Traps & Filters

5

In This Section

page(s)

Kurt J. Lesker Company

➤ Traps Overview

What Are Traps and Filters?

In general, a *trap* is a device that captures gases and vapors, while a *filter* captures particles, chemical "smokes", and aerosols. These distinctions imply the devices work under different pressure ranges, loosely defined as: traps operate best at 10^{-3} Torr or lower and filters operate best at 10^{-2} Torr or higher (see sidebar, Trapping and Filtering).

Traps are placed in two positions:

1. Between the high-vacuum pump and the mechanical pump—*foreline trap*
2. In or near the chamber—*system trap*

Filters are positioned:

1. Ahead of the rough pump—*foreline filter*
2. At the rough pump's exhaust port—*oil mist eliminator*

When the application demands, multiple stages of filtering and/or trapping may be housed inside the same container.

Traps

Foreline Traps

Foreline traps are placed between a high-vacuum pump and backing pump or between a chamber and roughing pump. The primary application is preventing oil vapor migration from the backing/rough pump backwards along the foreline (*backstreaming*). A secondary application is trapping condensible vapors from the chamber process entering the pump (see "Vapors from Process").

Vapors from Pump

To stop oil vapors backstreaming, the foreline trap is filled with (a) a highly absorbent material, (b) a fibrous "wool", or (c) a re-entry vessel filled with a cryogen.

Highly Porous Materials are "honeycombed" with molecule-sized pores, cavities, and channels, and have huge effective surface areas ranging typically from 40 to 400 m^3/g. Examples of better-known materials are MICROMAZE® plates, molecular sieve (zeolite), activated charcoal, and activated alumina.

The MICROMAZE trap material (proprietary KJLC®) consists of highly porous plates that are assembled in a labyrinth design. This causes gas molecules in molecular flow to make numerous surface bounces between the trap's inlet/outlet. Molecular sieves are silicates or alumino-silicates developed, mainly, as catalysts for the petroleum industry. Molecular sieve pellets are poured loose into the trap or in a metal-mesh basket. Activated charcoal, in granular form, has been used for many decades as a highly adsorbent material (particularly for "gas masks"). Activated alumina is a more recent development and may have the smallest total surface area; however, it has one distinct advantage (see "Vapors from Process").

These materials must be regularly regenerated by baking to modestly high temperatures and pumping. Removal of desorbing vapor is assisted by a low pressure N_2 flow through the trap during baking.

Metal Wools: Copper and stainless wools—dense balls of thin, machined turnings—are placed in traps to obscure the direct line-of-sight. These *conversion* traps have much smaller surface areas than the porous materials; however, the quantity of oil vapor retained may be comparable because the wool's surface coverage is not limited to mono-layers (as are highly absorbent materials). The disadvantage of the conversion trap is the oil is only loosely bound to the surface. Re-evaporation can cause oil vapor to appear upstream of the trap earlier than with porous material traps.

Conversion traps are particularly useful for mobile pumping carts. When not in operation, such carts are vented and left open to the atmosphere. Traps containing porous materials load with water vapor and must be regenerated before use. Conversion traps do not load with water vapor.

Permanently sealed conversion traps are discarded and replaced at the end of their useful life. Replaceable element conversion traps must have the element changed before vapor breakthrough. The time between replacement depends on the ambient temperature, distance between trap and pump, type of pump, type of oil, service-induced oil cracking, etc. It is rarely possible to give a useful answer except "prevention is better than cure"—that is, replace frequently.

Re-Entry Vessel: The trap's body surrounds an inner volume that may be a coiled tube mounted close to the trap's walls or another container with a large opening in the top. The tube type is cooled by a water flow or by blowing LN_2 through the tube. The container type accepts alcohol/solid CO_2 slush to cool the inner container's surface.

The vacuum between the trap body and the inner volume reduces thermal conduction and convection heat transfer, lessening the cryogen requirements.

Vapors from Process

Condensible Vapors: All oil-sealed rough pumps and most dry rough pumps should not pump large quantities of condensible vapors. Ignoring any reduction in the oil's lubricity that might arise from vapor condensing in the oil, the immediate problem is the pump's compression-rarefaction mechanism, which causes the vapor to cycle between liquid and vapor states, creating unacceptably high foreline pressures.

At first sight, at least two types of foreline traps noted in "Vapors from Pump" seem to fit this

Trapping and Filtering

The distinction in operating pressure ranges between traps or filters is apparent from any consideration of their operating characteristics.

Traps have no direct line-of-sight between inlet and outlet. In *molecular flow*, gas phase collisions are non-existent, meaning every molecule/atom in the gas flowing through the trap moves in a straight line (without any diverting gas phase collisions) and must hit at least one surface to traverse the trap. If a molecule is absorbed by, or freezes on, the surface, then it is successfully trapped. That is, traps work in *molecular flow* conditions.

Filters also have no (or limited) line-of-sight between inlet and outlet. Here, however, molecular flow is not the issue. Dust particles do not "flow" unless transported by a gas. Even the smallest particle is much heavier than a gas molecule and responds to gravity. To give dust sufficient momentum to "flow", it must have many gas phase collisions, and the gas pressure must be high enough to supply those collisions. That is, filters work in *transitional* or *continuum flow* conditions.

The filter's no line-of-sight is formed by either a fibrous/open cell foam element or a cyclone separator. The tortuous paths through an element have little influence on a gas's progress—some molecules hit surfaces and deflect, bouncing against others and causing them to deflect without ever hitting the element. By contrast, a particle's high mass and momentum cause it to continue on its "present path" and strike the element's surface (or continue down the cyclone separator's wall).

➤ Traps Overview

application: the porous trap and an LN_2 cooled re-entry trap. While often pressed into such service, in reality, they are not ideal. Trapping process vapors is difficult. First, in contrast to low mass transfer during pump vapor backstreaming, process vapors often present gas loads large enough to overwhelm the relatively small capacity of the foreline traps. Second, large mass flows from the process imply the foreline and trap are in transitional or viscous flow regimes. The predominance of gas phase collisions in these regimes causes some fraction of vapor molecules to pass through the trap and into the pump without hitting a trapping surface.

Corrosive Vapors: As a separate concern, allowing corrosive vapor into a pump—even an anti-corrosion version—should be avoided wherever possible. A corrosion-resistant pump filled with an inert fluid provides a longer life than a standard pump for any given corrosive condition. But it will not provide complete protection against every corrosive vapor that may enter it. Again, prevention is better than cure.

Traps designed specifically for removing process or corrosive vapors use, typically, large-area labyrinth structures with plates cooled by chilled heat-transfer liquids or gas cryogens like the blow-off gas from LN_2 tanks. Occasionally, different trapping techniques are combined in series/parallel within one trap body — for example, a chiller stage to remove bulk vapor followed by a large capacity absorbent stage.

Backstreaming

While foreline trapping of oil vapor backstreaming from rough pumps is well established, there are critical aspects that are often misunderstood. Oil vapor in the foreline is a mixture of regular and "cracked" (lower molecular weight) molecules. These molecules, particularly the lower mass ones, migrate toward the chamber by a combination of surface "creep" and vapor transport following evaporation. A common—mistaken—belief is: a trap is not needed because the diffusion or turbo pump is an effective barrier.

The fluid in a diffusion pump may have a vapor pressure 2 or 3 decades lower than a rough pump's fluid (at the same temperature). When the rough pump's oil reaches the diffusion pump's boiler, it preferentially boils. Cold wall condensation is less effective and the rough pump's oil rapidly backstreams into the chamber.

The turbo pump's rotor, while spinning, effectively blocks vapor migration, however, when stationary, oil vapor migrates to the low level rotors. If the pump is frequently vented, the rotor blades' temperature can be well above ambient, promoting oil evaporation from the lower blades to higher levels until it arrives in the chamber.

To prevent oil vapor from reaching the chamber, stop it before it reaches the high vacuum pumps. Correctly install a good foreline trap and rigorously maintain it. [Correct installation includes mounting a high-quality, bakeable, shut-off valve on either side of the trap. Rigorous maintenance includes: frequent bakeout at 150° C to 300° C with upstream valve closed and heated; low pressure N_2 gas flow through the trap during bakeout; before switching off the pumps, closing both valves (to prevent water vapor from entering the trap) and; venting the rough pump inlet after switching off (since anti-suckback valves frequently fail).]

System Traps

"System traps" is adopted here as the collective name for cold traps placed in or near the chamber. They are arbitrarily divided into (a) traps associated with high-vacuum pumps, (b) baffles used with, or substituting for, the traps in category (a), (c) cooled surfaces or shrouds mounted inside the chamber, often custom-built for a specific applications, and (d) Meissner traps mounted inside the chamber.

The lower the trap's surface temperatures, the higher the chances of a residual gas molecule sticking, first bounce, on that surface. Expressed another way—at low temperature, the molecule's internal energy is low and is less likely to have sufficient energy to break the surface-molecule bond.

Water vapor is the major residual gas component in a normal vacuum system. If the trap's temperature is low enough to cause water vapor molecules to stick semi-permanently, the trap acts as a pump and the chamber pressure may be significantly reduced.

Traps for Pumps

These (commercially available) traps are most frequently used in conjunction with diffusion pumps. The trap is positioned between chamber and diffusion pump to prevent oil vapor backstreaming into the chamber. (In this respect, it is not unlike a foreline trap.) An additional benefit is water vapor condensed on an LN_2 surface has a vapor pressure of 10^{-11} Torr. Providing the LN_2 level is maintained, this trap pumps water vapor and reduces the chamber's total pressure.

As noted in "Trapping with LN_2", this trap is not recommended for applications that generate or employ large quantities of condensible vapor. In addition, most turbo pump manufacturers do not recommend placing LN_2 traps above their pumps. The argument is, when the system is vented, water frozen on the trap's surface thaws and drips into the pump. While it's reasonable to protect the pump, if there is sufficient water to drip, perhaps an in-chamber LN_2 trap should be used.

Baffles

A *baffle* is a trap shaped like a short tube with vanes formed into a chevron or double Venetian blind pattern. The vanes enable no line-of-sight but still allow a high gas conductance. The vanes are cooled, often by water circulating through the vanes or through a serpentine pipe connected to the vanes. Some baffles are designed for refrigerant gas cooling using a closed-circuit compressor system.

Cooled baffles are sometimes installed as a lower-cost (but less effective) substitute for an LN_2 system trap. However, water-cooled baffles are mostly used as thermal barriers, say between LN_2 system traps and diffusion pumps.

Trapping with LN_2

All traps that have a contained volume of LN_2 require rigorous, yet simple maintenance—the LN_2 level must be kept constant. Allowing long periods between fills causes large level changes and runs the risk of releasing vapors previously frozen on the trap's surfaces. With the re-evaporation of vapor comes two risks: (a) vapor entering the pump or (b) pressure buildup (if the system is shut off but not vented).

Obviously, (b) may cause an explosion at a structural weak point such as a glass envelope ion gauge or viewport. Less obvious, but perhaps more dangerous, is the potential chemical, toxic, or fire hazard created as the operator opens the chamber connected to a trap that is now at ambient temperature. As a safety precaution, any application in which questionable vapors are frozen should be thoroughly examined by the facility's safety group.

LN_2 Shrouds

LN_2 cooled shrouds have many applications, some of the more common ones being (a) space simulation chambers formed by a surrounding LN_2 shroud just inside the main chamber wall, (b) titanium sublimation pumps with LN_2 cooled shrouds have higher pumping speeds than room temperature shrouds, (c) beam trapping in molecular beam experiments, and (d) LHe cryostats are thermally shielded by an LN_2 shroud.

Most shrouds are custom-built combinations of a stainless steel LN_2 reservoir and a brazed copper extension to suit specific applications and chamber dimensions. However, titanium sublimation pump shrouds are commercially available and typically are installed as part of an ion pump package rather than chamber-mounted.

Meissner Traps

When pumping a chamber from atmosphere, between ~10^{-3} to ~10^{-8} Torr, the major residual gas component is water vapor. A Meissner trap is, essentially, a coil of tubing through which a liquid/gas cryogen flows to maintain a low surface temperature. Given a low enough surface temperature, it is an efficient pump for water vapor.

Custom-built Meissner traps are often multiple loops of copper tube through which LN_2 is blown. Commercial Meissner coils, however, have a distinct advantage for certain applications. The cryogen flow from a (cooler/heater) compressor cools the coil from ambient to operating temperature in just a few minutes. This short delay to reach operating temperature and high water vapor pumping speed (examples are quoted from ~10,000 L/sec to >100,000 L/sec) makes these Meissner traps particularly useful for rapid pumpdown in chambers. Heating the trap from operating temperature to ambient takes a similarly short time, making these traps ideal for pumping water vapor in chambers that are frequently vented to atmosphere.

➤ Filters Overview

Filters

Foreline Filters

Foreline filters (often called inlet filters) are designed to stop/trap dust particles made in the vacuum process from reaching the pump. There are two basic forms. The first has a replaceable element (not unlike the air filter in a car), and the second uses a centrifugal principle to force the particles into a storage volume.

As noted earlier, it is not uncommon to combine different filtration elements (or methods) in one container. An example is filtering particles with a wide range of sizes. For this, a course filter element, to remove the larger particles, is placed ahead of a fine filter element, to capture the smaller particles. Such an arrangement has a longer service life before either element must be replaced.

But, it should be recognized that, in practice, most processes produce a wide range of particle diameters, and accepted that a fraction of the lightest, smallest particles will not be filtered from the gas stream.

Foreline Filter with Replaceable Elements

Foreline Filters—Element

Elements are typically cylindrical shapes made from woven fabric, fibrous mattes, or open cellular materials. The materials used include cellulose (paper), polyester fiber, and glass fiber. Gas flow is often from outside the cylinder into the center through pores in the material that provide no line-of-sight. At the pressures needed to "suspend" particles and make them flow, the material does not seriously limit the gas conductance. However, the particles' momentum means they are less easily diverted and hit the element with which they become mechanically entangled.

The filter's gas conductance depends to some degree on the particle size it is designed to remove. A common polyester filter will stop particles 5 micron in diameter or larger and has a conductance from 35 cfm to 175 cfm (16 L/s to 64 L/s). Note that the element must be replaced at regular intervals because capturing dust reduces its gas conductance.

Foreline Filters—Cyclone

In the cyclone filter, dust-laden gas enters a filter's cylindrical body tangentially. The gas is pumped from a top, central exhaust while the particle's momentum causes it to continuously swirl around the chamber walls and eventually fall under gravity to the bottom of the filter body.

Cyclone filters are particularly suited to removing particles of higher mass or higher density (which typically, but not necessarily, means larger diameter).

Mist Eliminators

The gas exiting a rough pump's exhaust valve bubbles up through the oil reservoir, often creating an aerosol of oil droplets. When displacing large gas volume, these droplets are visible as a mist at the exhaust. Mist eliminators are designed to stop these aerosols from entering the atmosphere.

The typical mist eliminator mounts above the pump's exhaust port and has a filter element that causes the mist to coalesce and drip back into the pump's oil reservoir. The element may be a ball of metal shavings, an inorganic wool, or an open cellular foam. Like trapping particles, noted above, the intent is to make the exhaust gas's path so torturous, the heavy aerosol droplets cannot follow the gas path and strike solid surfaces. Some designs use electrostatic fields to ionize and electrostatically deflect the droplets, but they are not yet widely used.

Oil Mist Eliminator

➤ Filters Overview

Oil Filters

Particles entering an oil-sealed rough pump may or may not chemically react but will certainly form sludge. An oil filter, primarily, removes particles to reduce wear on close-tolerance pump surfaces. Typically, filter elements trap particle sizes >0.2 microns. Activated alumina is often used to neutralize hydrous acid and Lewis acids that are part of the process exhaust gases.

A few large-capacity pumps have small oil filters integrated into the pump body. But for those that do not, external oil filtration units are recommended. One or more filter elements are housed in separate canisters and connected by pipes to the pump's oil reservoir. An electrically driven gear pump circulates the oil from the pump through the elements and back. As an incidental benefit, the filter provides cooling by circulating the oil for several seconds outside the body of the mechanical pump.

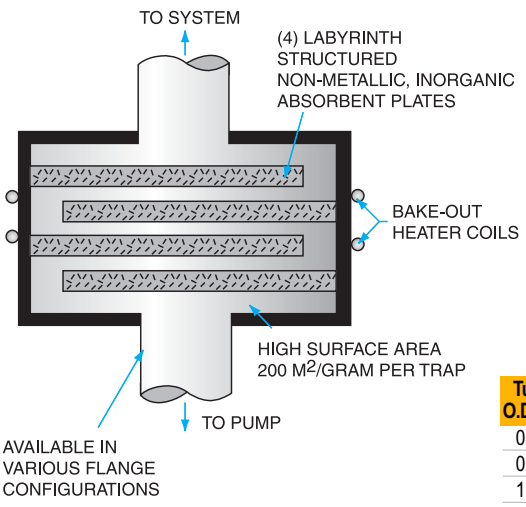
In multi-element designs, different filter elements may be chosen—one for particle removal and another for acid removal. Element materials have included activated alumina, cellulose (paper) fibers, Fuller's earth, and fiberglass.

Pump Exhausts

Avoid breathing the aerosols that escape from a pump's exhaust port, particularly when the pump is under a heavy gas load. While no specific health hazard is known to this writer, breathing in the mist is unlikely to be beneficial to the lung's performance. An oil mist eliminator *may* trap a high percentage of the aerosol droplets, but any untrapped mist will enter the atmosphere surrounding the pump.

It cannot be overemphasized: mist eliminators **do not stop** the exhaust gases/vapors from any vacuum process—some of which are extremely hazardous. It is **always** prudent to assume the worst and duct gases exiting a mist eliminator from the room where the pump is installed to a proper exhaust abatement system or the atmosphere as required by the appropriate health and safety codes.

➤ MICROMAZE®
(Absorbent Plate Elements)



■ KJLC® MICROMAZE Traps

These traps will effectively absorb oil vapor backstreaming from the pump, protecting the vacuum system from oil contamination.

Our MICROMAZE trap contains a labyrinth of flat plates arranged so that a gas molecule must collide many times with them during its travel through the trap. Each plate is a highly porous, non-metallic proprietary material with a surface area estimated at approximately 200 square meters per gram.

The pores vary in size but center around a diameter effective for trapping polar and non-polar molecules (water and oil). The labyrinth structure makes an extremely effective foreline trap—ideal for preventing mechanical pump oil vapors from migrating into the chamber.

Each plate weighs approximately 25 grams and each trap has four plates. Hence, after the trap has been baked for regeneration, the total surface area takes up roughly 20,000 square meters.

Assuming this surface will adsorb a vapor to a depth of one molecular layer, and further assuming the vapor's molecular weight is 100 and diameter is 5 angstroms, we can calculate the trap's capacity is about 2 grams of vapor.

MICROMAZE can adsorb ***all*** gases.*

*At exhibitions, we demonstrated the MICROMAZE trap's ability to adsorb gases with an interesting test. We filled any rotary vane pump (capable of reaching the 10^{-3} Torr range) with a fresh hydrocarbon oil. On the pump's inlet we mounted a tee piece with a MICROMAZE trap on one arm and a T/C (or Pirani) gauge on the other arm. On the trap's other port, we mounted a B/A ionization gauge. The trap was baked overnight with the pump running. With the pump still running, we cooled and switched on the gauges. The T/C gauge showed a pressure in the mTorr range while the ionization gauge showed mid to low 10^{-5} Torr. Whatever gases caused the higher pressure noted on the T/C gauge (Water vapor? Oil vapor? Air?), the MICROMAZE trap removed them!

Tube O.D. (in.)	Overall Length (in.)	Conductance (L/s)	Connections (on Both Ends)	Voltage	Part No.	Price
0.75	5.07	3	KF16 Flanged	110 VAC	MMA-077-2QF	Call
0.75	7.09	3	KF16 Flanged	220 VAC	MMA-077-2QF2	Call
1.00	5.06	5	KF25 Flanged	110 VAC	MMA-102-2QF	Call
1.00	6.39	5	KF25 Flanged	220 VAC	MMA-102-2QF2	Call
1.50	5.07	7	KF40 Flanged	110 VAC	MMA-152-2QF	Call
1.50	6.39	7	KF40 Flanged	220 VAC	MMA-152-2QF2	Call
2.00	5.07	8	KF50 Flanged	110 VAC	MMA-202-2QF	Call
2.00	6.39	8	KF50 Flanged	220 VAC	MMA-202-2QF2	Call

NOTE: The effective life of a MICROMAZE trap may shorten if used in vacuum process systems producing large quantities of fluorine or hydrogen fluoride.

➤ Molecular Sieve Element

IN THIS SECTION ➤

Molecular Sieve Element Traps

What These Traps Do

- Zeolite desiccant removes hydrocarbons that backstream toward the chamber when the mechanical pump oil reaches its vapor pressure
- Trap water vapor and other gases before they reach the mechanical pump and contaminate the pump oil
- Can reduce the frequency of oil changes by a significant amount

Design Features

- Use a split-housing design for ease of maintenance and zeolite replacement
- Sieve material rests in a suspended basket fabricated from perforated 304 stainless steel, offering maximum conductance
- Suspended basket provides the conductance to the sieve at the top of the basket as well as around the periphery
- Mid-basket baffle causes the gas to enter one-half of the basket and to exit the other half

Includes

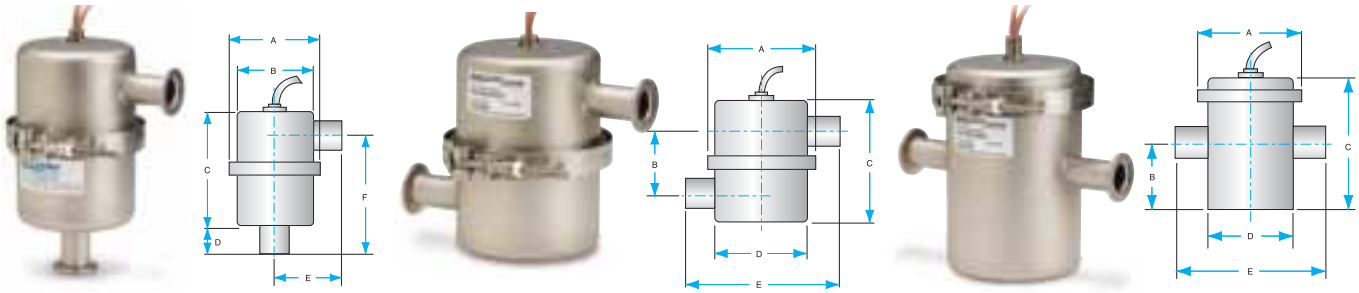
- Appropriate charge of sieve material (⅛" zeolite pellets)
- 4" comes with (1) 1-lb. can; 6" comes with (2) 1-lb. cans
- Integral 110 VAC or 220 VAC regeneration heater
- Clip holds heater in place enabling the mounting of traps in any orientation

About the Heater

- 4" diameter trap heater rates at 120V, 125W; 6" at 120V, 230W

To Replace the Sieve

- Remove trap end containing the heater and then remove nut at the end of basket
- Dump the old sieve
- Replace with new sieve and then attach the basket end plate



Body O.D.	Flange Size	Port O.D.	Sieve Charge Required Voltage (included)	Dimensions (in.) A	B	C	D	E	F	Part No.	Price
Angle Style											
4"	KF16	0.75"	110 VAC 1 lb.	4.80	4.00	6.20	1.50	3.65	6.55	TSR4MR075QF	Call
4"	KF16	0.75"	220 VAC 1 lb.	4.80	4.00	6.20	1.50	3.65	6.55	TSR4MR075QF2	Call
4"	KF25	1.00"	110 VAC 1 lb.	4.80	4.00	6.20	1.50	3.65	6.55	TSR4MR100QF	Call
4"	KF25	1.00"	220 VAC 1 lb.	4.80	4.00	6.20	1.50	3.65	6.55	TSR4MR100QF2	Call
4"	KF40	1.50"	110 VAC 1 lb.	4.80	4.00	6.20	1.50	3.65	6.55	TSR4MR150QF	Call
4"	KF40	1.50"	220 VAC 1 lb.	4.80	4.00	6.20	1.50	3.65	6.55	TSR4MR150QF2	Call
6"	KF40	1.50"	110 VAC 1.5 lbs.	6.90	6.00	8.10	1.50	4.65	7.75	TSR6MR150QF	Call
6"	KF40	1.50"	220 VAC 1.5 lbs.	6.90	6.00	8.10	1.50	4.65	7.75	TSR6MR150QF2	Call
Inline Style (Offset)											
4"	KF16	0.75"	110 VAC 1 lb.	4.80	3.50	6.20	4.00	7.30	—	TSR4MI075QF	Call
4"	KF16	0.75"	220 VAC 1 lb.	4.80	3.50	6.20	4.00	7.30	—	TSR4MI075QF2	Call
4"	KF25	1.00"	110 VAC 1 lb.	4.80	3.50	6.20	4.00	7.30	—	TSR4MI100QF	Call
4"	KF25	1.00"	220 VAC 1 lb.	4.80	3.50	6.20	4.00	7.30	—	TSR4MI100QF2	Call
4"	KF40	1.50"	110 VAC 1 lb.	4.80	3.50	6.20	4.00	7.30	—	TSR4MI150QF	Call
4"	KF40	1.50"	220 VAC 1 lb.	4.80	3.50	6.20	4.00	7.30	—	TSR4MI150QF2	Call
6"	KF40	1.50"	110 VAC 1.5 lbs.	6.90	4.00	8.10	6.00	9.30	—	TSR6MI150QF	Call
6"	KF40	1.50"	220 VAC 1.5 lbs.	6.90	4.00	8.10	6.00	9.30	—	TSR6MI150QF2	Call
Inline Style (Straight)											
4"	KF16	0.75"	110 VAC 1 lb.	4.80	3.50	7.00	4.00	7.30	—	TSR4MS075QF	Call
4"	KF16	0.75"	220 VAC 1 lb.	4.80	3.50	7.00	4.00	7.30	—	TSR4MS075QF2	Call
4"	KF25	1.00"	110 VAC 1 lb.	4.80	3.50	7.00	4.00	7.30	—	TSR4MS100QF	Call
4"	KF25	1.00"	220 VAC 1 lb.	4.80	3.50	7.00	4.00	7.30	—	TSR4MS100QF2	Call
4"	KF40	1.50"	110 VAC 1 lb.	4.80	3.50	7.00	4.00	7.30	—	TSR4MS150QF	Call
4"	KF40	1.50"	220 VAC 1 lb.	4.80	3.50	7.00	4.00	7.30	—	TSR4MS150QF2	Call
6"	KF40	1.50"	110 VAC 1.5 lbs.	6.90	3.50	7.00	4.00	9.30	—	TSR6MS150QF	Call
6"	KF40	1.50"	220 VAC 1.5 lbs.	6.90	3.50	7.00	4.00	9.30	—	TSR6MS150QF2	Call

Molecular Sieve Adsorbent Materials

Material	Weight	Pellet Size	Part No.	Price
Zeolite 13x10 Angstrom	1 lb.	⅛"	MST-13X-1/8	Call
Zeolite 13x10 Angstrom	50 lbs.	⅛"	MST-13X-50	Call

➤ Metal Wool Element Traps

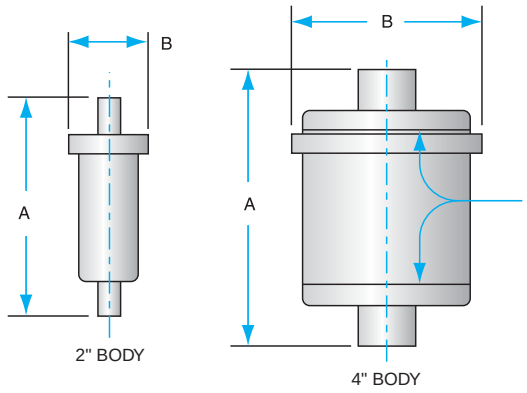
IN THIS SECTION ➤

Metal Wool Element Traps

Ideal for use in mobile/portable vacuum systems or where pumps are repeatedly cycled or systems vented.

- A foreline vapor trapping device
- Feature a large surface area of metal wool
- Do not need regeneration
- Do not absorb moisture from the atmosphere when left open

DID YOU KNOW: Originally, the preferred trap material was fine copper wool, but more recently stainless steel wool has replaced it for effluent gases that react with copper.



Replaceable Element

- Rechargeable traps
- Features an inexpensive replaceable steel wool element that is changed after oil vapor breakthrough occurs
- Comes standard with copper wool filter elements (other element materials sold separately; see replaceable metal wool elements)

Tube O.D.	Flange Size	Body O.D.	Dimensions (in.) A	B	Part No.	Price
0.75"	KF16	2"	8.53	3.56	TAR2CS075QF	Call
1.0"	KF25	4"	10.30	3.56	TAR4CS100QF	Call
1.5"	KF40	4"	10.30	3.56	TAR4CS150QF	Call
2.0"	KF50	4"	10.30	4.80	TAR4CS200QF	Call

Replaceable Metal Wool Elements

After the introduction of the rechargeable conversion trap, it was only a small step to offer other fillings such as activated alumina and activated carbon.

In general, their applications depend on alumina adsorbing acid fumes and carbon adsorbing organic solvents coming from the chamber.

NOTE: Because the rechargeable unit has an o-ring joint, the trap cannot be heated in situ to regenerate the active filling.

Element Material	Trap Size (Body Diameter) (in.)	Part No.	Price
Copper	2	TAR2C	Call
Copper	4	TAR4C	Call
Copper	6	TAR6C	Call
Stainless Steel	2	TAR2S	Call
Stainless Steel	4	TAR4S	Call
Stainless Steel	6	TAR6S	Call
Alumina*	2	TAR2A	Call
Alumina*	4	TAR4A	Call
Alumina*	6	TAR6A	Call
Carbon*	2	TAR2B	Call
Carbon*	4	TAR4B	Call
Carbon*	6	TAR6B	Call

Description	Size (in.)	Part No.	Price
Fine Mesh Screen	2	TAR2ASCR	Call
For use with	4	TAR4ASCR	Call
Carbon and Alumina	6	TAR6ASCR	Call

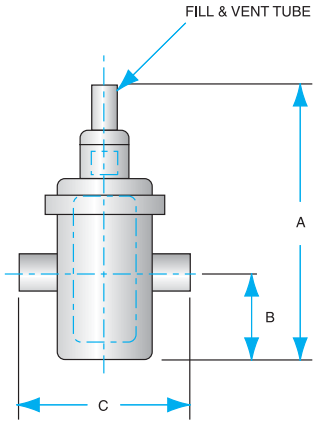
*These elements require two fine mesh screens (one for each end of the trap) sold separately **above**.

➤ Inline LN_2 Cooled Traps

■ Inline Style (Single Fill Tube)

Works in vacuum systems containing solvents, water vapor, or organic vapors.

- Traps volatile materials before they can enter the mechanical pump to ruin the foreline pressure and contaminate the oil
- Traps all oil vapors before they can enter the chamber from the mechanical pump
- Acts as a pump, producing lower base pressures and faster pump down
- Two-piece split-housing body enables quick removal of the reservoir for cleaning without disassembling the system



Body O.D.	Flange Size	Port O.D.	LN_2 Reservoir (liters)	Dimensions (in.) A	B	C	Part No.	Price
4"	KF16	0.75"	0.75	11.50	3.70	7.30	TLR4XI075QF	Call
4"	KF25	1.00"	0.75	11.50	3.70	7.30	TLR4XI100QF	Call
4"	KF40	1.50"	0.75	11.50	3.70	7.30	TLR4XI150QF	Call
6"	KF40	1.50"	1.60	14.20	4.50	9.30	TLR6XI150QF	Call
6"	KF50	2.00"	1.60	14.20	4.50	9.30	TLR6XI200QF	Call

NOTE: 4" traps hold 0.75 liter LN_2 and 6" traps hold 1.6 liters LN_2.

NOTE: Angled traps also available. Please inquire or visit our website.

NOTE: Under standard conditions, 4" diameter traps can run a maximum of 5 hours before needing a refill; 6" diameter traps can run a maximum of 8 hours before requiring more liquid nitrogen.

➤ Inline LN_2 Cooled Traps

■ LN_2 Control & Transfer

These flexible stainless steel hoses are vacuum insulated, conferring many advantages over normal methods of transferring LN_2 from a pressurized dewar to the trap or cryogenic shroud.

■ *Vacuum Insulated Flex Hoses*

- Warm to the touch and will cause no freeze-burns
- Conserve LN_2 (see chart **below**)
- Eliminate danger of frost, ice-balls, or moisture problems
- Eliminate hazard of water puddles
- Enable for fast delivery of LN_2 to the receiver
- Remain flexible during LN_2 transfer

The hoses have all stainless steel construction with a protective outer braid or spiral wrapping. In the vacuum space, super insulation layers are applied at a density of 60 layers/inch diameter. The vacuum annulus is baked, evacuated to 10^{-6} Torr, and a chemical getter added. Each hose is helium leak checked to 1 x 10^{-9} std. cc/sec., cold shocked, and flow tested prior to shipment.

Three hose internal diameters are available—"Super Flexible" hoses in ¼" and ⅜" and "Flexible" hose in ½". Any length, from 4 to 20 feet in 2-foot increments, is available. Contact us for the price of hoses in excess of those shown in the ordering table.

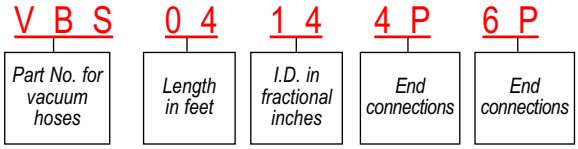
End connections can be plain tube, JIC Swivel (otherwise known as ½" flare nuts), or male NPT to suit the tube diameter. Most large LN_2 dewars use JIC Swivel connections at their outlets.

These highly flexible transfer hoses are used for all LN_2 transfer applications, including filling smaller receptacles and supplying LN_2 to moving or vibrating reservoirs. The most surprising data justifying their use is the cost of LN_2 lost to evaporation when using other transfer systems. The Cost-per-Day table suggests that in one month, the cost of the LN_2 lost using a 4' long, ⅜" I.D., uninsulated transfer line, 24 hours/day suffices to cover the cost of the same length "Super Flexible" hose.

LN_2 Cost-per-Day
(Based on LN_2 @ $1.00/gal.)

	Transfer Line Insulation		
Usage (hr./day)	None	Foam	Vacuum
8	$11.84	$3.48	$0.14
16	$23.68	$6.97	$0.28
24	$35.54	$10.46	$0.42

Example Ordering Configuration Part No.:



Part Number Conventions

Part numbers for vacuum hoses have the initial letters "VBS" followed by:

- Two digits indicating *length in feet* ("04" meaning 4')
- Two digits indicating the *I.D. in fractional inches* without the "/" ("14" meaning ¼")
- Terminal letters/numbers indicating end connections:

  J = ½" SAE flare nut

  4P = ¼" male NPT

  6P = ⅜" male NPT

  8P = ½" male NPT

More example of ordering configuration part numbers:

VBS 06 38 8P 6P
6-ft., ⅜" I.D. hose with ½" MNPT on one end

VBS 10 38
10-ft., ⅜" I.D. hose with ½" end tubes

Length	Part No.	Price
	¼" I.D. Flexible	
4'	VBS0414	Call
6'	VBS0614	Call
8'	VBS0814	Call
10'	VBS1014	Call
	⅜" I.D. Flexible	
4'	VBS0438	Call
6'	VBS0638	Call
8'	VBS0838	Call
10'	VBS1038	Call
	½" I.D. Flexible	
4'	VBS0412	Call
6'	VBS0612	Call
8'	VBS0812	Call
10'	VBS1012	Call

ORDERING NOTE: The prices listed above apply to any transfer hose of a given I.D. regardless of end connections. Please indicate appropriate part number with corresponding end connection suffixes, if desired. Part numbers without end connection suffixes have ½" tube ends.

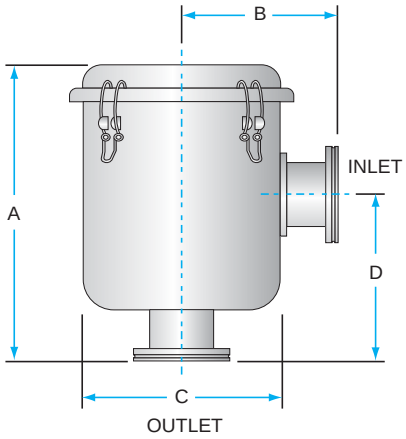
Multimedia Housings

Features:

- Vacuum level: Typically 1 x 10^{-3} milliTorr (1.3 x 10^{-3} mbar)
- Interchangeable cartridge provided for easy clean replacement
- Rugged all steel construction with zinc clear plating
- Temperature (continuous): -15°F (-26°C) to 220°F (104°C)

Options:

- Polyester: Pleated media for high dirt-holding capacity of 99+% removal efficiency standard to 5 micron
- Paper: Pleated media for high dirt-holding capacity 99+ removal efficiency standard to 2 micron
- Activated Alumina: Prevents backstreaming and traps water and acid vapors
- Activated Carbon: Wound A.C. impregnated polyester media provides dual filtration; stops both particulate matter, gas or vapor odors, and contaminants
- S.S. Wire Mesh: Corrosive-resistant media with large surface area, traps condensable particles and oil vapors
- A.C. Granulate: Granulate-filled cartridge provides greatest capacity to absorb gas or vapor odors



Description	Dimensions (in) A	B	C	D	Rated Flow (SCFM)	Part No.	Price
Inlet Vacuum Filter, Carbon Steel with Zinc Clear Plated Finish, NW16 Inlet/Outlet, Polyester Element	3 7/8	2 5/8	3 3/4	2 1/4	18	PFI825KF16	Call
Inlet Vacuum Filter, Carbon Steel with Zinc Clear Plated Finish, NW25 Inlet/Outlet, Polyester Element	4 3/8	3 3/8	5 3/4	2 3/4	25	PFI843KF25	Call
Inlet Vacuum Filter, Carbon Steel with Zinc Clear Plated Finish, NW40 Inlet/Outlet, Polyester Element	4 3/8	3 3/8	5 3/4	2 3/4	55	PFI843KF40	Call
Inlet Vacuum Filter, Carbon Steel with Zinc Clear Plated Finish, NW40 Inlet/Outlet, Polyester Element	7 3/16	4 5/8	7 3/8	5	60	PFI849KF40	Call
Inlet Vacuum Filter, Carbon Steel with Zinc Clear Plated Finish, ISO K63 Inlet/Outlet, Polyester Element	11 1/2	6	8 3/4	6 1/2	210	PFI851K63	Call
Inlet Vacuum Filter, Carbon Steel with Zinc Clear Plated Finish, ISO K100 Inlet/Outlet, Polyester Element	15 3/16	8 5/16	13 1/4	8 1/8	520	PFI239K100	Call

Turn the page for more Multimedia Housing Filter Options! ➤

➤ KF Flanged

■ Multimedia Housing Filter Options

Description	Part No.	Price
NW16 Inlet/Outlet — 18 SCFM		
Polyester Element (99+% Efficient at 5 microns)	PFI825	Call
Paper Element (99+% Efficient at 2 microns)	PFI824	Call
1 micron Z media Polyester Element (99+% Efficient at 1 microns)	PFI825Z	Call
4 micron Z media Polyester Element (99+% Efficient at 4 microns)	PFI825N	Call
25 micron Z media Polyester Element (99+% Efficient at 25 microns)	PFI825W	Call
100 micron Z media Polyester Element (99+% Efficient at 100 microns)	PFI825U	Call
Stainless Steel Wire Mesh Element	PFI824S2	Call
Activated Carbon Impregnated Polyester Media (99+ % Efficient at 5 microns)	PFIAC824	Call
Activated Alumina Granulate Cartridge	PFIAA824	Call
Activated Carbon Granulate Cartridge	PFIACG824	Call
Zeolite Granulate Cartridge	PFIZE824	Call
HEPA Element (99.97% Efficient at 0.3 microns)	PFIHE824	Call
NW25 Inlet/Outlet — 25 SCFM		
NW40 Inlet/Outlet — 55 SCFM		
Polyester Element (99+% Efficient at 5 microns)	PFI843	Call
Paper Element (99+% Efficient at 2 microns)	PFI842	Call
1 micron Z media Polyester Element (99+% Efficient at 1 microns)	PFI843Z	Call
4 micron Z media Polyester Element (99+% Efficient at 4 microns)	PFI843N	Call
25 micron Z media Polyester Element (99+% Efficient at 25 microns)	PFI843W	Call
100 micron Z media Polyester Element (99+% Efficient at 100 microns)	PFI843U	Call
Stainless Steel Wire Mesh Element	PFI842S2	Call
Activated Carbon Impregnated Polyester Media (99+% Efficient at 5 microns)	PFIAC842	Call
Activated Alumina Granulate Cartridge	PFIAA842	Call
Activated Carbon Granulate Cartridge	PFIACG842	Call
Zeolite Granulate Cartridge	PFIZE842	Call
HEPA Element (99.97% Efficient at 0.3 microns)	PFIHE842	Call
NW40 Inlet/Outlet — 60 SCFM		
Polyester Element (99+% Efficient at 5 microns)	PFI849	Call
Paper Element t (99+% Efficient at 2 microns)	PFI848	Call
1 micron Z media Polyester Element (99+% Efficient at 1 microns)	PFI849Z	Call
4 micron Z media Polyester Element (99+% Efficient at 4 microns)	PFI849N	Call
25 micron Z media Polyester Element (99+% Efficient at 25 microns)	PFI849W	Call
100 micron Z media Polyester Element (99+% Efficient at 100 microns)	PFI849U	Call
Stainless Steel Wire Mesh Element	PFI848S2	Call
Activated Carbon Impregnated Polyester Media (99+% Efficient at 5 microns)	PFIAC848	Call
Activated Alumina Granulate Cartridge	PFIAA848	Call
Activated Carbon Granulate Cartridge	PFIACG848	Call
Zeolite Granulate Cartridge	PFIZE848	Call
HEPA Element (99.97% Efficient at 0.3 microns)	PFIHE848	Call
ISO K63 Inlet/Outlet — 210 SCFM		
Polyester Element (99+% Efficient at 5 microns)	PFI851	Call
Paper Element (99+% Efficient at 2 microns)	PFI850	Call
1 micron Z media Polyester Element (99+% Efficient at 1 microns)	PFI851Z	Call
4 micron Z media Polyester Element (99+% Efficient at 4 microns)	PFI851N	Call
25 micron Z media Polyester Element (99+% Efficient at 25 microns)	PFI851W	Call
100 micron Z media Polyester Element (99+% Efficient at 100 microns)	PFI851U	Call
Stainless Steel Wire Mesh Element	PFI850S2	Call
Activated Carbon Impregnated Polyester Media (99+% Efficient at 5 microns)	PFIAC850	Call
Activated Alumina Granulate Cartridge	PFIAA850	Call
Activated Carbon Granulate Cartridge	PFIACG850	Call
Zeolite Granulate Cartridge	PFIZE850	Call
HEPA Element (99.97% Efficient at 0.3 microns)	PFIHE850	Call
ISO K100 Inlet/Outlet — 520 SCFM		
Polyester Element (99+% Efficient at 5 microns)	PFI239	Call
Paper Element (99+% Efficient at 2 microns)	PFI238	Call
1 micron Z media Polyester Element (99+% Efficient at 1 microns)	PFI239Z	Call
4 micron Z media Polyester Element (99+% Efficient at 4 microns)	PFI239N	Call
25 micron Z media Polyester Element (99+% Efficient at 25 microns)	PFI239W	Call
100 micron Z media Polyester Element (99+% Efficient at 100 microns)	PFI239U	Call
Stainless Steel Wire Mesh Element	PFI238S2	Call
Activated Carbon Impregnated Polyester Media (99+% Efficient at 5 microns)	PFIAC238	Call
Activated Alumina Granulate Cartridge	PFIAA238	Call
Activated Carbon Granulate Cartridge	PFIACG238	Call
Zeolite Granulate Cartridge	PFIZE238	Call
HEPA Element (99.97% Efficient at 0.3 microns)	PFIHE238	Call

➤ Polyester Element

IN THIS SECTION ➤

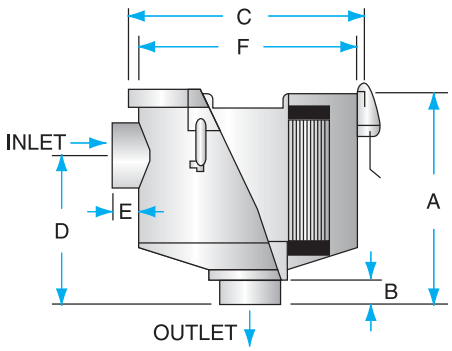
Foreline Dust Filters with Polyester Element

Offers a 99+% removal efficiency standard to 5 microns on polyester media.

- Vacuum level is typically 1 x 10^{-3} Torr (1.3 x 10^{-3} mbar)
- Features low pressure drop with a positive sealing o-ring system
- Temperature range: -15º F (-26º C) to 220º F (104º C)

■ Female NPT Inlet

- All-steel construction features a baked enamel finish with stainless steel torsion clips for increased durability
- Brazed fittings enable medium vacuum performance
- Applications include vacuum booster, factory automation, leak detection, medical, printing industry, vacuum pick-and-place devices, vacuum packaging, and general vacuum pumps and systems



Filters

Element Media	Rated Flow (scfm)	Element Flow (scfm)	NPT (Inlet)	NPT (Outlet)	Dimensions (in.) A	B	C	D	E	F	Weight (lbs.)	Part No.	Price
Polyester	35	55	1	1	4.38	0.75	5.88	2.63	0.75	5	3	PFI843100HC	Call
Polyester	80	115	1.5	1.5	6.75	0.75	7.33	4.5	0.75	6.81	5	PFI849150HC	Call
Polyester	175	290	2	2	10.25	0.75	8.75	5	0.75	7.63	15	PFI851200HC	Call

NOTE: Elements from previous page will fit these housings. Please call us to order element types not listed in the ordering table.

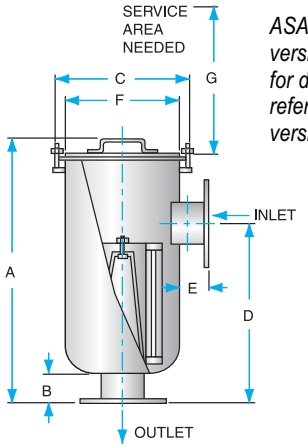
Filter Accessories

Description	Part No.	Price
Stainless Steel Adapter: KF40 Flange to 1¼" Male NPT	QF40XMNPT20	Call
Stainless Steel Adapter: KF40 Flange to 1½" Male NPT	QF40XMNPT24	Call
Stainless Steel Adapter: KF25 Flange to 1" Male NPT	QF25XMNPT16	Call
Stainless Steel Adapter: KF40 Flange to 1" Male NPT	QF40XMNPT16	Call
Replacement Polyester Element for PFI843125HC Filter	PFI843	Call
Replacement Polyester Element for PFI849150HC Filter	PFI849	Call
Replacement Polyester Element for PFI851200HC Filter	PFI851	Call

➤ Polyester Element

■ Filters with Male NPT or ASA Flanged Inlet

- Inlet gas load enters the canister above the element for maximum element usage
- All-steel construction features a baked enamel finish with heavy-duty T-bolts to ensure structural integrity and easy maintenance
- Applications include bag house systems, factory automation, food processing, glass and ceramic processes, medical, vacuum furnaces and packaging, vacuum pumps (rotary vane, screw compressors, and piston pumps), and central vacuum systems



ASA flanged version shown for dimensional reference; NPT version similar

NOTE: Please call us to order element types not listed in the ordering table.

Male NPT

ASA Flanged

Filters with Male NPT

Element Media	Rated Flow (scfm)	Element Flow (scfm)	NPT (Inlet)	NPT (Outlet)	Dimensions (in.) A	B	C	D	E	F	G	Weight (lbs.)	Part No.	Price
Polyester	300	800	3"	3"	27.12	3	14	18.5	3	12	15	50	PFI335P300	Call
Polyester	520	800	4"	4"	27.12	3	14	18.5	3	12	15	55	PFI335P400	Call
Polyester	800	1,100	5"	5"	28.12	3	18.5	19.5	3	16	15	88	PFI345P500	Call
Polyester	1,100	1,500	6"	6"	29.12	4	18.5	20.5	4	16	15	97	PFI375P600	Call

Filters with ASA Flanges

Element Media	Rated Flow (scfm)	Element Flow (scfm)	Flange (Inlet)	Flange (Outlet)	Dimensions (in.) A	B	C	D	E	F	G	Weight (lbs.)	Part No.	Price
Polyester	520	800	4"	4"	27.12	3	14	18.5	3	12	20	64	PFI335P400F	Call
Polyester	800	1,100	5"	5"	28.15	3	18.5	19.5	3	16	20	90	PFI345P500F	Call
Polyester	1,100	1,500	6"	6"	29.12	4	18.5	20.5	4	16	20	113	PFI375P600F	Call
Polyester	1,800	1,825	8"	8"	38	4	22.5	25.5	4	20	20	185	PFI377P800F	Call
Polyester	2,900	6,600	10"	10"	57.5	4	26.41	45	4	24	33	380	PFI685P1000F	Call
Polyester	4,950	9,410	12"	12"	69.5	4	26.41	57	4	24	25	465	PFI485P21200	Call

ASA Flange Dimensions

125/150# Pattern Figure	Dimensions (in.) O.D.	B.C.	B.H.	No. of Holes	Flange Thickness
4"	9	7½	0.75	8	0.38"
5"	10	8½	0.88	8	0.38"
6"	11	9½	0.88	8	0.38"
8"	13½	11¾	0.88	8	0.38"
10"	16	14¼	1	12	0.38"
12"	19	17	1	12	0.5"

Replacement Filter Elements

Description	Part No.	Price
Polyester Element for:		
PFI335P300 Filter	PFI335P	Call
PFI345P400 Filter	PFI345P	Call
PFI375P600 Filter	PFI375P	Call
PFI377P800 Filter	PFI377P	Call
PFI685P1000 Filter	PFI685P	Call
PFI485P21200 Filter	PFI485P	Call

➤ Fiberglass Element

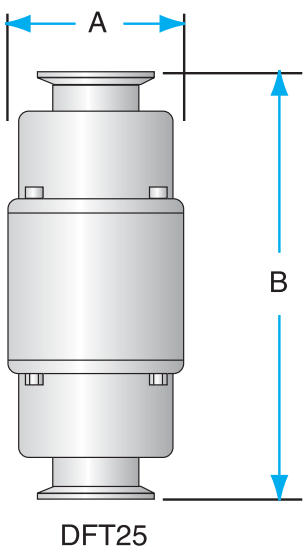
■ KF (QF) Flanged Inlet

Retain particles larger than 6 microns without seriously impairing pumping speed.

- Installed upstream of mechanical pumps

DFT 25 Model

- Compact and economical filter
- Mounts directly on the intake of any mechanical pump with a KF25 (KF or NW25) intake flange



DFT25

KF Filter Dimensions

Filter Model	Flange Size	Dimensions (in.) A	B	Part No.	Price
DFT 25	KF25	2.5	5.8	AV-104202	Call

Replacement Filter Elements

Description	Pkg. Qty.	Part No.	Price
Replacement Fiberglass Element for DFT 25 Filter	1	AV-068445	Call

Kurt J. Lesker Company

➤ Single Canister Versions

■ OF1000 Filter Unit

Remove acids and particulates from mechanical pump fluids while pump operates.

- Easily installed and replaced element/canister assembly has a recessed lid to prevent oil spillage
- Unit features fluid capacity of 3.75 qt.
- Flexible Teflon® hoses guard against oil leaks caused by electrical discharges burning pinholes in the hose
- Hoses terminate in dripless quick disconnects
- Three series of units are available

Standard Series

- Works in silicon production processes including LPCVD, LP epitaxy, and numerous plasma processes

PFPE Series

- Similar to the Standard Series but is prepared for filtering Fomblin® oils

Chemical Series

- Has a Teflon coating on the filter's interior housing, making it an excellent unit for filtering oils used in BCl_3 and fluorocarbon etch process systems

NOTE: Filter elements sold separately. See the Replacement Filter Elements chart for selections.

SPECIFICATIONS

Motor — 1/8 hp, 115/208/220 VAC 1 phase, 50/60 Hz
Pump:
Rate (gpm) — 0.7
Speed (rpm) — 1,800
Pressure Gauge (psig) — 0 to 100
Hoses (Teflon®/Carbon Black with Stainless Steel Braid) — 3/8" (I.D.) x 4'
Dimensions (in.) — 16 x 14 x 11
Weight, Dry (lbs.) — 45

NOTE: Dual canister versions, for filtration needs requiring multimedia filter elements, are available upon request. Contact us for pricing and availability.

OF1000 Oil Filtration Units

Series	Part No.	Price
Standard	LH-898550	Call
PFPE	LH-898551	Call
Chemical	LH-898561	Call

Replacement Filter Elements

Description	Part No.	Price
Al_2O_3	LH-898504	Call
Fullers	LH-898505	Call
Hydrophilic	LH-898506	Call
Fiberglass	LH-898507	Call

➤ Multiple Canister Versions

Filtering mechanical pump oil is essential for vacuum processes producing particles, hydrous acids, or Lewis acids. Forcing the oil through elements that neutralize acids, adsorb moisture, and entrain particles reduces pump repair costs while extending oil life.

■ *Motorguard Filter Unit*

Systems excel in applications involving small- and large-scale ion implantation, plasma etching, photo-resist stripping, and LPCVD processes.

How It Works

Oil transfers by a high-pressure pump (115/230V TEFC electric motor wired standard for 115 VAC) through parallel filter elements, each housed in a patented container.

The fluid forces through the labyrinth of sub-micron-size pores in the filtering medium, where particles are physically trapped—and water, acids, and ammonia are adsorbed.

- Units attach directly to a mechanical pump with two flexible hoses
- Filter elements are tightly compressed, multi-layer rolls of cellulose (paper) activated alumina, or hydrophilic fabric media
- Maintain oil at a pH of 7 while removing abrasive particles down to 0.1 micron diameter
- Each unit ships with two 3/8" (I.D.) x 5' flexible hoses and instruction manual suggesting interconnection to different mechanical pump models

SPECIFICATIONS

No. of Elements — 3
Motor (hp) — 1/12
Flow (L/min.) — 1.9
Oil Capacity (L) — 3
Pressure Gauge — Yes
Compatible Fluids:
Hydrocarbon — Yes
Inert — Yes
Elements Included — 3 active Alumina filters

Motorguard Oil Filtration Units

Model	Part No.	Price
MG 318400	MG318400	Call

Pump Adapter Couplings

Manufacturer	Fitting	Part No.	Price
Welch	1/8" NPT Male	QCFC-031	Call
Welch	1/4" NPT Male	QCFC-032	Call
Welch	3/8" NPT Male	QCFC-033	Call
Welch	1/2" NPT Male	QCFC-034	Call
Welch (for 1397 & 1374 pumps)	Coaxial	MG-833-10	Call
Adixen (Alcatel)	3/8" NPT Male	QCFC-042A	Call
Edwards	1/8" BSPP Male	QCFC-031E	Call
Edwards	1/4" BSPP Male	QCFC-032E	Call
Edwards	3/8" BSPP Male	QCFC-033E	Call
Edwards	1/2" BSPP Male	QCFC-034E	Call
Edwards	3/4" BSPP Male	QCFC-036E	Call
Edwards	1" BSPP Male	QCFC-049E	Call
Leybold	—	MG-838-10	Call

Replacement Filter Elements

Description	Material	Pkg. Qty.	Part No.	Price
Element for MG111300, MG212200, MG313200, MG317300, MG318400 Filters	Al_2O_3	4	MG-M735	Call
Element for MG111300, MG212200, MG313200, MG318400 Filters	Cellulose	4	MG-M723	Call
Element for MG1X351, MG1X351-1 Filters	Cellulose	4	MG-M673	Call
Element for MG111300, MG212200, MG313200, MG318400 Filters	Hydrophilic	4	MG-M730	Call
Element for MG1X351, MG1X351-1 Filters	Hydrophilic	4	MG-M660	Call

Kurt J. Lesker Company

➤ Standard Series

■ KJLC® Regular Duty

Available in two series:

Compact Series Exhaust Filters

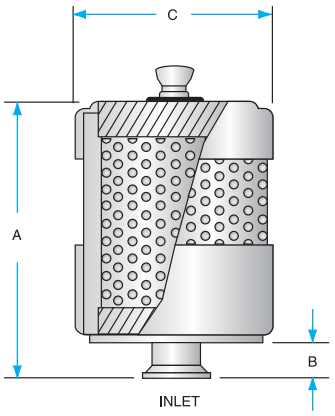
- Low-profile, compact open-body design with a high coalescing media
- Operates at 99.97% removal efficiency at 0.3 micron diameter particles with maximum inlet concentration of 500 ppmw (parts per million by wt.) mineral oil or 1,000 ppmw synthetic oil
- Filter has expanded metal on both sides of the media and nickel chrome construction with a plated finish
- Works between 4º C and 104º C

Pressure Release Series Exhaust Filters

- Feature a back pressure release valve with a ⅛" NPT oil drain to release the element at (7.38 psi) 0.5 bar differential for pump protection
- Fully drawn, sealed-body shell adds durability, making each filter nearly invulnerable to rust and vibration
- Compact, low-profile design uses high-performance coalescing media housed in a durable carbon steel construction with baked enamel finish
- Filters help purify the surrounding environment while giving a minimum efficiency of 99.7% on 0.3 mm diameter particles
- Operate at temperatures between 4º C and 104º C

GL Series

FG Series



Oil Mist Eliminators

Series	Flow (scfm)	Inlet Flange	Dimensions (in.) A	B	C	Weight (lbs.)	Part No.	Price
Compact	4.5	KF16	5.75	2.12	2.5	1.2	PFEFG5QF16	Call
Compact	20	KF25	9.25	2.12	5.12	3.5	PFEFG10QF25	Call
Pressure Release	8	KF16	4.31	0.88	3.25	1.0	PFEGL915QF16	Call
Pressure Release	8	KF25	4.31	0.88	3.25	1.0	PFEGL915QF25	Call
Pressure Release	22	KF25	7.38	0.88	5.25	2.5	PFESG925QF25	Call

Replacement Mist Eliminator Elements

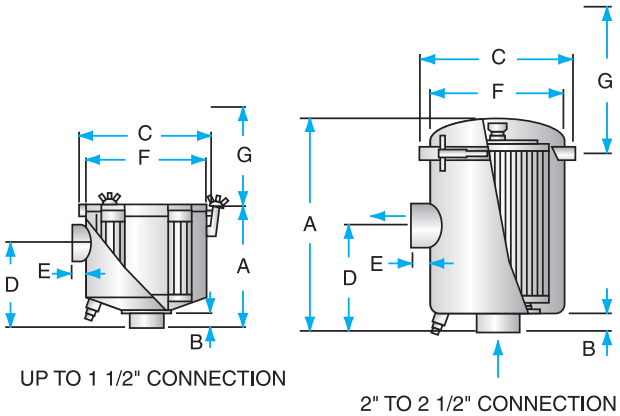
Description	Part No.	Price
Element for:		
PFEFG5 Oil Mist Eliminators	PFEFG5	Call
PFEFG10 Oil Mist Eliminators	PFEFG10	Call
PFEGL910 Oil Mist Eliminators	PFEGL910	Call
PFEGL915 Oil Mist Eliminators	PFEGL915	Call
PFESG925 Oil Mist Eliminators	PFESG925	Call

■ KJLC® Heavy Duty

- Feature brazed fittings and a positive sealing o-ring seal system for high vacuum duty
- Fully drawn, one-piece carbon steel canister with a standard ¼" drain tap
- Operate from 4° C to 104° C
- Minimum efficiency of 99.7% on 0.3 mm diameter particles with maximum inlet concentration of 500 ppmw (parts per million by weight) mineral oil or 1,000 ppmw synthetic oil
- Low oil carryover and large oil-catching efficiency
- Can perform low velocity separation of ultra fine oil mist due to filter's large surface area

Oil Mist Eliminators

Rated Flow (scfm)	Element Flow (scfm)	Inlet	Outlet	Dimensions (in.) A	B	C	D	E	F	G	Weight (lbs.)	Part No.	Price
40	50	KF40	KF40	6.75	0.75	7.31	4.62	0.75	6.75	5.25	5	PFEHG848KF40	Call
40	50	1" NTP	1" NTP	6.75	0.75	7.31	4.62	0.75	6.75	5.25	5	PFEHG848100	Call
50	50	1.5" NTP	1.5" NTP	6.75	0.75	7.31	4.62	0.75	6.75	5.25	5	PFEHG848150	Call
125	125	2" NTP	2" NTP	11.25	0.75	8.75	5	0.75	7.62	9.25	15	PFEHG850200	Call
175	200	2" NTP	2" NTP	17.5	0.75	8.75	5	0.75	7.62	14.5	30	PFEHG860200	Call



Replacement Mist Eliminator Elements

Description	Part No.	Price
Element for:		
PFEHG848 Mist Eliminators	PFEHG848	Call
PFEHG850 Mist Eliminators	PFEHG850	Call
PFEHG860 Mist Eliminators	PFEHG860	Call

NPT to KF Adapters

Description	Part No.	Price
1" MNPT to KF40	QF40XMNPT16	Call
1.5" MNPT to KF40	QF40XMNPT24	Call
2" MNPT to KF50	QF50XMNPT32	Call

Kurt J. Lesker Company

➤ OEM Mist Eliminators

■ *Adixen™ (Alcatel®)*

Manufactured by Adixen (Alcatel) for their oil-sealed mechanical pumps.

- Can retain oil droplets smaller than 1 micron in diameter
- An internal over pressure valve prevents exceeding the maximum permissible exhaust pressure

Chemical and Chemical Plasma Series

- For mechanical pumps
- Pump-aggressive gases encountered in plasma etching
- Oil that condenses in the second group does not recycle back to the pump but remains in the mist eliminator's body
- Sight glass enables operator to monitor the quantity of oil retained

Hermetic Series

- For hermetically sealed mechanical pumps
- Made of stainless steel
- Helium leak checked to extremely low leak rates by Adixen (Alcatel) before shipping
- Use when pumping precious or exotic gases in a closed loop

Oil Mist Eliminators

For Pump Models	Part No.	Price
2002 Standard Series	AV-062886	Call
2005–2021 Standard Series	AV-104200	Call
2033, 2063 Standard Series	AV-104887	Call
2005–2021 Standard Series (High Constant Inlet Pressure)	AV-104199	Call
2005–2021 Chemical Series	AV-066849	Call
2033, 2063 Chemical Series	AV-068785	Call
2033, 2063 Hermetic Series	AV-068744	Call

Replacement Mist Eliminator Elements

Description	Pkg. Qty.	Part No.	Price
Element for:			
AV-068316, AV-52190, AV-68494, AV-104200 (OME25S)	1	AV-068304	Call
AV-068442, AV-68744, AV-104887 (OME40S)	1	AV-068443	Call
AV-068785 (OME40CI)	1	AV-068778	Call
AV-066827, AV-65873, AV-66827, AV-65873, AV-104200 (OME25S)	5	AV-068838	Call
AV-066849, AV-66827, AV-65873, AV-068316 (OME25C/H)	1	AV-066800	Call
AV-062886 (OME2002)	1	AV-062824	Call
AV-063899 (OME50S)	1	AV-082672	Call

➤ OEM Mist Eliminators

■ Welch®

All filter elements have a two-stage construction consisting of multiple layer of fine wire screen and a special non-organic fiber.

Standard Series Exhaust Filter

- Removes particles and droplets to the 0.3 micron size
- Element enables for easy replacement when loaded with oil
- Any oil run-off from the filter while in use returns to the pump

Directional Exhaust Filters

- Features a tube outlet so that exhaust gases conduct to an outside vent or fume hood
- Tube can rotate 360º
- Replaceable filter elements remove particles down to the 0.3 micron size

Oil Mist Eliminators

Series	Compatible Pump/ Housing	Part No.	Price
Standard	8803, 8804, 8890 Series 1399, 1400, 1405 (old style), 8905 Series	SW1417	Call
Directional	1376, 1380, 1402, 1405 (new style), 8806 Series	SW1417A	Call
Directional	1374, 1397 Series	SW1417B	Call

Replacement Mist Eliminator Elements

Series	Part No.	Price
1417	SW1417L	Call
1417A, 1417T, 1417S	SW1417G	Call
1417B, 1417U	SW1417H	Call

■ Edwards

Oil Mist Eliminators

Series	Compatible Pump/ Housing	Part No.	Price
EMF3	Speedivac 2, E2M1.5, E2M2	ED-A46220000	Call
EMF10	RV3, RV5, RV8, E1M5, E1M8, E2M8, E2M12	ED-A46226000	Call
EMF20	RV12, E1M18, E2M18	ED-A46229000	Call
MF30	E2M28, E2M30	ED-A46233000	Call
MF100	E2M40, E2M80	ED-A46203000	Call
MF300	E2M175, E2M275	ED-A46204000	Call

Replacement Mist Eliminator Elements

Series	Part No.	Price
EMF3	ED-A22304197	Call
EMF3 Odor Removal (5 pack)	ED-A22304081	Call
EMF10	ED-A22304198	Call
EMF10 Odor Removal (5 pack)	ED-A22304079	Call
EMF20	ED-A22304199	Call
EMF20 Odor Removal (5 pack)	ED-A22304077	Call
MF30	ED-A22304057	Call
MF100 (2 required)	ED-A22304020	Call
MF300 (4 required)	ED-A22304021	Call

■ Orelikon

Oil Mist Eliminators

Series	Compatible Pump/ Housing	Part No.	Price
AF4-8	D4B, D8B	LH-18906	Call
AF16-25	D16B, D25B, and NT5, NT10, HT16 with adapter kit	LH-18911	Call
AF40-65	D40B, D65B	LH-18916	Call
ARS16-25*	D16B, D16BCS, D25B, D26BCS, and NT5, NT10, NT16 with adapter kit	LH-18956	Call
ARS40-65*	D40B, D40BCS, D65B, D65BCS	LH-18957	Call

*Includes oil return

Replacement Mist Eliminator Elements

Series	Part No.	Price
AF4-8	LH-18971	Call
AF16-25	LH-18972	Call
AF40-65	LH-18973	Call
ARS16-25	LH-18972	Call
ARS40-65	LH-18973	Call

■ Varian

Oil Mist Eliminators

Compatible Pump/Housing	Part No.	Price
DS42	V9499388	Call
DS102 - DS602	V9499395	Call
HS452, HS652	V9499392	Call

Replacement Filter Cartridges

Series	Part No.	Price
DS42 (2 pack)	V9499386	Call
DS102-DS602 (2 pack)	V9499394	Call

Kurt J. Lesker Company

➤ Replacement Filter Elements

Kurt J. Lesker Company carries a full range of filter elements for current and obsolete filtration units from Leybold, Adixen (Alcatel), Stokes, Edwards, and other major manufacturers.

Filter Elements

Fullers Earth

- High capacity for standard acids
- Traps particles down to 10 micron diameter

Hydrophilic

- Effective for hydrolyzed acids
- Traps particles down to 1 micron diameter

Activated Alumina

- Extremely effective against Lewis acids and polar compounds
- Traps particles down to 10 micron diameter

Activated Carbon

- Has properties similar to activated alumina
- Excellent for applications involving arsine or phosphine

Particulate (Fiberglass or Paper)

- Traps particles down to 10 micron diameter

NOTE: Please contact us for replacement filters available for other manufacturers and obsolete filtration systems.

Filter Manufacturer	Mfr.'s Part No.	Filter Element	Filterdyne Part No.	KJLC® Part No.	Price
Adixen (Alcatel)	68533	Fullers Earth	FE-310-404	FILFE310	Call
Adixen (Alcatel)	68880	Activated Alumina	FE-310-369	FILAA310	Call
Adixen (Alcatel)	68881	Activated Carbon	FE-310-405	FILAC310	Call
Edwards	A223-04-068	Particulate	FE-607-617	FILPP607	Call
Edwards	A223-04-091	Activated Alumina/Particulate	FE-607-617	FILAAPP607	Call
Leybold	898504	Activated Alumina	FE-606-365	FILAA606	Call
Leybold	898505	Fullers Earth	FE-606-366	FILFE606	Call
Leybold	898506	Hydrophilic	FE-606-325	FILPH6065	Call
Leybold	898507 (10 micron)	Particulate	FE-606-367	FILPP60610	Call
Leybold	898507 (5 micron)	Particulate	FE-606-471	FILPP60605	Call
Leybold	898523	Activated Alumina	FE-718-338	FILAA618	Call
Leybold	898525	Hydrophilic	—	FILPH61805	Call
Leybold	898599	Particulate	FE-618-306	FILPP6185	Call
Leybold	99-171-158	Particulate	FE-618-307	FILPP61810	Call
Leybold	99-171-159	Fullers Earth	FE-718-342	FILFE618	Call
Stokes	085-37-794	Particulate	FE-409-379	FILPP4091	Call
Stokes	085-39-432	Particulate	FE-814-389	FILPP8143	Call
Stokes	085-39-890	Activated Alumina	FE-814-350	FILAA814	Call
Stokes	085-39-956	Activated Alumina	FE-409-386	FILAA409	Call
Stokes	085-39-965	Activated Alumina	FE-418-458	FILAA418	Call