

**Gardner**  
**Denver**

MEMBRANE DRYERS

# MMD Series



# Membrane Dryers

## Air Treatment & Technology

The carefully engineered Gardner Denver membrane dryer design provides a reliable method to remove moisture as a water vapor while coalescing filters remove solid particles, liquid water droplets, liquid oil and oil vapors from the compressed air system.

### MMD Series Membrane Dryers offer Flexible Pressure Dew Points Between +40°F and -40°F (+4°C to -40°C)

Moisture (water vapor) is present in ambient air as a gas and cannot be filtered. Membrane fibers present in the MMD Series remove water vapor to prevent it from condensing into harmful liquid water droplets inside compressed air systems. Powder painting, laboratory instruments and food packaging machines with pneumatic components are examples of applications which cannot tolerate the presence of any moisture.



### FIL Series Grade E and Grade F Coalescing Filters Remove Water Droplets and Solid Particles to 0.01 Micron

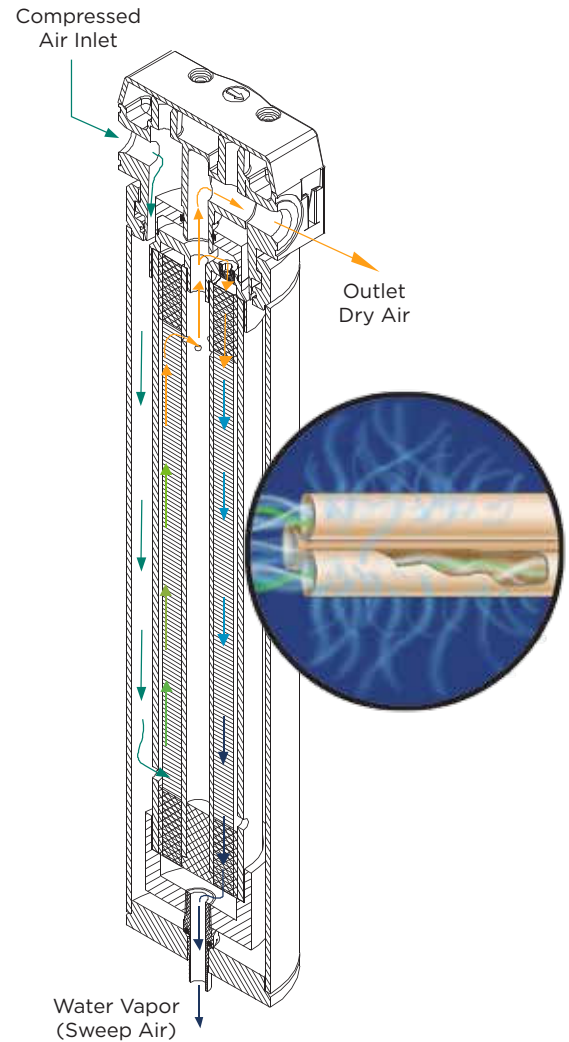
Water droplets are formed by the condensed water vapor present in ambient air. Solid particles come from ambient air contaminants like dust and from rusted, oxidized pipework. They can cause pneumatic equipment to malfunction and trigger instrument and control failures.

### FIL Series Grade G Filters Remove Oil and Oil Vapors for Oil-Free Air

Liquid oil and oil vapors are introduced by compressor coolants and by hydrocarbon vapors present in ambient air. Oil-free compressed air is particularly important in food and pharmaceutical processes where direct and indirect contact with compressed air occurs. Oil contamination of food and drug products can generate significant liability issues and manufacturing spoilage costs.

## Membrane Fibers Dry Compressed Air with No Oxygen Loss

- The MMD Series Membrane Dryer utilizes a spiral wrapped bundle of tube-shaped membrane fibers to remove water vapor from the compressed air stream. These fibers are engineered to separate moisture without reducing the oxygen content in the compressed air stream.
- Compressed air should be prefiltered prior to the membrane dryer. We recommend Gardner Denver FIL Series Grade C prefiltration (1 micron solid particles) and then an FIL Series Grade F oil removal filter (oil removal to 0.0008 ppm). In situations where the maximum inlet liquid load is less than 1,000 ppm, a FIL Series Grade E oil removal filter may be used as a stand-alone prefilter (0.01 micron particles and 0.008 ppm oil removal).
- After prefiltration of liquid oil and water, the saturated air now begins passing through the outer walls of the membrane tubes. The air is dried as it traverses the length of the membrane bundle by the process of permeation and exits the dryer for use downstream having achieved its' design dew point.
- Permeation is the name of the process by which water vapor moves from the outside of the tubes (area of high vapor pressure), to the inside of the tubes (area of low vapor pressure). A fraction of the compressed air will sweep the water vapors through the membrane walls and exit the dryer through the sweep air ports on the dryer.



Self-Sufficient Design

# Features

## Installation Convenience

- Lightweight modules can be installed on machinery or in instrumentation control rooms without the need for additional support
- Does not require electric power to run, eliminating the need for a power source
- Great for portable applications due to the self-sufficient design
- In-line “T” type connection to prefilters make it easy to incorporate it into an existing OEM package design
- Durable under many environmental conditions: high and low temperatures, corrosive and explosive atmospheres, indoors or out
- Replaceable membrane bundle

## Housings

- Rugged, welded aluminum housing is epoxy coated for durability
- Space-saving modular connection to prefilters

## No Operator or Input Power Required

- Simply hook the membrane dryer up to the compressed air system and walk away
- No adjustments necessary, no instruments required
- No maintenance as there are no moving parts which will wear out
- Long-life membranes with proper liquid oil and water prefiltration



## Modular Prefiltration Packages with Mounting Systems

- Utilize one Gardner Denver FIL Series Grade E High Efficiency Oil Removal Filter for normal conditions with less than a 1,000 ppm inlet liquid load. This single prefilter package is very common with OEM applications.
- Utilize two FIL Series filters, the FIL Series Grade C General Purpose Filter and the FIL Series Grade F Maximum Oil Removal Filter, for extreme conditions with greater than a 1,000 ppm inlet liquid load. The dual prefilter package is very common with painting applications.
- A FIL Series Grade G Oil Vapor Removal Filter should be utilized as the final filter for food and pharmaceutical applications where compressed air comes into direct/indirect contact with these end products.
- Convenient mounting systems for all filter combinations are available consisting of a wall-mounting bracket, modular connection kit from filter(s) to dryer, and a modular filter connection kit should there be two prefilters. The filters include automatic drains and a differential pressure indicator to signal the need for element replacement.



### TYPICAL APPLICATION

| PACKAGING MACHINES | CONVERTING MACHINES | GENERAL APPLICATIONS |
|--------------------|---------------------|----------------------|
| Air/Gas Flushing   | Blow Molding        | Painting             |
| Bagging            | Cup Making          | Instrument Air       |
| Capping/Lidding    | Bag Making          | Air Logic            |
| Labeling           | Laminating          | Train Doors          |
| Imprinting         | Pouch Making        | Air Transport        |
| Shrink Wrapping    |                     | Fluid Agitation      |
| Traying            |                     | Dental               |

|      | INLET(I)<br>TEMP.            | OUTLET PRESSURE DEW POINT |                 |                  |                  |                  |                  |
|------|------------------------------|---------------------------|-----------------|------------------|------------------|------------------|------------------|
|      |                              | 50°F<br>(10°C)            | 40°F<br>(4.4°C) | 20°F<br>(-6.7°C) | 0°F<br>(-17.8°C) | -20°F<br>(-29°C) | -40°F<br>(-40°C) |
| MMD1 | 40°F Inlet<br>(4.4°C) Outlet | —                         | —               | 3.14<br>2.92     | 1.24<br>1.02     | 0.86<br>0.64     | 0.63<br>0.41     |
|      | 60°F Inlet<br>(16°C) Outlet  | 4.98<br>4.77              | 3.7<br>3.49     | 1.39<br>1.17     | 0.95<br>0.73     | 0.7<br>0.49      | 0.53<br>0.31     |
|      | 80°F Inlet<br>(27°C) Outlet  | 2.89<br>2.67              | 1.52<br>1.31    | 1.06<br>0.84     | 0.78<br>0.57     | 0.59<br>0.38     | 0.45<br>0.23     |
|      | 100°F Inlet<br>(38°C) Outlet | 1.35<br>1.13              | 1.15<br>0.94    | 0.87<br>0.65     | 0.67<br>0.45     | 0.51<br>0.3      | 0.38<br>0.16     |
|      | 120°F Inlet<br>(49°C) Outlet | 1.07<br>0.85              | 0.94<br>0.73    | 0.74<br>0.53     | 0.58<br>0.37     | 0.45<br>0.24     | 0.34<br>0.12     |
|      | 150°F Inlet<br>(66°C) Outlet | 0.84<br>0.63              | 0.76<br>0.55    | 0.62<br>0.41     | 0.49<br>0.29     | 0.39<br>0.18     | —                |
| MMD2 | 40°F Inlet<br>(4.4°C) Outlet | —                         | —               | 8.25<br>7.68     | 3.78<br>3.21     | 2.77<br>2.20     | 2.16<br>1.59     |
|      | 60°F Inlet<br>(16°C) Outlet  | 13.09<br>12.52            | 9.73<br>9.16    | 4.16<br>3.59     | 3.03<br>2.45     | 2.36<br>1.79     | 1.89<br>1.31     |
|      | 80°F Inlet<br>(27°C) Outlet  | 7.59<br>7.02              | 4.52<br>3.95    | 3.30<br>2.73     | 2.57<br>2.00     | 2.07<br>1.50     | 1.68<br>1.11     |
|      | 100°F Inlet<br>(38°C) Outlet | 4.07<br>3.50              | 3.56<br>2.99    | 2.80<br>2.23     | 2.26<br>1.69     | 1.85<br>1.28     | 1.51<br>0.94     |
|      | 120°F Inlet<br>(49°C) Outlet | 3.32<br>2.76              | 2.99<br>2.43    | 2.45<br>1.89     | 2.03<br>1.46     | 1.68<br>1.12     | 1.38<br>0.82     |
|      | 150°F Inlet<br>(66°C) Outlet | 2.69<br>2.14              | 2.48<br>1.93    | 2.10<br>1.55     | 1.77<br>1.22     | 1.49<br>0.94     | —                |
| MMD3 | 40°F Inlet<br>(4.4°C) Outlet | —                         | —               | 20.3<br>18.9     | 8.34<br>6.94     | 6.05<br>4.64     | 4.67<br>3.27     |
|      | 60°F Inlet<br>(16°C) Outlet  | 32.3<br>30.8              | 24.0<br>22.6    | 9.24<br>7.83     | 6.62<br>5.21     | 5.12<br>3.71     | 4.07<br>2.67     |
|      | 80°F Inlet<br>(27°C) Outlet  | 18.7<br>17.3              | 10.1<br>8.7     | 7.25<br>5.84     | 5.60<br>4.19     | 4.47<br>3.07     | 3.62<br>2.22     |
|      | 100°F Inlet<br>(38°C) Outlet | 9.02<br>7.61              | 7.84<br>6.43    | 6.11<br>4.71     | 4.90<br>3.49     | 3.99<br>2.59     | 3.27<br>1.86     |
|      | 120°F Inlet<br>(49°C) Outlet | 7.29<br>5.91              | 6.54<br>5.16    | 5.32<br>3.94     | 4.38<br>2.99     | 3.63<br>2.23     | 3.00<br>1.62     |
|      | 150°F Inlet<br>(66°C) Outlet | 5.85<br>4.50              | 5.38<br>4.03    | 4.53<br>3.19     | 3.82<br>2.47     | 3.22<br>1.87     | —                |
| MMD4 | 40°F Inlet<br>(4.4°C) Outlet | —                         | —               | 26.7<br>24.9     | 11.2<br>9.3      | 8.3<br>6.5       | 6.5<br>4.7       |
|      | 60°F Inlet<br>(16°C) Outlet  | 42.4<br>40.6              | 31.5<br>29.7    | 12.3<br>10.4     | 9.0<br>7.2       | 7.1<br>5.3       | 5.7<br>3.9       |
|      | 80°F Inlet<br>(27°C) Outlet  | 24.6<br>22.7              | 13.3<br>11.4    | 9.8<br>8.0       | 7.7<br>5.9       | 6.3<br>4.4       | 5.1<br>3.3       |
|      | 100°F Inlet<br>(38°C) Outlet | 12.0<br>10.1              | 10.5<br>8.7     | 8.4<br>6.5       | 6.8<br>5.0       | 5.6<br>3.8       | 4.7<br>2.8       |
|      | 120°F Inlet<br>(49°C) Outlet | 9.8<br>8.0                | 8.9<br>7.1      | 7.4<br>5.5       | 6.1<br>4.3       | 5.1<br>3.3       | 4.3<br>2.5       |
|      | 150°F Inlet<br>(66°C) Outlet | 8.0<br>6.2                | 7.4<br>5.6      | 6.3<br>4.6       | 5.4<br>3.6       | 4.6<br>2.8       | —                |
| MMD5 | 40°F Inlet<br>(4.4°C) Outlet | —                         | —               | 47.6<br>44.3     | 20.6<br>17.3     | 15.1<br>11.8     | 11.8<br>8.5      |
|      | 60°F Inlet<br>(16°C) Outlet  | 75.5<br>72.2              | 56.1<br>52.8    | 22.7<br>19.4     | 16.5<br>13.2     | 12.9<br>9.6      | 10.3<br>7.0      |
|      | 80°F Inlet<br>(27°C) Outlet  | 43.7<br>40.5              | 24.7<br>21.4    | 18.0<br>14.7     | 14.0<br>10.7     | 11.3<br>8.0      | 9.2<br>5.9       |
|      | 100°F Inlet<br>(38°C) Outlet | 22.2<br>18.9              | 19.4<br>16.1    | 15.3<br>12.0     | 12.3<br>9.0      | 10.1<br>6.8      | 8.3<br>5.0       |
|      | 120°F Inlet<br>(49°C) Outlet | 18.1<br>14.8              | 16.3<br>13.1    | 13.3<br>10.1     | 11.0<br>7.8      | 9.2<br>6.0       | 7.6<br>4.4       |
|      | 150°F Inlet<br>(66°C) Outlet | 14.6<br>11.5              | 13.5<br>10.3    | 11.4<br>8.3      | 9.7<br>6.5       | 8.2<br>5.0       | —                |

|      | INLET(I)<br>TEMP.            | OUTLET PRESSURE DEW POINT |                 |                  |                  |                  |                  |
|------|------------------------------|---------------------------|-----------------|------------------|------------------|------------------|------------------|
|      |                              | 50°F<br>(10°C)            | 40°F<br>(4.4°C) | 20°F<br>(-6.7°C) | 0°F<br>(-17.8°C) | -20°F<br>(-29°C) | -40°F<br>(-40°C) |
| MMD6 | 40°F Inlet<br>(4.4°C) Outlet | —                         | —               | 77.6<br>72.2     | 32.3<br>26.9     | 23.9<br>18.6     | 18.8<br>13.4     |
|      | 60°F Inlet<br>(16°C) Outlet  | 123<br>118                | 91.5<br>86.1    | 35.5<br>30.1     | 26.0<br>20.6     | 20.5<br>15.1     | 16.5<br>11.2     |
|      | 80°F Inlet<br>(27°C) Outlet  | 71.3<br>66.0              | 38.4<br>33.1    | 28.3<br>23.0     | 22.3<br>16.9     | 18.1<br>12.7     | 14.8<br>9.4      |
|      | 100°F Inlet<br>(38°C) Outlet | 34.7<br>29.3              | 30.4<br>25.1    | 24.2<br>18.8     | 19.7<br>14.3     | 16.2<br>10.9     | 13.4<br>8.0      |
|      | 120°F Inlet<br>(49°C) Outlet | 28.4<br>23.1              | 25.7<br>20.4    | 21.2<br>15.9     | 17.7<br>12.4     | 14.8<br>9.5      | 12.3<br>7.0      |
|      | 150°F Inlet<br>(66°C) Outlet | 23.1<br>17.9              | 21.3<br>16.2    | 18.2<br>13.1     | 15.5<br>10.3     | 13.2<br>8.0      | —                |
| MMD7 | 40°F Inlet<br>(4.4°C) Outlet | —                         | —               | 147<br>137       | 60.8<br>50.6     | 44.7<br>34.5     | 34.9<br>24.7     |
|      | 60°F Inlet<br>(16°C) Outlet  | 233<br>223                | 173<br>163      | 67.0<br>56.8     | 48.7<br>38.5     | 38.1<br>27.9     | 30.5<br>20.4     |
|      | 80°F Inlet<br>(27°C) Outlet  | 135<br>125                | 72.8<br>62.6    | 53.1<br>43.0     | 41.5<br>31.3     | 33.4<br>23.3     | 27.3<br>17.1     |
|      | 100°F Inlet<br>(38°C) Outlet | 65.5<br>55.3              | 57.2<br>47.1    | 45.1<br>35.0     | 36.5<br>26.3     | 30.0<br>19.8     | 24.6<br>14.5     |
|      | 120°F Inlet<br>(49°C) Outlet | 53.3<br>43.3              | 48.1<br>38.1    | 39.5<br>29.5     | 32.7<br>22.7     | 27.3<br>17.3     | 22.7<br>12.7     |
|      | 150°F Inlet<br>(66°C) Outlet | 43.1<br>33.4              | 39.8<br>30.1    | 33.8<br>24.0     | 33.8<br>24.0     | 28.6<br>18.9     | —                |
| MMD8 | 40°F Inlet<br>(4.4°C) Outlet | —                         | —               | 205<br>191       | 90.7<br>76.5     | 68.9<br>54.7     | 55.1<br>40.9     |
|      | 60°F Inlet<br>(16°C) Outlet  | 326<br>311                | 242<br>228      | 98.9<br>84.8     | 74.4<br>60.2     | 59.6<br>45.5     | 48.8<br>34.6     |
|      | 80°F Inlet<br>(27°C) Outlet  | 189<br>174                | 107<br>92.4     | 80.4<br>66.2     | 64.4<br>50.2     | 53.0<br>38.9     | 43.9<br>29.7     |
|      | 100°F Inlet<br>(38°C) Outlet | 96.9<br>82.7              | 85.9<br>71.8    | 69.5<br>55.3     | 57.4<br>43.2     | 48.0<br>33.8     | 70.0<br>25.8     |
|      | 120°F Inlet<br>(49°C) Outlet | 80.4<br>66.5              | 73.4<br>59.4    | 61.5<br>47.6     | 51.9<br>37.9     | 43.9<br>30.0     | 36.9<br>23.0     |
|      | 150°F Inlet<br>(66°C) Outlet | 66.3<br>52.7              | 61.7<br>48.1    | 53.3<br>39.7     | 45.8<br>32.2     | 39.3<br>25.7     | —                |
| MMD9 | 40°F Inlet<br>(4.4°C) Outlet | —                         | —               | 287<br>267       | 118<br>97.9      | 89.6<br>69.7     | 71.7<br>51.8     |
|      | 60°F Inlet<br>(16°C) Outlet  | 456<br>136                | 339<br>319      | 129<br>109       | 96.7<br>76.8     | 77.6<br>57.7     | 63.5<br>43.6     |
|      | 80°F Inlet<br>(27°C) Outlet  | 264<br>244                | 138<br>119      | 105<br>84.6      | 83.8<br>63.9     | 69.0<br>49.1     | 57.2<br>37.3     |
|      | 100°F Inlet<br>(38°C) Outlet | 126<br>106                | 112<br>91.8     | 90.4<br>70.5     | 74.7<br>54.8     | 62.4<br>42.5     | 52.0<br>32.2     |
|      | 120°F Inlet<br>(49°C) Outlet | 104<br>84.9               | 95.3<br>75.8    | 80.0<br>60.4     | 67.5<br>47.9     | 57.1<br>37.6     | 48.0<br>28.5     |
|      | 150°F Inlet<br>(66°C) Outlet | 86.1<br>67.1              | 80.2<br>61.1    | 69.2<br>50.2     | 59.5<br>40.5     | 51.1<br>32.0     | —                |

**Note:**

1. Use inlet air temperature if the air entering the dryer has not been dried upstream (air is saturated). If air has been dried (e.g. in a refrigerated dryer) use the dew point temperature of the inlet air.

2. Flow capacities are at 100 psig (7 kgf/cm<sup>2</sup>). Capacities are established in accordance with CAGI (Compressed Air and Gas Institute) Standard ADF 700; Membrane Compressed Air Dryers - Methods for Testing and Rating. For larger capacities, alternate pressures, and dew points contact your local distributor for assistance.

**3 Year Warranty**

The standard one year warranty is extended to three years when the dryer is installed with an optional pre-filter package. To keep the warranty in effect, elements must be replaced at six month intervals and the drain mechanism yearly.

| MODEL | INLET FLOW/<br>OUTLET FLOW <sup>(1)</sup><br>CAPACITY SCFM |                        | IN/OUT<br>CONNECTIONS | DIMENSIONS<br>IN (MM) |          | WEIGHT<br>LB (G) | REPLACEMENT<br>BUNDLES<br>PART NO. |
|-------|--|------------------------|-----------------------|-----------------------|----------|------------------|------------------------------------|
|       | @ +40°F<br>(+4°C) PDP                                      | @ -40°F<br>(-40°C) PDP |                       | L                     | W        |                  |                                    |
| MMD1  | 1.15 (0.94)  | 0.38 (0.16)            | 3/8"                  | 11 (281)              | 8 (209)  | 5 (2.45)         | MMDB1                              |
| MMD2  | 3.56 (2.99)  | 1.51 (.094)            | 3/8"                  | 15 (387)              | 8 (209)  | 6 (2.77)         | MMDB2                              |
| MMD3  | 7.84 (6.43)  | 3.27 (1.86)            | 1/2"                  | 19 (486)              | 8 (209)  | 7 (3.04)         | MMDB3                              |
| MMD4  | 10.5 (8.7)   | 4.7 (2.8)              | 1/2"                  | 27 (696)              | 8 (209)  | 8 (3.58)         | MMDB4                              |
| MMD5  | 19.4 (16.1)  | 8.3 (5.0)              | 3/4"                  | 20 (498)              | 11 (267) | 11 (4.90)        | MMDB5                              |
| MMD6  | 30.4 (25.1)  | 13.4 (8.0)             | 3/4"                  | 27 (696)              | 11 (267) | 14 (6.19)        | MMDB6                              |
| MMD7  | 57.2 (47.1)  | 24.6 (14.5)            | 1"                    | 29 (747)              | 12 (310) | 17 (7.55)        | MMDB7                              |
| MMD8  | 85.9 (71.8)  | 40.0 (25.8)            | 1"                    | 35 (885)              | 14 (346) | 35 (15.88)       | MMDB8                              |
| MMD9  | 112 (91.8)   | 52.0 (32.2)            | 1"                    | 41 (1040)             | 14 (346) | 40 (18.14)       | MMDB9                              |

**Maximum Operating Pressure:**

**Membrane dryer:** 200 psig (14 kgf/cm<sup>2</sup>)  
**Maximum Inlet Temperature:** 150°F (66°C) Dimensions and weights are for reference only. Request certified drawings for construction purposes. (1) Flow capacity at 100 psig (7 kgf/cm<sup>2</sup>) and 100°F (38°C) saturated inlet. Flow capacities are established in accordance with CAGI (Compressed Air and Gas Institute) **Standard ADF 700:** Membrane Compressed Air Dryers - Methods for testing and rating.



The leader in every market we serve  
by continuously improving all business processes  
with a focus on innovation and velocity

**Gardner  
Denver**<sup>®</sup>

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