

# Sample Filters

## Balston Sample Filters Protect Sensitive Analyzers

Balston Gas and Liquid Sample Analyzer Filters protect analyzers from sample impurities by removing solids and liquids from gases with 99.99999+% efficiency at 0.01 micron. Balston Sample Filters offer liquid filtration to 1 micron or lower. Composed of borosilicate glass microfibers with a resin binder, Balston sample filters are inert to most any gas or liquid.

To satisfy the extremely wide range of requirements for analyzer sample filters, Parker Hannifin Corporation supplies a complete line of filter housings in stainless steel, polypropylene, and other corrosion resistant materials, as well as a choice of high efficiency filter elements which are inert to most all liquids and gases.



## Product Features

- Remove liquids and solids from gas samples
- Remove solids and gas bubbles from liquid samples
- Coalesce and separate two liquid phases
- Filter solids and liquids from gases with 99.99999+% efficiency at 0.01  $\mu\text{m}$
- Temperature resistance to 900°F (482°C)
- Low pressure drop
- Long life between filter element changes

### Emissions Monitoring and Analysis

### Process Instrumentation and Controls

### Slip Stream and By-Pass Sampling Filtration

### Specialty Gas and Chemical Filtration



# Sample Filters

## Sample Filter Functions

Sample Filters

### Coalescing Filtration: Separating Liquids From Gases

Microfibre Filter Cartridges efficiently separate suspended liquids from gases. The micro fibers capture the fine liquid droplets suspended in the gas and cause the droplets to run together to form large drops within the depth of the filter cartridge. The large drops, forced by the gas flow to the downstream surface of the filter cartridge, from which the liquid drains by gravity. This process is called “coalescing”. Since the coalesced liquid drains from the cartridge at the same rate that liquid droplets enter the cartridge, the cartridge has an unlimited life when coalescing liquids from relatively clean gases, and the filters operate at their initial retention efficiency even when wet with liquid (see Figure 1). Note that the flow direction is inside-to-outside, to permit the liquid to drip from the outside of the filter to the housing drain.

Since the coalesced liquid drips from the downstream surface of the filter cartridge in the presence of filtered gas, it is important to avoid carryover, or entrainment, of liquid droplets by the gas leaving the filter housing. The possibility of entraining coalesced liquid is minimized by using an X-Type filter cartridge. The X-Type filter cartridges are constructed of two layers, an inner high-efficiency coalescing layer and an outer layer of coarse glass fibers. The coarse, rapidly-draining outer layer ensures that the liquid drips continuously from the bottom of the filter cartridge and minimizes the chance of liquid carryover. (The small internal volume of some filter housings does not permit use of the thick-wall X-Type cartridges, and therefore Q-Type cartridges must be used.) Re-entrainment of coalesced liquid is also avoided by ensuring that the gas flow rate through the housing is safely below the maximum shown in the flow charts on page 40. For most requirements for removing liquid from gas samples, Grade DX or DQ filter cartridges should be used.

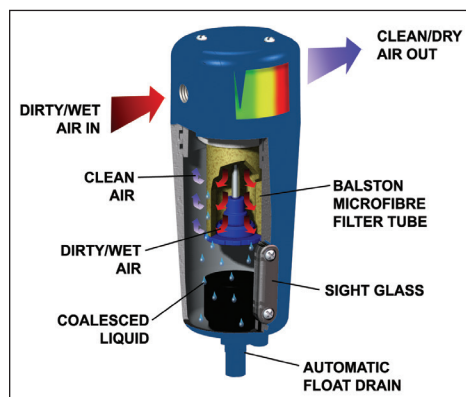


Figure 1  
Balston Compressed Air Filter

### Draining Collected Liquid

If liquid is carried into the filter in slugs rather than dispersed as droplets in the gas, a filter which is properly sized for steady-state conditions can be flooded and permit liquid carryover. If slugging of liquid is expected, a filter with a relatively large bowl should be selected to provide adequate liquid holding capacity and provisions should be made to drain the liquid automatically from the bowl of the housing as fast as it accumulates. An automatic float drain can be used if the pressure is in the 10-400 psig (0.69-28 barg) range. Above 400 psig (28 barg), the possibilities are: a constant bleed drain, a valve with automatic timed actuator (supplied by customer), or an external reservoir with manual valves (see Figure 2). The external reservoir can be constructed of pipe or tubing with sufficient volume to hold all the liquid which is expected to be collected during any period of unattended operation.

If the filter is under vacuum, the external reservoir is a practical method of collecting coalesced liquid for manual draining from time to time. If an external vacuum source, such as an aspirator, is available, the liquid may be drained continuously from the housing drain port.

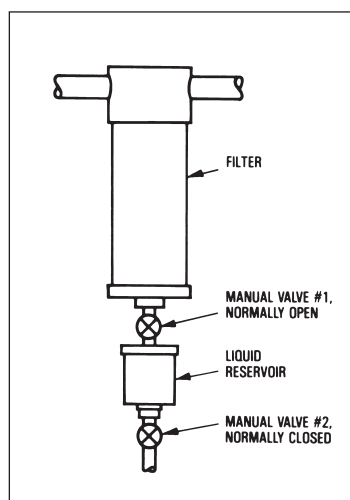


Figure 2  
To drain liquid while filter is operating at pressure or vacuum conditions, close valve #1, and open valve #2

# Sample Filters

## Sample Filter Functions

### Coalescing Filtration: Separating Two Liquid Phases

In principle, Microfibre Filter Cartridges separate suspended droplets of a liquid which is immiscible in another liquid by the same process as they separate droplets of liquid from a gas. The liquid droplets suspended in the continuous liquid phase are trapped on the fibers and run together to form large drops, which are then forced through the filter to the downstream surface. The large drops separate from the continuous liquid phase by gravity difference, settling if heavier than the continuous phase and rising if lighter. The coalescing action of Balston® filters is effective with aqueous droplets suspended in oil or other hydrocarbons, and also with oil in water suspensions.

In practice, liquid-liquid separations are much more difficult than liquid-gas separations. The specific gravity difference between two liquids is always less than between a liquid and a gas, and therefore a longer phase separation time is needed. Either the filter housing must be oversized or the flow rate greatly reduced to avoid carryover of the coalesced phase. As a rule of thumb, flow rate for liquid-liquid separation should be no more than one-fifth the flow rate for solid-liquid separation shown in the chart on page 77. Even at low flow rates, if the specific gravity difference between the two liquids is less than 0.1 units (for example, if an oil suspended in water has a specific gravity between 0.9 and 1.1), the separation time for the coalesced phase may be impractically long. In that case, if there is only a small quantity of suspended liquid, the filter tube can be used until saturated with the suspended liquid and then changed.

Another practical problem with liquid-liquid separations is that small quantities of impurities can act as surface-active agents and interfere with the coalescing action. For that reason it is not possible to predict accurately the performance of a liquid-liquid coalescing filter, and each system must be tested on site. The general guidelines for the system to start testing are to use Grade DX filter cartridges, and flow inside-to-outside at very low flow rates. If the suspended liquid is lighter than the continuous phase, the housing should be oriented so that the drain port is up. In general, Microfibre Filter Cartridges should be used for liquid-liquid coalescing in slipstream sampling applications only.

### Membrane Separation of Sample Streams

A Coalescer Membrane Combination Filter is designed to remove entrained liquid and particulate in gas samples for a wide variety of applications, and to prevent contamination or damage to the analyzers and sample system components. Microscopic pores contained within the membrane permit molecules of gas or vapor to flow through easily, allowing the composition of the sample gas to remain unchanged. However, even the smallest liquid molecules remain trapped and are unable to flow through the membrane's small passages under normal operating conditions. This is due to the high surface tension which causes liquid molecules to bind tightly together to form a group of molecules, moving together, which is too large to fit through the pores of the membrane.

The membrane is extremely inert, and is recommended for most process liquid applications, with the exception of hydrofluoric acid. It is also recommended for use in systems designed for PPB, PPM, and "percent level" component concentrations, as a result of its very low absorption characteristics. The membrane is strong and durable, but also very soft and pliable. Typically located upstream from the analyzer or component it is protecting, the Coalescer Membrane Combination provides protection even if other sample system components fail.

### Removing Gas Bubbles from Liquids

Microfibre Filter Cartridges readily remove suspended gas bubbles from liquid, eliminating the need for deaeration tanks, baffles, or other separation devices. Flow direction through the filter is outside-to-inside. The separated gas bubbles rise to the top of the housing and are vented through the drain port. If slipstream sampling is used, the separated bubbles are swept out of the housing with the bypassed liquid. Grade DX or Grade DQ is a good choice for gas bubble separation.



# Sample Filters

## Sample Filter Functions

### Quantitative Measurement of Solids in Gas

Quantitative determination of solids in gas, often a requirement in stack gas or other exhaust gas sampling, is readily accomplished using a Balston® Model 30 filter housing. In the Model 30 housing, the filter cartridge is sealed in place by a stainless steel spring acting on a lightweight stainless retainer disc (Figure 3). The retainer disc is pressed firmly into the end of the filter cartridge. When the housing is disassembled, the filter cartridge and retainer disc may be easily removed as a unit. At the beginning of the run, a tare weight is obtained on the filter cartridge-retainer disc assembly. When the filter is in service, flow through the filter cartridge is inside-to-outside so that even large solid particles which fall off the filter cartridge are held in the cartridge-disc assembly. At the conclusion of the run with a known volume of gas, the cartridge-disc assembly is reweighed, and the increase in weight can be expressed as solids concentration in the gas. Grade DH Filter Cartridges are recommended for high temperature sampling (up to 900°F/482°C). If the sampling or oven-drying temperatures do not exceed 300°F (149°C), Grade DQ may be used.

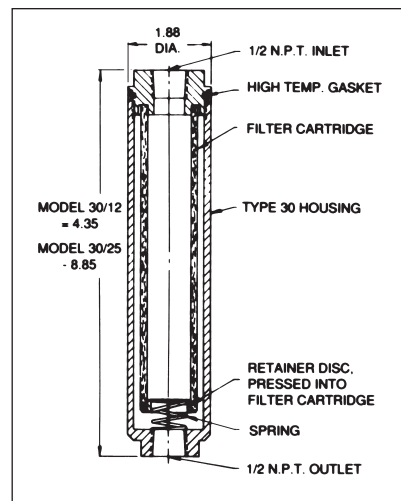


Figure 3

Filter cartridge and retainer disc of Model 30 housing may be weighed as a unit for quantitative determination of solids in gases.

### Slipstream or Bypass Sampling

Instrument sample use rates are invariably quite low, yet it is essential to minimize lag time in the sample system. Since analyzers often are located some distance from the sampling point, samples are usually transported to the analyzer at a relatively high flow rate to minimize lag time. The sample is divided at the analyzer, with the analyzer using the portion it requires (usually a very small fraction of the total sample), and the balance recycled to the process, or vented.

If the sample filter is located in the low-flow line to the analyzer, it will have good life between filter element changes because the solids loading rate is very low; however, the filter must be carefully selected to avoid introducing unacceptable lag time. If the filter is located in the high-flow portion of the sample system, its effect on sample lag time can be relatively low, but the life between filter changes may be inconveniently short because the element is filtering a much greater volume of material than the analyzer is using.

Ideally, a filter should be located at the point where the low-flow stream is withdrawn to the analyzer (Figure 4). This arrangement permits the main volume of the filter to be swept continuously by the high flow rate stream, thus minimizing lag time; at the same time, only the low-flow stream to the analyzer is filtered, thus maximizing filter life.

A slipstream filter requires inlet and outlet ports at opposite ends of the filter element to allow the high flow rate of the by-passed material to sweep the surface of the filter element and the filter reservoir, and a third port connected to the low flow rate line to the analyzer, which allows filtered samples to be withdrawn from the filter reservoir.

The Model 95 housings, 31GCFL, 41GCFL, 48S6, 49S6, DFU 8822-11, and DFU 8833-11 are ideal designs for slipstream sampling, since the inlet and the bypass ports are located at opposite ends of the housing, and the bypass port is as large as the inlet port. Larger housings, such as the Model 33S6, Model 45S6, and Model 27/35, can also be used for slipstream sampling, but the relatively small size of the drain port may limit the slipstream rate in some applications.

If bubble removal from a liquid is a requirement, this function may be combined with slipstream filtration, since the recommended flow direction for bubble removal is outside-to-inside, and the separated bubbles will be swept out of the housing by the bypass stream. In this case, the liquid feed should enter at the bottom of the housing and the bypass liquid exit at the top of the housing.

# Sample Filters

## Sample Filter Functions

### Slipstream Sampling Plus Coalescing Filtration

A special problem arises in slipstream sampling if the filter is to coalesce and continuously drain suspended liquid from a gas stream or to coalesce liquid droplets from a liquid stream. As noted earlier (see page 32), the coalesced liquid is removed in the form of large drops from the downstream side of the filter. Therefore, the coalescing filter requires two outlet ports, one for the dry gas and one for the liquid drain. To combine coalescing and slipstream filtration, a filter housing would need four ports - two for inlet and bypass and two for filtered gas and coalesced liquid - which is not a practical design. Therefore, slipstreaming plus coalescing requires two stages of filtration (Figure 5). The second (coalescing) stage must be located in the sample line to the analyzer, and should be as small as possible to minimize lag time. If the quantity of suspended liquid is not large, an in-line Disposable Filter Unit (9933-05 or 9922-05) may be considered as a trap for the suspended liquid, to be replaced when saturated.

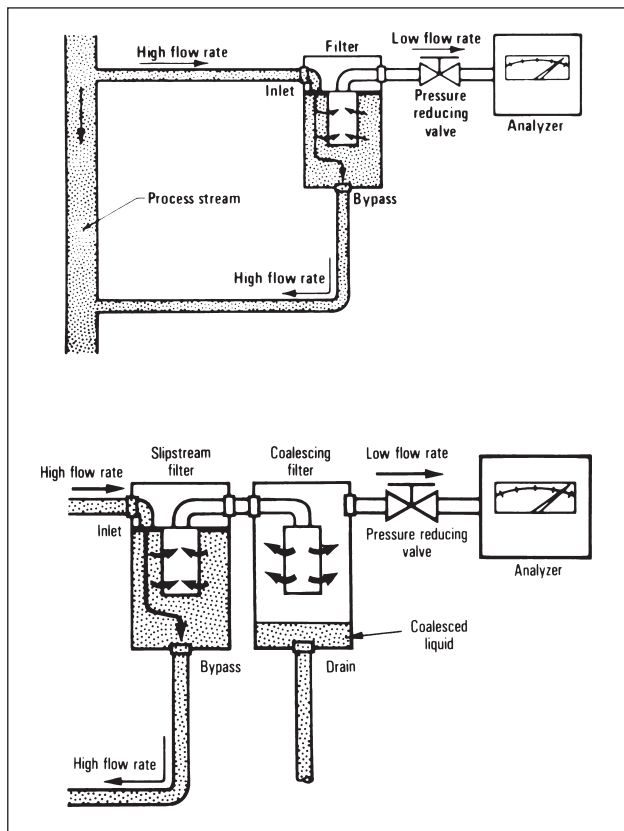


Figure 4  
Slipstream or  
bypass filtration

Figure 5  
Slipstream Filtration  
plus coalescing  
filtration

### Quantitative Measurement of Liquids in Gas

Quantitative determination of nonvolatile liquids suspended in a gas may be accomplished by a procedure similar to the solids determination (see page 68). In the case of liquids, the test is designed so that all the liquid entering the filter cartridge during the test period remains trapped on the fibers; i.e., the sample period is short enough that the filter cartridge does not become saturated and begin to drain liquid.

Any convenient filter housing may be used. The filter cartridge should be Grade BQ, to assure quantitative retention of aerosols, no matter what droplet size. With a known gas flow rate and test duration, the increase in weight of the filter cartridge will be a measure of the weight concentration of aerosol in the gas.

Considerable care must be taken to obtain a representative sample of aerosol in gas. If sampling from a large line, the sample probe should enter the pipe from above and if possible, extend into the pipe to avoid picking up liquid clinging to the wall of the pipe. There should be no valves, reducers, or sharp elbows in the sample line upstream from the filter.

# Sample Filters

## Application Recommendations

### Acid Plant Stack Gas

A frequently encountered sampling requirement is to analyze the gas composition in the exhaust from absorbers or scrubbers in acid manufacturing plants. The exhaust gas invariably contains droplets of dilute acid, which must be removed from the sample before it enters the analyzer. The recommendations are similar to those for natural gas sample filtration: Grade DQ or DX filter tube, inside-to-outside flow, and two stages of filtration if slipstream sampling is required. Depending upon the composition of the suspended liquid, housings may be stainless steel, PTFE (Model 95T), Monel (Model 95M), or PVDF (DFU 8822-11).

### Sampling Ambient Air or Other Atmospheric Pressure Gas

The filtration requirement for ambient air samplers is usually to remove solid particles or liquid droplets which could deposit on analyzer optical surfaces or cause other calibration problems. Grade DX or DQ filter cartridges are recommended. For low flow rate personal samplers, the compact and lightweight DFU 9933-05-DQ is often used. For higher flow rates, the Model 90 filter holder with Grade DX or DQ filters is recommended.

Ambient air sampling systems are often under negative pressure, induced by the sampling pump. If it is necessary to drain coalesced liquid from the system, the external reservoir is often the most convenient method (see Figure 2 on page 66).

### Sampling Water

Most water analyzers are well protected against the damage or calibration drift caused by solid contamination if a 10 micron (LP Grade 30) filter cartridge is used. If long filter life is desired in a system with high solids loading (including most tap water, well water, and cooling water), a two stage LP cartridge system is recommended: LP Grade 10 followed by LP Grade 30.

### Sampling Liquid Effluent Streams

Liquid effluent analyzers usually deal with aqueous streams having a high solids content. In addition, the analyzers are often located in remote areas of the plant and are infrequently serviced. Therefore, the sample filter system must have long life between filter cartridge changes, even in a high solids situation. The general recommendation for this requirement is a two stage filter system, LP Grade 10 filter cartridge followed by LP Grade 30 filter cartridge. The filters should be oversized as much as possible without causing excessive lag time. Plastic filter housings are usually a good choice.

Measurements of steam and condensate conductivity, specific ion concentrations, and feedwater additive concentrations are often required in high pressure boiler systems. In a continuous sampling system, the high pressure steam or condensate is cooled to below 100°F (38°C) and then the pressure is reduced to near atmospheric pressure for metering to the analyzers. Filtration is required upstream from the pressure reducing valves, to prevent pitting of the valve seats by suspended particles and to eliminate variations in flow rate to the analyzers.

A stainless steel filter housing with the appropriate pressure rating and Grade DX or DQ filter cartridge is recommended. Since the analyzer system is often located some distance from the sampling point, slipstream filtration is usually required. Figure 9 shows a sampling system in operation at a nuclear steam generating facility.

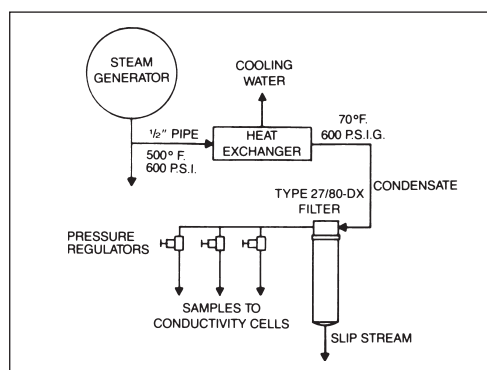


Figure 9

Model 27 filter with Grade DX filter cartridge protects pressure reducing valves in a steam condensate sampling system.

# Sample Filters

## Application Recommendations

### On-Line Process Analyzers

The variety of filtration requirements for on-line process analyzers precludes making general recommendations above for the required filtration functions. The filter housings most frequently used for process analyzer applications are the Model 95S6 and Model 91S6, which provide the corrosion resistance of Model 316 stainless steel (complies with NACE specification MR-01-75), a pressure rating of 5000 psig (345 barg), have full slipstream sampling capability, and minimum internal volume.



Figure 6  
Model 95S6, 316 stainless steel with 5,000 psig pressure rating, is the filter housing most frequently used in process analyzers

### Natural Gas Analyzers

To protect gas composition analyzers from liquids and solids, Grade DX or DQ filter tubes are recommended, with inside-out flow direction. If both slipstream sampling and coalescing are required, a two stage system must be used, as described on page 75.

The Model 85, 5000 psig (345 barg) rating and Model 37, 4000 psig (276 barg) rating housings comply with NACE specification MR-01-75. For lower pressure applications, any stainless steel housing of appropriate flow capacity may be used.



Figure 7  
Model 85 (left) or Model 37/12 (right) are used for natural gas sample filtration when a housing larger than the Model 95S6 is required

### Stack Gas Sampling

The Model 30 housing with Grade DH filter cartridge is used for quantitative determination of solids in stack gas, as described on page 68. The Model 30 may also be used as a beginning-of-the-line filter at stack gas temperature up to 900°F (95°C), to prevent solids from entering the gas sample line. Grade DH is used for this purpose. After the sample is cooled, a coalescing filter with Grade DX tube is used to remove suspended liquids before the sample goes to the analyzer. Flow direction is inside-to-outside. Model 33G or 45G housings are often used in this application to permit a visual check on the liquid level in the filter housing. Since there often is a considerable amount of liquid present at this point, positive steps must be taken to drain the housing to ensure that liquid does not build up and carry downstream to the analyzer.

The coalescing filter should be located as close to the analyzer as possible to minimize the chance of condensation between the filter and the analyzer. Additional precautions which can be taken to avoid downstream condensation are to cool the sample below ambient temperature upstream from the coalescing filter, and to heat the line.

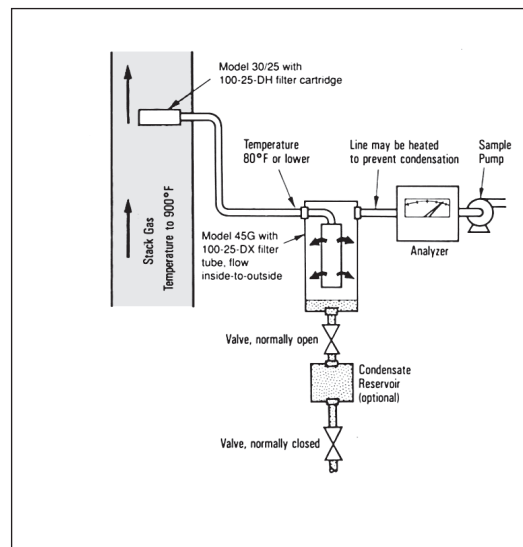


Figure 8  
Stack gas sample lines usually require a high temperature solids filter at the sample point and a condensate separator immediately upstream from the analyzer

# Sample Filters

## Filter Cartridge and Housing Selection

**Table 1 Filter Cartridge Description**

<b>LP Cartridges:</b>	Designed to filter liquids with high solids contents. Have an integral prefilter and an external support structure (flow direction is inside-to-outside).
<b>X-Type Cartridges: Coalescing</b>	Used for solids and relatively large amounts of suspended liquids in gases. Provide excellent chemical resistance, temperature resistance to 300°F (150°C), and good mechanical handling properties. These cartridges have thick walls for improved coalescing efficiency. Should be used whenever permitted by housing internal volume. Fluorocarbon Resin Binder.
<b>Q-Type Cartridges: Particulate</b>	Used for solids and trace amounts of liquids in gases. Also ideal for liquid service and removal of particulates. Similar to X-Type cartridges in chemical and temperature resistance. Fluorocarbon Resin Binder.
<b>S-Type Cartridges: Particulate</b>	Used for solids and trace amounts of liquids in gases. Also ideal for liquid service and removal of particulates. Improved chemical and temperature resistance properties over Q-Type. PTFE Resin Binder. Max temp 500°F.
<b>H-Type Cartridges: Particulate</b>	Recommended for oxygen service or when X-Type or Q-Type are unsuitable. H-Type cartridges have temperature resistance to 1000°F (538°C) in dry gas, 100°F (38°C) in liquid. Quartz construction.
<b>M Type Sintered Stainless Steel Cartridges: Particulate</b>	Designed for applications having heavy loading of solid contaminants. These cartridges are also suitable for removing heavy, viscous liquids from gases and as prefilters to high efficiency final filters. Constructed of 316 stainless steel with molded viton end seals.
<b>CI Cartridges: Vapor Adsorption</b>	Used to remove trace quantities of oil vapor. Activated carbon sandwiched between two layers of microfiber filter media absorbs oil vapor. Must be prefiltered with Grade DX and Grade BX. Max. operating temp. is 180°F/82°C.

### Filter Cartridge Description

Parker Hannifin supplies filter cartridges in three different designs: LP Cartridges, Sintered Stainless Steel Cartridges, and Microfibre Filter Cartridges (X, H, or Q-type). See Table 1 for descriptions:

### How To Select The Filter Cartridge

- 1 When selecting a cartridge, do not overspecify. Select the coarsest grade which will adequately protect the instrument. Coarser grade filters provide lower pressure drop and longer life than finer grades.
- 2 When selecting X, Q, or H type cartridges, a D or B positioned before the cartridge type will determine the retention efficiency (see chart to the left). For LP and Sintered Stainless Steel Cartridges, the numerical Grade value indicates retention efficiency (see Table 2).

Refer to the chemical compatibility chart on page 38 to confirm compatibility of the filter cartridge material with the sample composition.

**Table 2 Retention Efficiency of Filter Cartridges for Gas and Liquid Sample Filtration**

Gas Filtration at 0.01 µm	
<b>Microfibre Filter Cartridges</b>	
Grades DX, DQ, DH, DS	93%
Grades BX, BQ, BH, BS	99.99%
Grade AQ	99.9999+%
Grade AAQ	99.99999+%
Liquid and Gas Filtration at Indicated Micron Size	
<b>Sintered SS Cartridges</b>	
Grade 5M	5 µm Nominal
Grade 10M	10 µm Nominal
Grade 20M	20 µm Nominal
Grade 40M	40 µm Nominal
Grade 70M	70 µm Nominal
Grade 00M	100 µm Nominal
Liquid Filtration (98% retention)	
<b>Microfibre Filter Cartridges (98% retention)</b>	
Grades DX, DQ, DH, DS	25 µm
Grades CX, CQ, CH, CS	8 µm
Grades BX, BQ, BH, BS	2 µm
Grade AQ	0.9 µm
Grade AAQ	0.3 µm
LP Cartridges (80% retention)	
Grade 10	75 µm
Grade 20	25 µm
Grade 30	10 µm
Grade 50	1 µm

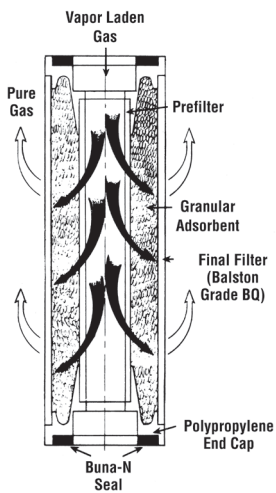
### How To Select The Filter Housing

- 1 Select a filter housing in the material appropriate for your application. Please refer to the Application Index on page 76, and the appropriate data sheet.
- 2 Select a filter housing with a port size equal to the line size where the filter is to be located. If the line size at the filter has not yet been selected, determine the gas flow rate and pressure at the point where the filter will be located, and refer to the appropriate flow chart on pages 77 and 78 of this bulletin. Flow rates for liquids are located on page 77 and flow rates for air and gas sample filters are located on page 78.



# Sample Filters

## Vapor Adsorption Cartridges



Type CI Vapor Adsorption Cartridges contain a bed of adsorbent granules in the annular space between two Microfibre Filter Tubes, with permanently bonded end caps. Utilizing a wide choice of adsorbents, the Type CI cartridges selectively remove vapors from air and other gases. Flow direction is inside-to-outside through the cartridge, and the outer Microfibre Filter cartridge serves as an integral final filter to prevent carryover of adsorbent particles.

For low flow applications, Disposable Adsorption Units (DAU) provide a means of utilizing the same choice of adsorbents used in the Type CI cartridges in a completely disposable package.

Because the absorbed vapor remains trapped in the solid bed, the Type CI cartridge has a fixed upper limit of total weight of vapor which can be captured. It is usually not feasible to regenerate the cartridge when it has reached its adsorption limit. Type CI cartridges should be used only when small quantities of vapor are to be removed.

### Adsorbents used in Type CI Cartridges

Adsorbent	Grade No.	Use For
<b>Carbon</b>	000	Compressor oil vapors, C <sub>5</sub> and heavier hydrocarbons, aromatics, oxygenated hydrocarbons, chlorinated organics, freons, carbon disulfide.
<b>Molecular Sieve Type 13X</b>	103	Most C <sub>4</sub> and lighter hydrocarbons, ethylene, propylene, acetylene, ethylene oxide, ammonia, mercaptans, sulfur hexafluoride, triethylamine, and smaller amines.
<b>Mixed Sodium and Calcium Hydroxides</b>	107	all acidic gasses, including sulfur trioxide, sulfur dioxide, nitrogen dioxide, carbon dioxide, hydrogen sulfide, hydrogen chloride, phosphorus trichloride, boron trifluoride.

### Considerations in Using Adsorbent Cartridges

The following factors should be considered when selecting a vapor adsorbent cartridge:

- 1 Solid adsorbents are effective only for vapors. Since liquids will damage or inactivate most solid adsorbents, the Type CI cartridge or DAU must be preceded by an efficient coalescing filter.
- 2 In contrast with Microfibre Filters, which operate at their initial efficiency throughout their life, adsorbent cartridges have a limited holding capacity. When the adsorption capacity is reached, no further adsorption occurs. The limiting capacity, or “break-through” point, is not sharply defined, and the exit vapor concentration will increase rapidly as saturation is approached. To avoid unwanted vapor contaminants downstream, it is necessary to change the adsorbent cartridge well before it has reached its ultimate adsorption capacity.
- 3 Adsorption is reversible, if operating conditions change, a vapor may desorb rather than adsorb. For example, if a temporary surge in vapor impurity concentration causes a relatively high concentration to be absorbed on the solid, a subsequent decrease in inlet vapor composition will result in desorption of vapor from the solid to the gas stream.
- 4 The efficiency of a given adsorbent for a given vapor depends upon the specific operating conditions. Therefore, again in contrast to filtration, it is not possible to assign a single efficiency rating to an adsorbent. While it is not possible to predict or guarantee an adsorption efficiency for any specific set of conditions, it is possible to enhance the conditions beneficial to adsorption and avoid conditions which interfere with adsorption. Conditions which aid adsorption are: low temperature, high pressure, low flow rate, and absence of competing vapors (particularly water vapor).

# Sample Filters

## Stainless Steel Sintered Metal Filter

Remove solids and liquids from gas samples

Remove solids from liquid samples

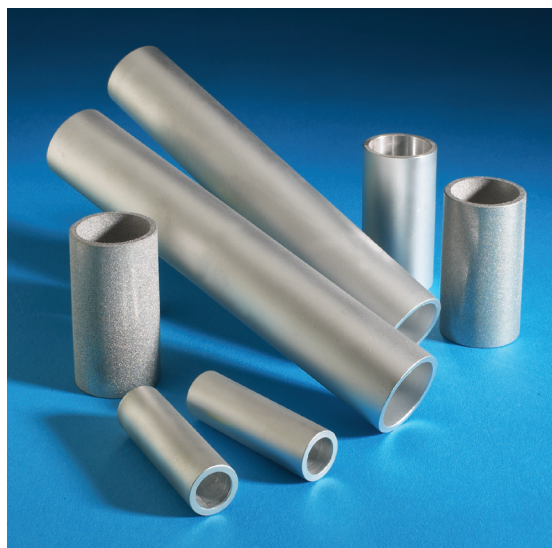
Filtration efficiencies from 5 to 100 micron

316L stainless steel construction

Long life, cleanable filter cartridges

Temperature resistance to 400°F (204°F)

Up to 200 psid (14 barg) (differential pressure)



### Advantages

The Balston Stainless Steel Sintered Metal Filter is suitable for applications which require a durable, low maintenance reusable stainless steel filter. The filter cartridge is constructed of 316 stainless steel with two molded Viton gaskets. It may be installed in select Balston filter housings which are designed to accommodate an 050-11, 100-12, and 100-25 size filter cartridge. The Balston Stainless Steel Sintered Metal Filters may be used in liquid or gas service, to filter particulate sized from 5 micron to 100 micron, depending on the grade of the filter used.

The Balston Stainless Steel Sintered Metal Filter has excellent chemical resistance characteristics.

Installation of the Balston Stainless Steel Sintered Metal Filter is straightforward and requires approximately 2-3 minutes. First, remove the filter bowl from the filter housing into which the filter will be installed. Next, place the molded Viton gaskets on to the ends of the cartridge. For 050-11 elements, make sure the shoulder of the gasket fits snugly onto the outer diameter of the cartridge. Finally, holding the gaskets in place on the cartridge, slide the cartridge on the support core or tie rod of the housing, and reassemble the filter housing.

Check the filter housing for leaks after reassembling.

The Balston Stainless Steel Metal Filter Cartridge should be removed from service and cleaned annually, or when the pressure drop across the filter is significant enough to adversely affect the user's application.

The cartridge may be cleaned by backflushing or ultrasonic methods. After cleaning, visually inspect the filter cartridge to confirm it's integrity for continued service.

### Applications

Samples with heavy loading of solid contaminants

Removal of heavy, viscous liquids from gas samples

Prefilters to final high efficiency filters

Ideal for sample lines that are periodically back-flushed

High temperature applications