



MMR Technologies, Inc.

WHY ARE FILTERS AND DRYERS NECESSARY IN A JOULE THOMSON REFRIGERATOR SYSTEM?

Even when gas is pre-purified and has at least a 99.998% purity, as specified by MMR Technologies (Refer to the technical support bulletins on Nitrogen Gas and Argon Gas Specifications for further information), these gases may still contain water vapor and other condensable contaminants.

A filter-dryer system is necessary to remove both the water and the other condensable contaminants to ensure optimal performance of the Joule Thomson refrigerators. Failure to use one of these systems in conjunction with your cooling system will ultimately result in a loss of cooling capacity, reduction in the temperature range the microminiature refrigerator can obtain, clogging in the channels of the glass refrigerator, and ultimately damage to these channels that may not be repairable.

MMR Technologies supplies two possible configurations for the filter-dryers, each system designed to work with the company's line of microminiature Joule-Thomson refrigerators. This technical support bulletin describes each filter-dryer option available to help you decide which is the best option for your research needs and environment.

There are a number of applications for the filter-dryers from MMR Technologies, including:

- Suitable for drying argon, nitrogen, hydrogen, helium, and many other gases to a Dew Point below -75°C .
- Use of this dryer with the MMR line of microminiature refrigerators allows continuous operation of the refrigerators for up to hundreds of hours without clogging.
- The dryer may be used to provide point-of-use, dry gas at a purity level, previously attainable only with dryers of much greater cost.

STANDARD FILTER SYSTEM

The standard filter system supplied by MMR Technologies (part number F2101) is a simple, manual system that is connected directly in line between the gas source and the Joule-Thomson refrigerator. This filter system has been designed to remove water vapor and other condensable contaminants from high pressure gas, ensuring optimum operation. The filter material in this can be readily replaced, usually once a month, depending on the usage and gas purity.



FIGURE 1. Standard Filter Dryer Apparatus, F2101

Features and Benefits

A few features and benefits of the standard filter system include:

- Low cost, effective filter system
- Easy-to-replace filter material
- Compact, in line design - requires no bench top space or wall mounting
- Designed for high pressure operation with inlet and outlet pressures up to 2500 psi and the exhaust at atmospheric pressures.
- High throughput with continuous flow to 4 liters per minute (8.8 scfm)

REVERSIBLE GAS FILTER-DRYER SYSTEM

The Model F2105 Reversible Gas Filter-Dryer system has been designed to remove water vapor and other condensable contaminants from high pressure gas under computer control. The unique design of this filter-dryer makes it unnecessary, in normal operation, to replace the contents of the drying cartridges.



FIGURE 2. Reversible Filter Dryer Apparatus

Features and Benefits

A few of the features and benefits of the reversible filter-dryer include:

- Simple daily turning of a knob to maintain continuous drying and filtering capability.
- Never need to replace or refill the drying cartridges.
- Simple compact design
 - 7" x 12.5" of bench space, or
 - wall mounting
- Leak free operation by the use of 1/8" Swagelock fittings on the inlet and outlet
- Designed for high pressure operation with inlet and outlet pressures up to 2500 psi and the exhaust at atmospheric pressures.
- High throughput with continuous flow to 4 liters per minute (8.8 scfm)
- Small bypass flow rates of less than 0.3 liters per minute (0.66 scfm)
- No electrical power required - the system is self purging with operation requiring only high pressure gas.
- Multiple filters, including 3 micron filters on the inlet and outlet lines to prevent particulate contamination of the gas lines or refrigerators used with the filter-dryer.

PRINCIPLE OF OPERATION FOR REVERSIBLE FILTERS

The F2105 reversible filter-dryer systems operate on the same principle, that of a heaterless dryer, to achieve an extraordinary purity of outlet gas.

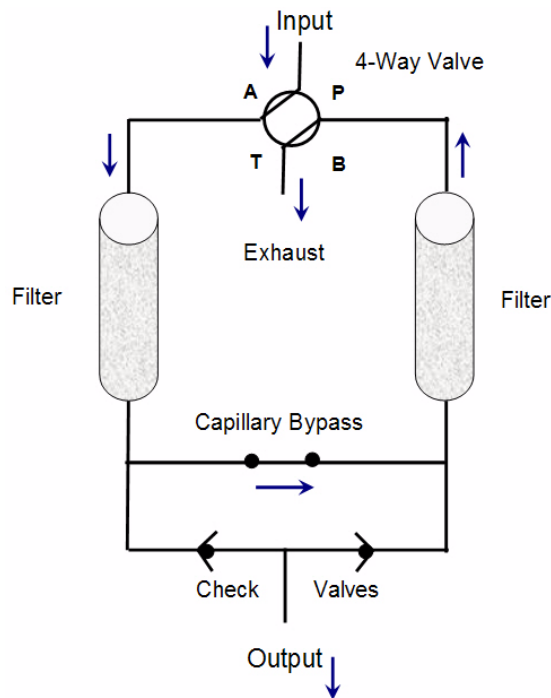


FIGURE 3. Schematic of a Reversible Gas Filter-Dryer

The filter-dryer showing in Figure 3 contains two drying cartridges which are selected for use through the four-way valve shown. In use, moderate dry gas from a high pressure cylinder is passed through the four-way valve to the first drying cartridge. After being purified by this cartridge, the most of this purified gas passes through a check valve and then to the outlet to the refrigerator. A small fraction of gas from the first filter cartridge does not go to the refrigerator, and is instead allowed to expand through a fine capillary constriction to atmospheric pressure. This gas then passes back through the second cartridge, then through the four-way valve to the exhaust port. This dry gas purges impurities and water vapor from the second cartridge.

After 4 to 24 hours of operation, the four-way valve is reversed, reversing the flow of gas through the two cartridges. With each reversal, the gas at the high pressure outlet becomes more and more highly purified, eventually reaching a purity level containing less than a few tens of parts per billion of water vapor.

FURTHER QUESTIONS

If you have further questions, please do not hesitate to contact MMR Technologies, Inc.:

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