE MR-01-75
- Reduces Fluid Contamination
- Increases Equipment Life
- Reduces Risk of Hydrate Formation
- Reduces Gas Supply Freeze Off Risk

Bettis Model DD (Standard Service)

Bettis Model DD-S (Sour Service)

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Molecular Sieve Characteristics

Molecular sieves are synthetically produced zeolites, a crystalline form of alkali metal (calcium, sodium, potassium) aluminosilicates, very similar to natural clays. They are highly porous, with a very narrow range of pore sizes and very high surface area per package volume. Manufactured by ion-exchange, molecular sieves possess highly localized polar charges on their surfaces that act as extremely effective adsorption sites for polar compounds such as water and hydrogen sulfide. Unlike other desiccants, molecular sieves exhibit a fairly constant rate of adsorption and equilibrium water capacity over a wide range of relative humidities. Molecular sieves are alkaline, so special acid resistant sieves are available for very sour gases.

Since the pore size range is narrow, molecular sieves exhibit selectively towards adsorbates on the basis of their molecular size, and tend not to adsorb bigger molecules such as the heavy hydrocarbons. The pore diameter of a molecular sieve is measured in angstroms, Å (1 micron = 10,000 angstroms). Molecular sieves offer a means of simultaneous dehydration and desulfurization and are therefore the best choice for sour gases.

Natural gas, whether at the well head or in the sales gas pipeline, almost always contains water vapor. Water content can range from extremely high at the well head and gathering system to the typical 4-5 lb. H_20/MMscf in the sales gas line. Dehydration of supply gas, whether power, signal, or burner, can reduce the risk of contaminating hydraulic fluid, freeze offs and hydrate formation.

Hydrogen sulfide (H2S), when present in natural gas, may generate corrosive by-products at concentrations as low as 50 ppm. Natural gas containing H2S may also contain carbon dioxide (CO_2) which is corrosive at concentrations as low as 0.7 wt %.

Molecular sieve 4A desiccant will adsorb H_2S and CO_2, thus reducing corrosion, increasing equipment life and reducing the foul odor associated with H_2S in vented gas.

Bettis Desiccant Dehydrators can be used to remove adsorbates from flows such as fuel, power, and signal gas streams and can also remove of water vapor from the power and/or signal gas of gas/hydraulic valve operators.

Features

- Effective adsorption of water and hydrogen sulfide
- Conformance to NACE MR-01-75 (optional)
- Molecular sieve desiccant bed can be regenerated
- Reduces the risk of hydrate formation
- Reduces the risk of power gas supply freeze off
- Reduces the risk of contaminating hydraulic fluid (in gas/hydraulic operators)
- Adsorption of hydrogen sulfide and carbon dioxide increases equipment life and reduces foul odors
- Can be used to remove adsorbates from flows such as fuel, power and signal gas streams
- Various sizes and desiccant types available
- Available in both standard and low temperature configurations

Typical Physical Characteristics

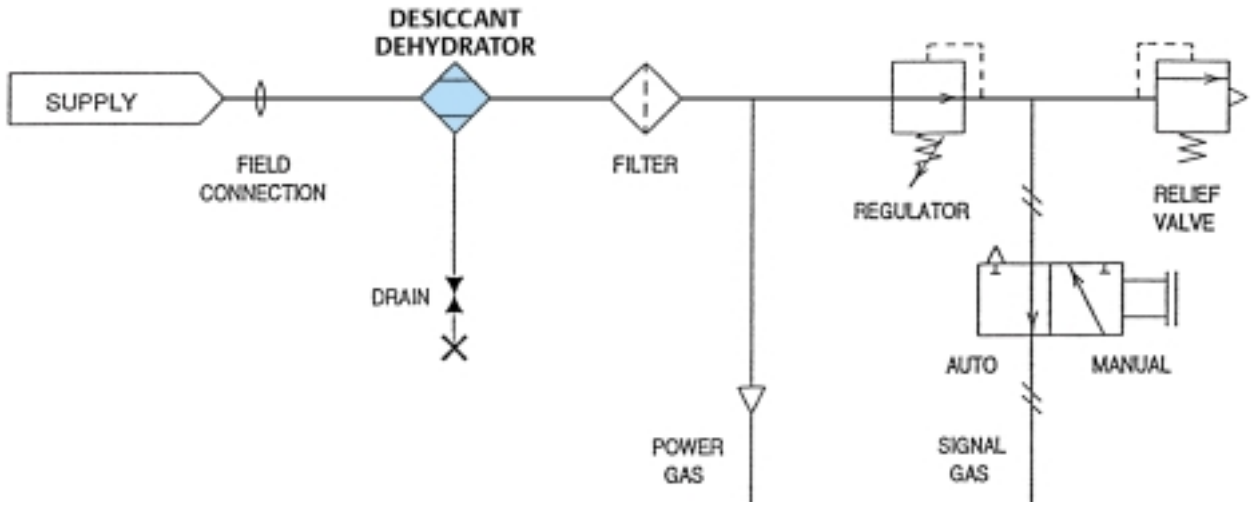
General

Available Pellet Diameters	1/16″, 1/8″	Theoretical H_2O Adsorption Capacity by Weight at 60°F and 40% R.H.	22%
Operating Temp. Range	–80°F to 200°F	Operating Superficial Flow Veloc. Range	10 to 100 ft/min.
Heat of Adsorption	1800 max. BTU / lb. H_2O		

By Type

Desiccant Type	3A	4A	5A	13X
Pore Diameter (Å)	3	4	5	10
Zeolite	Potassium	Sodium	Calcium	Sodium
Bulk Density (lb./cu. ft.)	44	44	44	40
Typical Molecules Adsorbed (each type adsorbs listed compounds plus those of all types to the left)	H_2O, NH_3	Ethanol, H_2S CO_2, SO_2, C_2H_4, C_2H_6, C_3H_6	n-C_4H_9OH n-C_4H_{10}, C_3H_8, to $C_{22}H_{46}$, R-12	Molecules with effective diameters < 10Å

Typical Schematic of Power Gas Application



Models

Model	DD-1	DD-2	DD-3
Overall Size	NPS 3 X 24″	NPS 4 X 30″	NPS 6 X 36″
Capacity MS Desiccant Weight (lbs.)	2.05	4.05	12.98

Refer to **Product Manual** for sizing information.

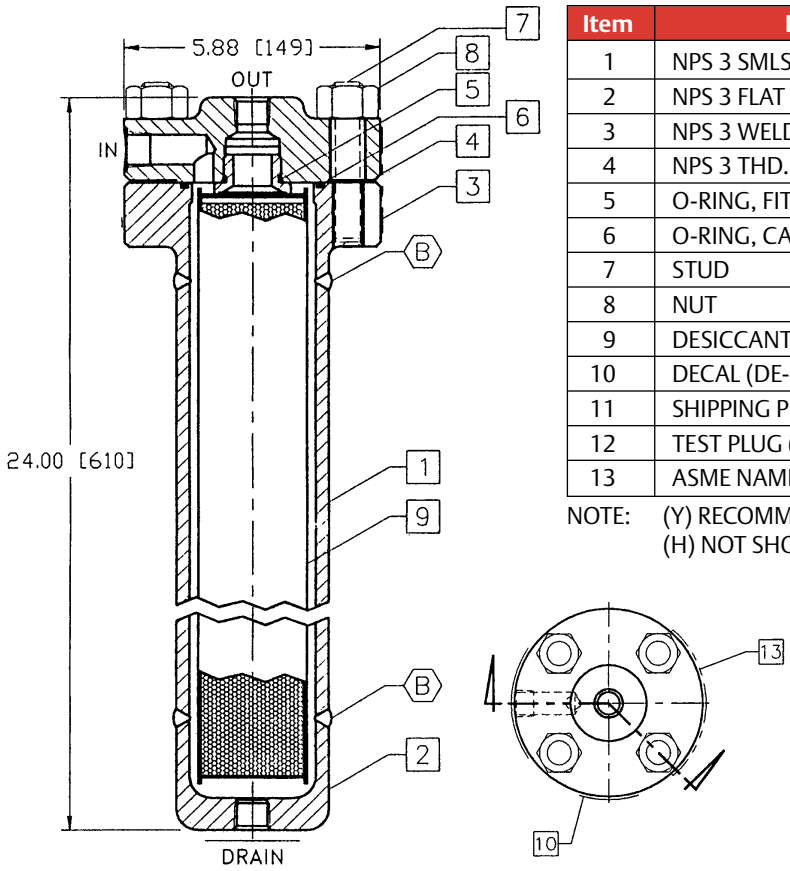
Specifications (All Models)

Maximum Allowable Working Pressure (Std. Service)	2220 psig
Maximum Allowable Working Pressure (Sour Service)	2220 psig
Temperature Rating (Standard Materials)	–20 to 150° F (–29 to 65° C)
Temperature Rating (Low Temp. Materials)	–50 to 150° F (–46 to 65° C)
Inlet Connection	1/2 NPT
Outlet Connection	1/2 NPT
Mounting	U-Bolt or free standing as required.

Testing/Registration

Flanged body Desiccant Dehydrator pressure vessels are designed, constructed and tested in accordance with ASME Section VIII Div. 1 requirements. Local regulatory approval, if required, is available. CRN Number OH3118.12

Cutaway Assembly Model DD-1F



Item	Description	Material	Qty.	Note
1	NPS 3 SMLS PIPE	SA-333-6	1	
2	NPS 3 FLAT HEAD	SA-350-LF2	1	
3	NPS 3 WELD NECK FLANGE	SA-350-LF2	1	
4	NPS 3 THD. RED. CAP	SA-350-LF2	1	
5	O-RING, FITTING	H-T Fluoro 70A	1	(Y)
6	O-RING, CAP	H-T Fluoro 70A	1	(Y)
7	STUD	SA-320-L7M	4	
8	NUT	SA-194-7M	4	
9	DESICCANT CARTRIDGE	SS 304	1	(Y)
10	DECAL (DE-PRESSURIZE BEFORE ...)	VINYL	1	
11	SHIPPING PLUG (LOOSENED)	A105	2	(H)
12	TEST PLUG (SEALED DRAIN)	A105	1	(H)
13	ASME NAMEPLATE (OPTIONAL)	AL/SS	1	

NOTE: (Y) RECOMMENDED SPARE PARTS, PART NO. SPRK-DD-1F
(H) NOT SHOWN

SPECIFICATIONS:
PORTS: 1/2 NPT x 1/2 NPT x 1/2 NPT
SERVICE: AIR, SWEET GAS, H2S SOUR GAS
TEMP. RATING: -46°C THRU 65°C
MASS: 50.8 lbm [23.0 kg]
OPTION: DRAIN VALVE
MAWP: 1500 OR 2220 PSIG, AS SPEC'D
STD CARTRIDGE: 4A
EFFECTIVE Cv: 3.5 at 1000 PSIG INLET
COMPLIANCE WITH NACE MR-01-75, AND APPLICABLE PARTS OF ASME VIII-1

H_2O Content of Natural Gas (lb. H_2O/MMscf)

Dewpoint (°F)	–20	–10	0	10	20	30	40	50	60	70
115 psia	4.75	7.25	11.50	18.00	29.00	40.00	62.00	90.00	125.00	170.00
515 psia	1.25	2.00	3.25	5.00	7.25	10.50	15.50	21.50	30.00	42.00
1015 psia	.75	1.25	1.75	3.00	4.25	6.00	9.00	13.00	18.00	25.00

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