

Replacement Information for Model FD-1500 Filter/Dryer



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Introduction

The Becker filter/dryer is a durable unit designed to provide dry, clean instrumentation gas by removing particles, free water, and water vapor from natural gas.

The design of the FD-1500 incorporates a replaceable “Spin on” cartridge inside a carbon steel housing. Gas enters the unit from the top and continues around the narrow passageway between the housing and the cartridge increasing the velocity of the gas. The gas enters the cartridge from the bottom resulting in a complete change in direction of the flow. This change in direction in gas flow causes the free water to separate from the gas. A three-inch space between the bottom of the housing and the cartridge allows for collection of free water. The gas then enters the replaceable cartridge. The replacement cartridge has three main components:

1. A primary filter to remove larger particles.
2. 2 lbs. of silica gel (desiccant) which can absorb 1 lb. of water vapor and free water.
3. A secondary fine filter with 110 square inches of media to strain particles as small as 10 microns.

The FD-1500 provides adequate capacity to flow sufficient gas for instrumentation. The maximum operating pressure is 1500 psig (each FD-1500 is hydrostatically tested to 2250 psig). The flow capacity of the entire unit is 50 scfm due to the fittings, etc. The capacity of the fine filter itself at 1500 psig and 10 psid differential pressure is 212 scfm.

The FD-1500 will provide reliable use if the following replacement procedure for the cartridge is observed.

Technical Assistance

Should you have any questions, you may contact your local Becker sales representative or Becker technical assistance at:

Dresser, Inc.

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THE EXPECTED LIFE OF THE DESICCANT IN THE FILTER/DRYER REPLACEMENT CARTRIDGE MODEL FD-1500

The life cycle of the desiccant depends on the following factors:

1. The amount of desiccant in the FD-1500.
2. The amount of water in the gas.
3. The amount of gas flowing through the FD-1500.

The useful life expectancy of the dryer can be calculated by the formula:

$$T = \frac{W_d}{W_q \times Q}$$

Where:

T = life cycle (hours)

W_d = desiccant absorption capability (1 lb. for the FD-1500)

W_q = amount of water in the gas (lb./mmscf) for commercial grade natural gas, $W_q = 7 \text{ lb./1mmscf}$

Q = gas consumption (scfh)

The last factor Q is the most difficult to predict, it can fluctuate from zero consumption as in the case of Becker monitor control valves to a substantially large number as in the case of very active control valves. It is good practice to use $Q = 20 \text{ scfh}$. This value represents a steady state consumption for many instruments that bleed.

Useful average life for FD-1500 dryer:

$$T = \frac{1 \text{ lb}}{7 \text{ lb./mmscf} \times 20 \text{ scfh}} = 7142 \text{ hours} = 1 \text{ year}$$

It is a good practice to replace or regenerate the desiccant once a year.

Warning: It is common practice to check the condition of the dryer by opening the blow down needle valve provided at the bottom of the FD-1500. This inspection can only identify the presence of free water flowing with the gas.

If no water is found and the gas appears very dry, it does not necessarily mean that the desiccant does not require replacement. The absorption rate of the desiccant depends only on the variables in the formula on the previous page.

The following table is provided to identify if water fall out has occurred which may cause freezing problems in the instruments:

Notes

Table 1 - Equilibrium Moisture Contents of Natural Gases Above the Critical Temperature

PSIA											
°F	14.7	100	200	300	400	500	600	700	800	900	1000
-40	9.10	1.50	0.88	0.66	0.55	0.49	0.44	0.41	0.39	0.37	0.36
-36	11.5	1.90	1.10	0.80	0.68	0.59	0.54	0.50	0.47	0.45	0.43
-32	14.4	2.40	1.30	0.99	0.82	0.72	0.65	0.60	0.57	0.54	0.51
-28	17.8	2.90	1.60	1.20	1.00	0.87	0.79	0.72	0.68	0.64	0.61
-24	22.0	3.60	2.00	1.50	1.20	1.10	0.95	0.87	0.81	0.77	0.73
-20	27.0	4.40	2.40	1.80	1.50	1.30	1.10	1.00	0.97	0.92	0.87
-16	33.1	5.40	3.00	2.20	1.80	1.50	1.40	1.20	1.20	1.10	1.00
-12	40.5	6.50	3.60	2.60	2.10	1.80	1.60	1.50	1.40	1.30	1.20
-8	49.3	7.90	4.30	3.10	2.50	2.20	1.90	1.80	1.60	1.50	1.50
-4	59.8	9.50	5.20	3.70	3.00	2.60	2.30	2.10	1.90	1.80	1.70
0	72.1	11.4	6.20	4.50	3.60	3.10	2.70	2.50	2.30	2.10	2.00
4	86.8	13.7	7.40	5.30	4.30	3.60	3.20	2.90	2.70	2.50	2.40
8	104	16.4	8.80	6.30	5.10	4.30	3.80	3.40	3.20	3.00	2.80
12	124	19.5	10.5	7.50	6.00	5.10	4.50	4.00	3.70	3.50	3.30
16	148	23.2	12.4	8.80	7.00	5.90	5.20	4.70	4.30	4.00	3.80
20	176	27.4	14.6	10.4	8.20	7.00	6.10	5.50	5.10	4.70	4.40
24	208	32.4	17.2	12.2	9.70	8.20	7.20	6.40	5.90	5.50	5.10
28	246	38.1	20.2	14.3	11.3	9.50	8.30	7.50	6.80	6.30	5.90
32	289	44.7	23.7	16.7	13.2	11.1	9.70	8.70	7.90	7.30	6.90
34	313	48.4	25.6	18.0	14.2	11.9	10.4	9.30	8.50	7.90	7.40
36	339	52.4	27.7	19.4	15.3	12.9	11.2	10.0	9.20	8.50	7.90
38	367	56.6	29.9	20.1	16.5	13.9	12.1	10.8	9.80	9.10	8.50
40	396	61.1	32.2	22.6	17.8	14.9	13.0	11.6	10.6	9.80	9.10

Reference: Gas Engineers Handbook 1st Edition

The Table Above Can Be Used As Follows:

Assume that the pipeline pressure is 1000 psig at 40°F. This gas can hold 9.1 lb./mmscf of water.

Assume that the pressure will be cut from 1000 psig to 100 psig at the supply regulator.

Assume that for every 100 psig drop in pressure the gas will drop 7°F in temperature. In this case, the temperature will drop from 40°F to -23°F (1000 psig - 100 psig / 100 psig x 7°F =63°F).

From the table, look up 100 psig and -23°F (or the closest value). If the number is below 7 lb./mmscf, water will fallout of the gas and the desiccant should be replaced once a year to prevent problems as a result of freezing.

The above test procedure indicates the predicted service life of the Becker FD-1500 filter/dryer cartridge assembly. Should you require any additional information or assistance please feel free to telephone using our toll free number,

1-800-323-8844.

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