Considerations for Installation and Operation of Mott Bulk Gas Filters

FILTER TESTING AND QUALIFICATION

Helium Leak Testing

Mott bulk filters are leak tested prior to shipping to ensure the integrity of the filter housings. This is typically an inboard helium leak test where practical. Once filters are installed into the skid or supporting delivery systems, they are leak tested using industry standard helium leak testing methods. It is typical that due to the size of the bulk filter skids that inboard helium leak testing is not practical and that out-board leak testing be used to qualify the integrity of the welds and other connections. If the filter skids are being fabricated, the skid manufacturer typically can provide this service.

Moisture Dry Down

Subsequent to leak testing, filter systems are tested for moisture levels and particle efficiency testing. For moisture testing there are industry or end user specific guidelines that call for acceptable moisture levels criteria. The filters systems are purged with clean dry purified nitrogen or argon until moisture levels are reached. Unlike plastic or Teflon filters which have limited operating temperatures, Mott bulk filters can be heated to 450°C allowing for exceptional fast dry down when compared to Teflon®. It is not uncommon for installing personnel to wrap the Mott filters in a heat trace to bring the internal temperature to higher levels and aid in system dry down and acceptance. The ability to bring the filter interior to a higher temperature will be dependent upon the size of the filter, the flow of the purge gas and the efficiency of the heating system.

Particle Testing

There are specific guidelines for testing point-of-use filters, but these are not practical when testing large bulk filters. The sample gas flow rate and pressure limitation of commercially available particle counters require the use of isokinetic sampling probes. Isokinetic sampling means that the velocity entering the sample probe must equal the free stream velocity of the gas being sampled. Care must be taken to install the isokinetic sampling probes in the correct location within the tubing downstream of the filters. Incorrectly installed sampling probes can impact the accuracy of the particle counts. Mott bulk filter users are urged to consult their particle counter manufacturers for guidelines on the proper length, locations and size of the sampling probes.

Commissioning

It is recommended that once the Mott bulk filters are installed, an aggressive pulse purge be performed to help remove any residual particulate that may have accumulated on the downstream side of the filter element during handling and installation. An aggressive purge with filtered and purified nitrogen, argon or air at pulses of 80 psig to atmosphere for 10 seconds on and 10 seconds off for 20 to 30 minutes can greatly improve the time to qualify the filters to your particle specifications.

More Information

More information about the Mott line of bulk gas filters can be found on our website: www.mottcorp.com or by contacting your local Mott High Purity Distributors.

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Technical Bulletin:

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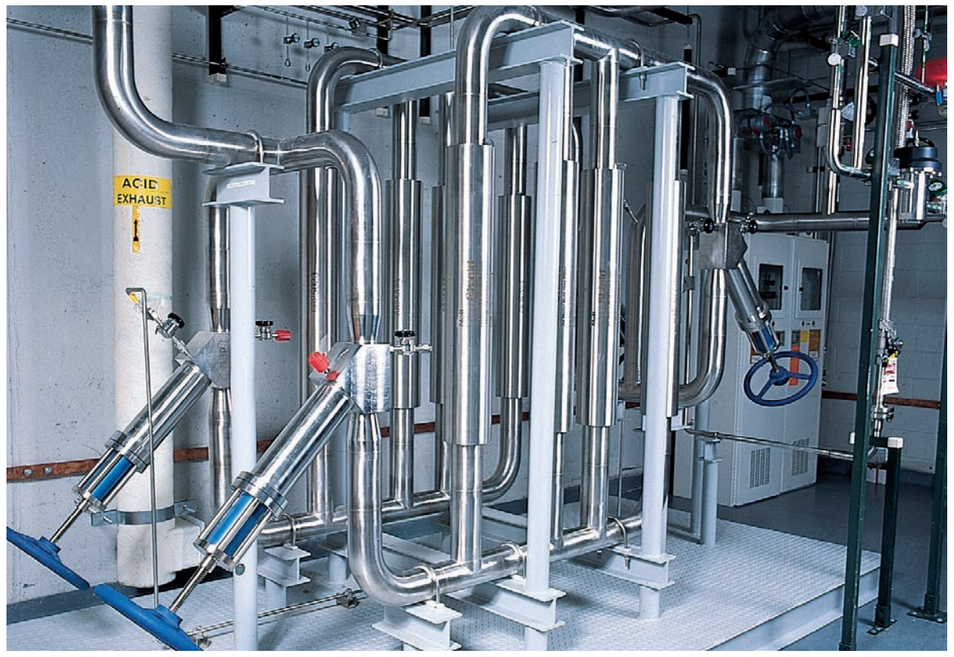

Mott high purity bulk gas filters are designed and manufactured to provide ultra high purity (UHP) levels of filtration efficiency (99.9999999% or 9 log reduction values of particles down to 0.003µm particle sizes) for process “bulk” gases. Nitrogen, oxygen, argon, hydrogen, and helium are often called bulk gases due to the way they are delivered or stored. They may also be called carrier gases to reflect their main role in micro-processor manufacturing. Today’s microprocessor facilities are receiving increasing amounts of specialty gases in bulk containers like tube trailers or ISO tonners. It is not uncommon for high purity electronics grade specialty gases like silane, hydrogen chloride, chlorine, nitrogen trifluoride, ammonia and nitrous oxide to be delivered in this manner. These gases are generally supplied to the point of use in a distribution system consisting of long piping runs made of tubing, valves, pressure regulators and point-of-use filters.

The purity of these gases can only be maintained when the piping systems used to deliver the gases to the point of use are extremely clean and free of leaks. To achieve this, all tubing, fittings, filters, valves and regulators are electro-polished on the interior surface to at least a 15 micro-inch (RMS) finish. This provides a smooth, high-luster surface that will reduce corrosion, improve purge-ability and greatly reduce particulate contamination.

In UHP bulk gas systems, all joints are welded using orbital gas tungsten welding equipment. These compact portable microprocessor-controlled units make it possible to obtain consistently repeatable, high-quality welds when other parameters such as tungsten length, joint preparation, temperature and metallurgical properties remain reasonably constant.

Unlike point-of-use filters, bulk gas filters are often installed outside of the traditional hard wall clean room. In some occasions the filters are installed on-site near the bulk gas storage area. This document provides some guidelines for installing and commissioning your Mott bulk gas filters with the intent to preserve the filters cleanliness during installation and optimize the time it takes to commission the filter afterwards.

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Handling

NOTICE: DO NOT DROP THE FILTERS when removing them from the packaging or during installation. Doing so can damage the internals and void your warranty.

Mott bulk gas filters should always be handled with great care. Inspection of shipping cartons, crates and containers for outwards signs of damage or mishandling are recommended and if found, should be reported to your shipping carrier immediately. When received, care should be taken when removing the filters from their shipping crates or cartons.

Larger models, with housing diameters greater than 6 inches, are equipped with lifting lugs to assist in the handling and movement of the filters.

To aid in clean room assembly, the filters will be double bagged according to industry guidelines. These bags should not be damaged or punctured during the process of removing the filters from shipping containers.

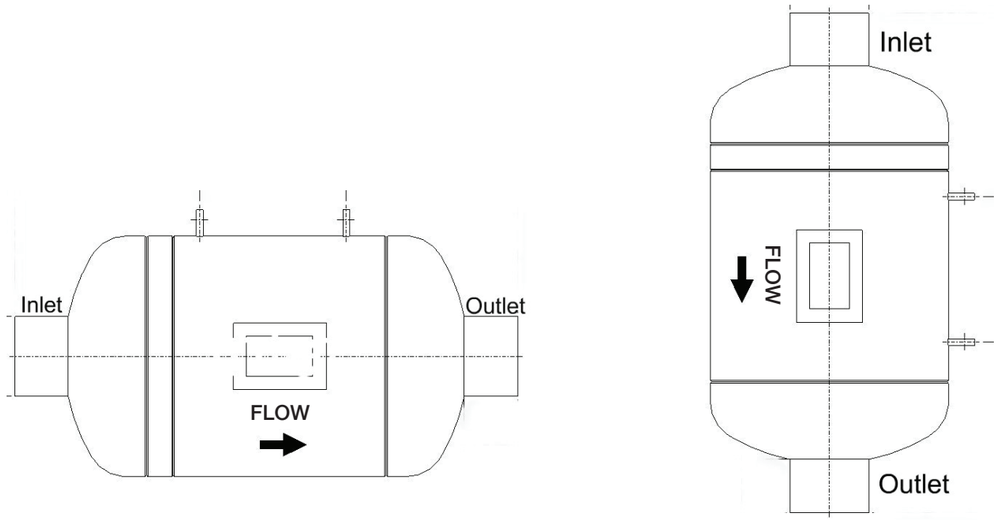
Installation

Prior to installation of your Mott bulk gas filters, facilities personnel must be trained in the practices of UHP material handling, welding, installation, and leak testing techniques.

Filter Orientation

Since Mott bulk filters are made of robust metal filter elements, flow direction does not necessarily impact the performance of the filter. Unlike plastic filter elements that can be damaged by incorrect gas flow and the resultant increased differential pressures, the metal filter elements can withstand maximum differential pressures up to 500 psid. Despite this, Mott does provide a flow arrow on the bulk filters which represents the optimal flow direction to install the filter.

The Mott bulk gas filters can also be installed in a vertical or horizontal position.



Mott Bulk Filters can be oriented in a horizontal position or in the vertical position as show above.

The supporting skids which include the ancillary tubing, iso-kinetic ports, isolation valves, pressure gauges and skid supports can be supplied by Mott Corporation or are supplied by third party fabricators.

When installing the filters into skids, there are several key areas of concern:

- Tubing Preparation
- Welding
- Contamination Control
- Purging

Tubing Preparation

In the vast majority of applications, Mott bulk gas filters are supplied with weld tube stub connections. In those situations where the mating tubing cannot be cut and prepared in an industry acceptable cleanroom, tubing should be cut under purge to reduce internal contamination. Larger tube and pipe can be cut with an orbital saw or other industry acceptable method.

Welding

It is common to employ special welding procedures for:

- Use of purified/filtered welding shield gas for all internal and external areas of the weld bead
- Internal tube purge pressure controls
- On-site tungsten tip grinding
- Coupon testing
- Inspection/tagging of the welds

In most welds, the interior backing gas pressure controls the contour of the interior weld bead shape. An oxygen analyzer is often used to ensure that the purge gas leaving the system interior is of the same purity as the source gas. It also establishes when the purge inside the tube reaches the source level of oxygen.

Contamination Control

To reduce contamination, on-site clean booth can be constructed for welding fabrication where practical. For larger sized filters welded outside of the clean booth, a welding theatre is often used. This is a containment envelope with a cleanroom plastic window supplied with HEPA filtered air. Both methods are used to reduce the amount of contamination introduced into the system at the site of the weld.

Purging

Where feasible, all systems and their extremities should be kept under dynamic purge around the clock. This hastens the start-up qualification for target levels of both particles and moisture. Typically a purified/filtered argon or nitrogen is used for purging applications.