

Introduction to Filters

Master Pneumatic



General Purpose Filters
Coalescing Filters



Series 350



Series 380

Several Types of Filters Remove Contaminants from Compressed Air

- General Purpose --- Remove water and particulate matter
- Coalescing --- Remove oil and solids of a given size
- Master Pneumatic also manufactures Adsorbing filters designed to remove taste, odors and additional oil vapor. Our Filenco desiccant dryer/filters are designed to filter air, drop pressure dew point, and remove oil mist.



Why Do You Need a Filter?

Dirt, moisture, and oil are everywhere. Several types of contaminants are:

- Particulates such as dust, dirt, pollen, smoke, & exhaust emissions
- Moisture in the form of water droplets
- Oil from the ambient air & compressor oil carryover
- Caustic gases such as sulfur oxides, nitrogen oxides, and chlorine compounds



Vanguard

Note: General Purpose Filters are not designed to remove oil. Instead, use a Coalescing Filter to remove oil.



Did you know that when you compress air up to 125 psig(8.6 Bar), you increase the concentration of contaminants 8 times?



Miniature

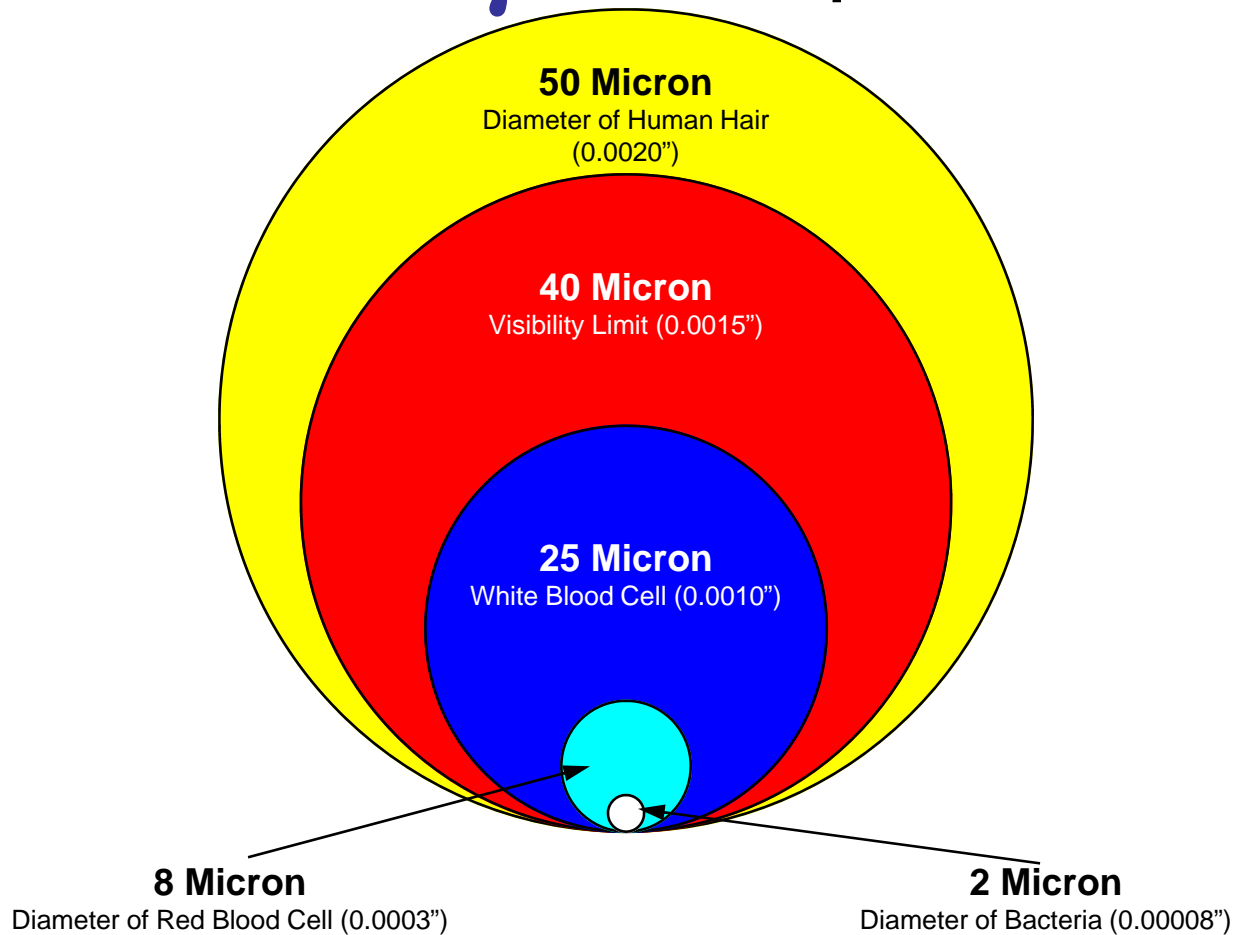
The results of contaminated compressed air are:

- Premature wearing and scoring of surfaces.
- Rust and corrosion of tools, piping, and equipment
- Damaged instruments
- Spoiled paint surfaces
- Increased scrap rate
- Unsafe/unpleasant work environment



Particulates-

Micron μ Comparison



General Purpose Filter

- Used in a Compressed Air system to stop dirt, pipe scale, water, and contaminants from passing downstream causing damage.
- Removes contaminating water emulsions and particle removal down to 5 micron.
- **Install as close as possible to the component it protects.**
- Replace elements frequently for optimal filter performance.
- 5 Micron Polyethylene standard (Some of the larger size products have 40 micron bronze as standard)
- Bronze options E3 (40 micron), E4 (20 micron) E5 (5 micron)



Sentry



MP General Purpose

Filters have the following ranges

- Product port size range from 1/8" to 2"
- Flow Rate from 10 scfm (4.7 l/s) to 1000 scfm (47 l/s)
- Element sizes from 5 um to 40 um
- Float, Auto or Manual drains are available in most product series.
- Other options can be accommodated **Consult factory**



High Flow
Vanguard



MP General Purpose Filters

...Several families are offered

- **Sentry and Miniature Series** – Polycarbonate bowl is standard. Metal bowl is optional.
- **Guardzman Series** – Polycarbonate bowl with metal shatterguard is standard. Metal bowl optional.
- **Guardzman 2 Series** – Metal bowl with sight gauge is standard.
- **Vanguard and Vanguard High Capacity** – Polycarbonate bowl with metal shatterguard is standard. Metal bowl optional with sight gauge. Metal bowl only 1 ¼"-2"
- **Series 350 & Series 380 with Color Cap Option** – Polycarbonate bowl with nylon shatterguard is standard. Metal bowl optional.



Why Master Pneumatic Filters?

- **Made in USA**
- M/P stands behind the product with a **7 YEAR** warranty
- Vast technical knowledge – since 1950
- Product has been proven with 60+ years of service
- Designed for safety and performance



High Flow
Vanguard



Filter Maintenance - Elements



- **Pressure Drop – Replace contaminated filter elements to avoid excess pressure drop.**
- **NOTE: A 10 psi (0.7 bar) pressure drop is excessive.**
- **Each compressed air circuit contains different levels of moisture and contaminants.**
- **Elements should be inspected soon after a new filter is first installed to determine the level of contamination.**

**Please note that a pressure drop can be critical
to the products being operated.**

Pressure drop occurs in pipe lines and bends in the piping.





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MP offers Several Drains for General Purpose Filters

Internal :

- *Automatic
 - » Float Design
 - » Differential Pressure
- *Manual



External:

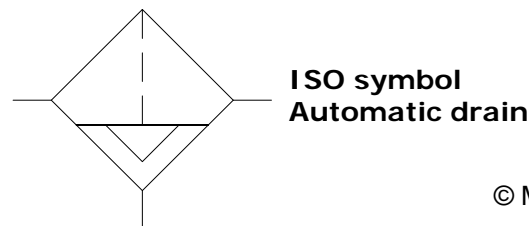
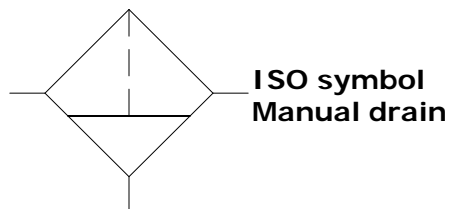
- * Warrior Electronic Control
- * Hydro-Jector (Float Design)



MP General Purpose Filters

Internal Drains

- In many industrial compressed air systems, the “standard” drain is a **manual** type. Maintenance has to visit the location on a regular basis to ensure that free water and the “soup” of contamination that the filter strips from the air is drained before it can re-entrain into the downstream air.
- **How often do you think this happens??**
- **Float drains** work on the float principal. As water and contamination accumulates in the bottom of the bowl, it will ultimately lift a float, and the air pressure in the bowl will vent to atmosphere through the opening, “blowing” the water from the bowl as it does. When the accumulated water is gone, there’s nothing left to “float” the valve operator, and it drops back into the orifice, sealing off the exit from the bowl.

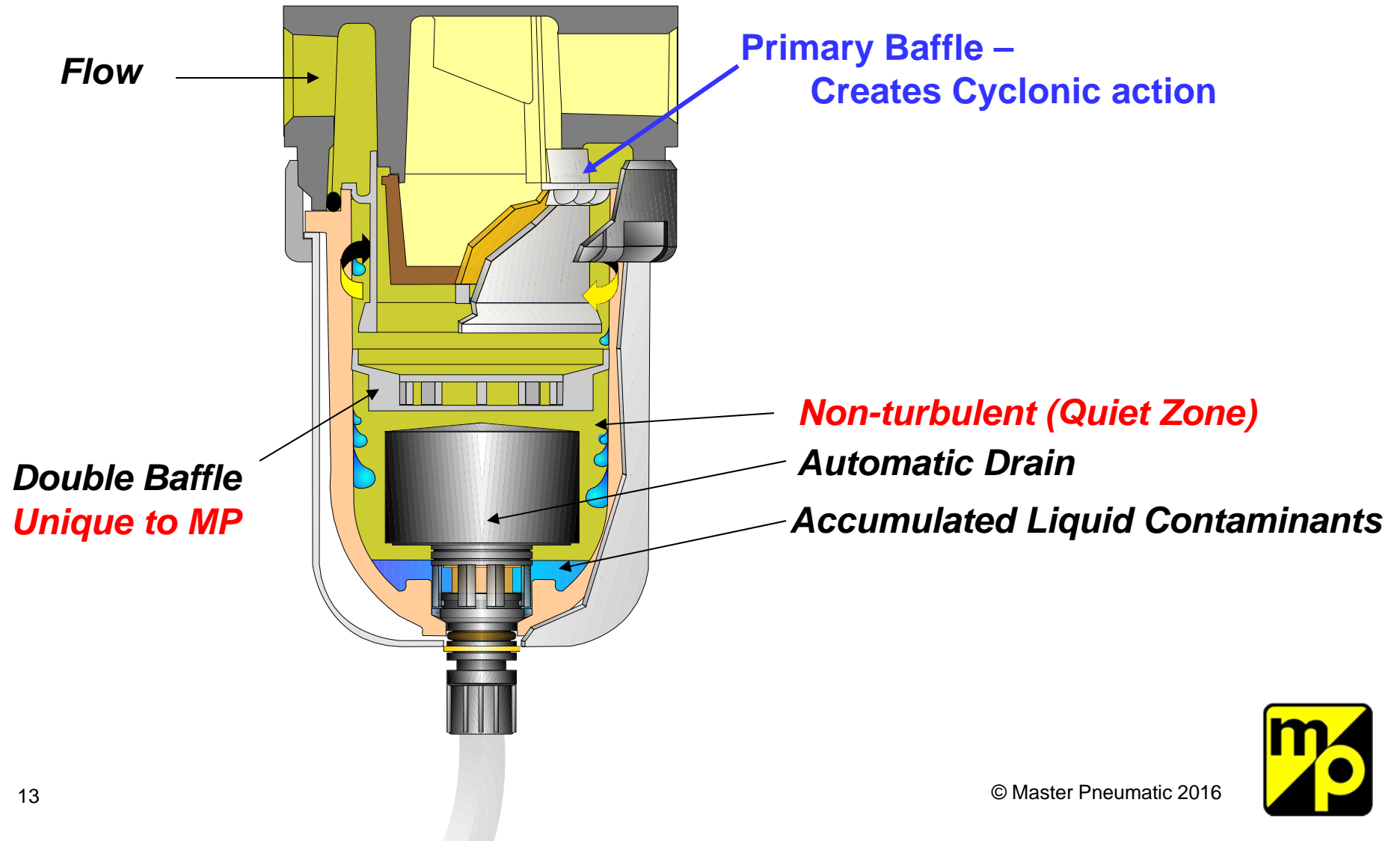


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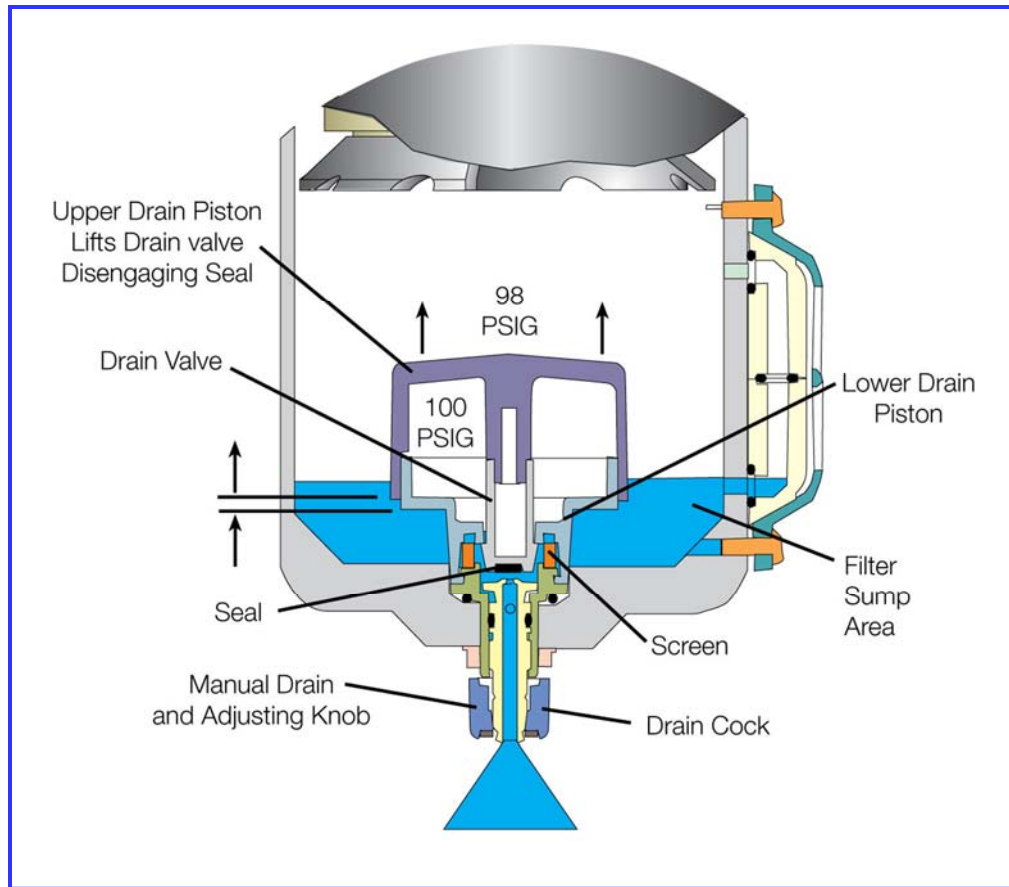


MP General Purpose Filter Design

Internal Drain (Differential Type)



Automatic Internal Drain Operation



- Differential Pressure Design
- **Note:** There must be a **pressure drop** across the filter having this type of automatic drain. If the application is continuous flow, a float drain must be used.
- An air filter **auto-drain** will ensure that the filter bowl is drained as necessary, without operator intervention.

MP General Purpose Filters

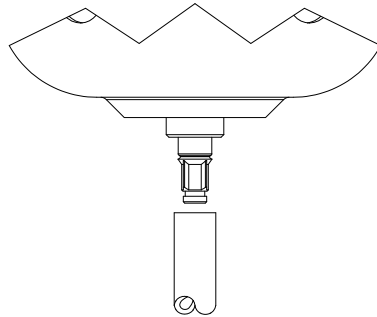
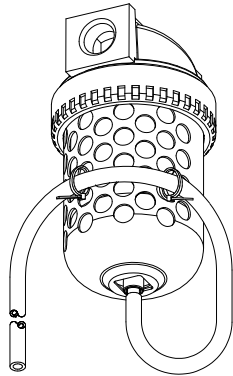
External Drain Application

- Use where severe condensation problems exist
- Liquid will drain regardless of air flow and with no loss of air
- Maximum discharge rate approximately 5 gallons (18.9 L) per minute at 100 psig (6.9 Bar).
- Self Flushing action removes contaminated water

Hydro-Jector



Tube Away



In applications where fluid in the bowl should not be vented into the atmosphere, Tube Away Kits are available to divert the fluid into the proper receptacle.



Available for all general purpose and Coalescent filters, including Sentry and Miniature Filters

General Purpose Filters

With External Drains Installed

ELECTRONIC CONTROLLED WARRIOR DRAIN



Assembled in Series 380

HYDRO- JECTOR

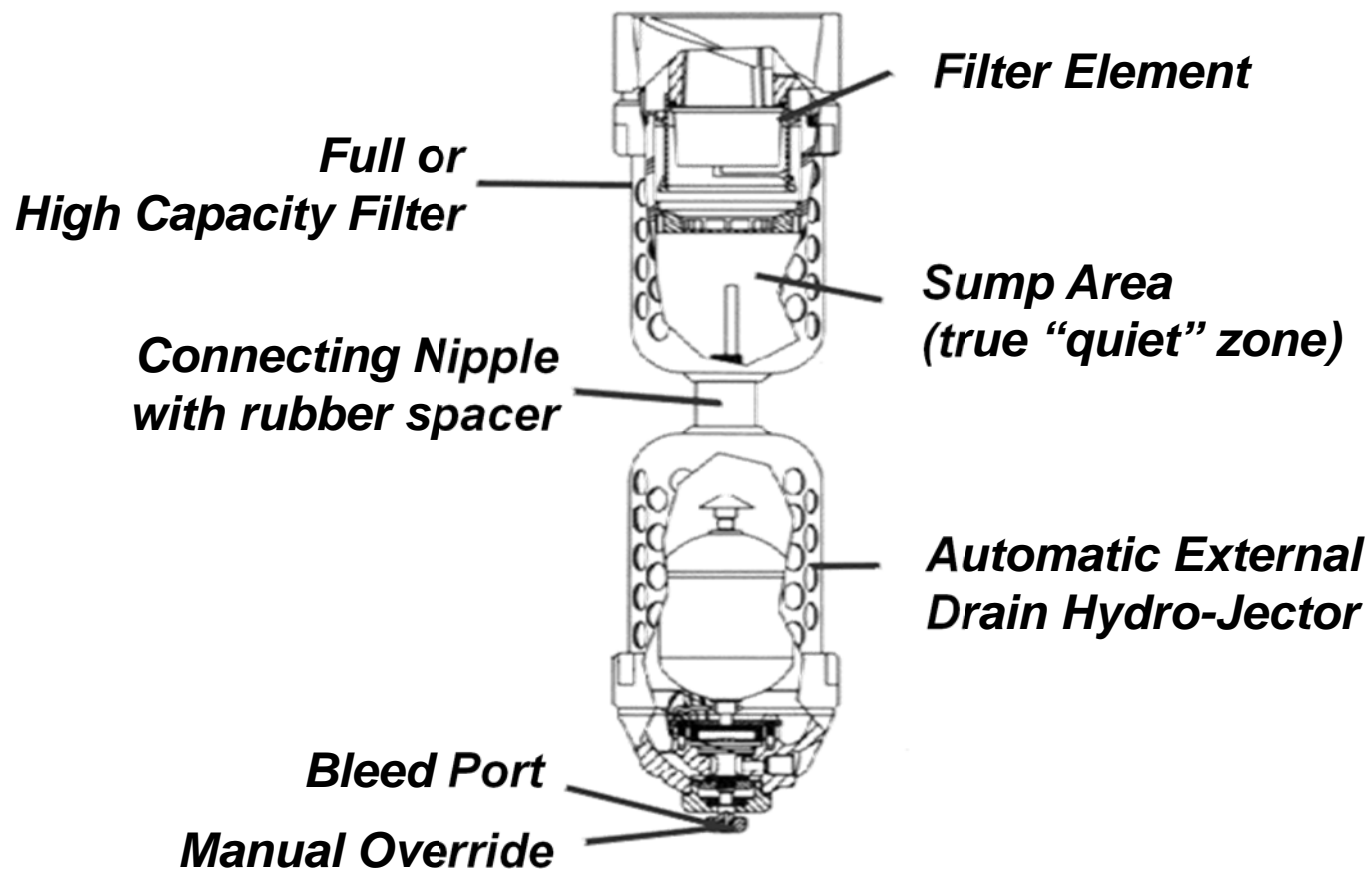


Warrior Drain kit

Assembled in
High Flow
Vanguard



Automatic External Drain/Filter Installation



Hydro-Jector

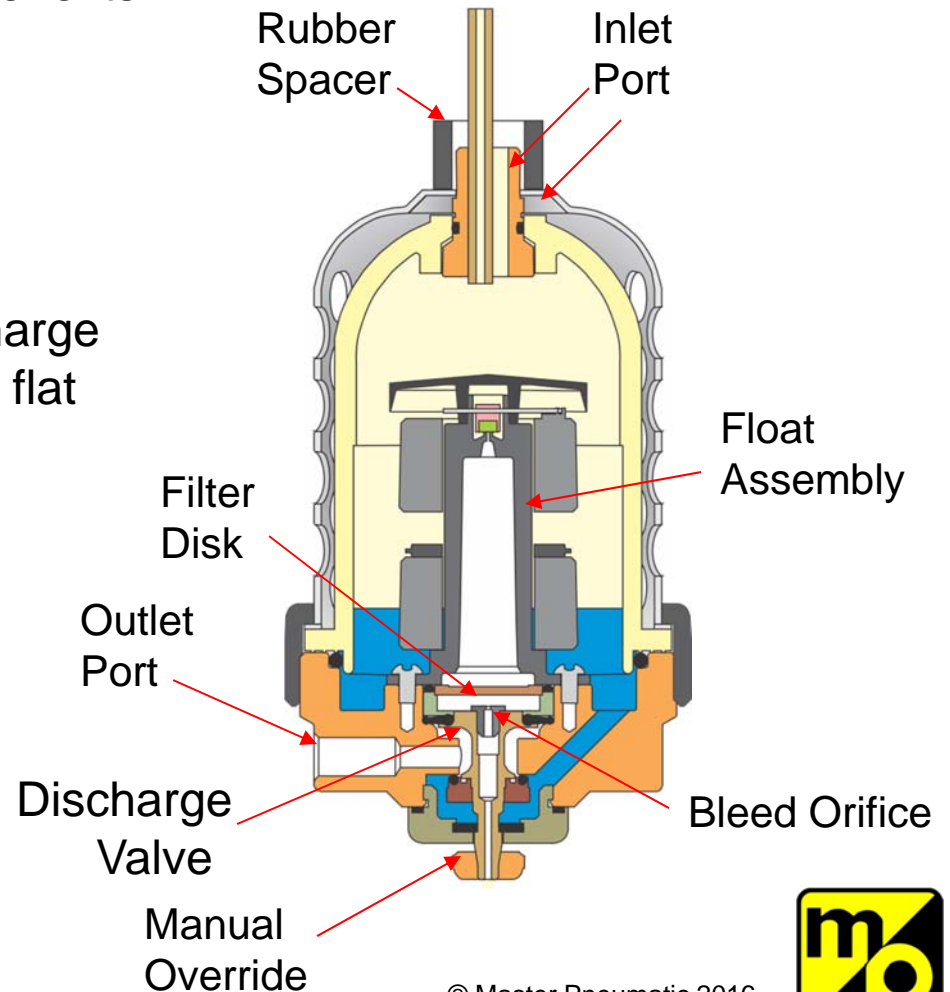
Section View

New Design

New design provides the following benefits:

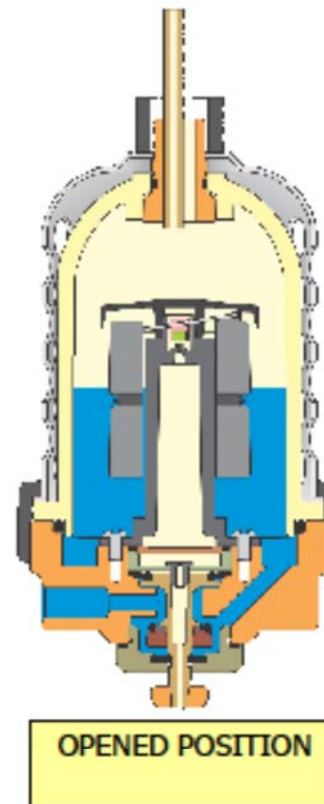
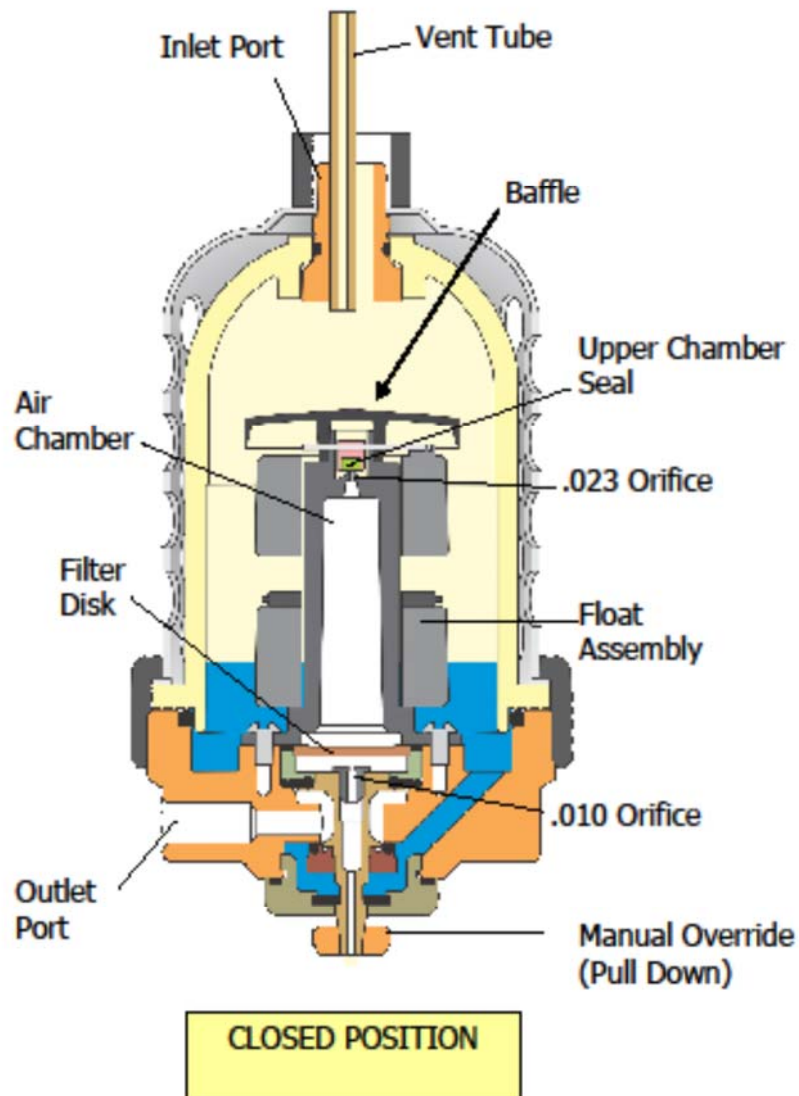
- Improved reliability
- Lower profile
- Less weight
- Improved sealing capacity of Discharge Valve by using “O-Ring” instead of a flat seal

Not recommended where heavy oil or foam is present as can be the case in separators or large aftercoolers



Master Pneumatic Hydro-Jector

The Hydro-Jector basically is a high flow float drain.



Fluid enters the E100 Hydro-Jector at inlet port.

The baffle prevents incoming contaminants from entering the air chamber and minimizes any affect on the float.

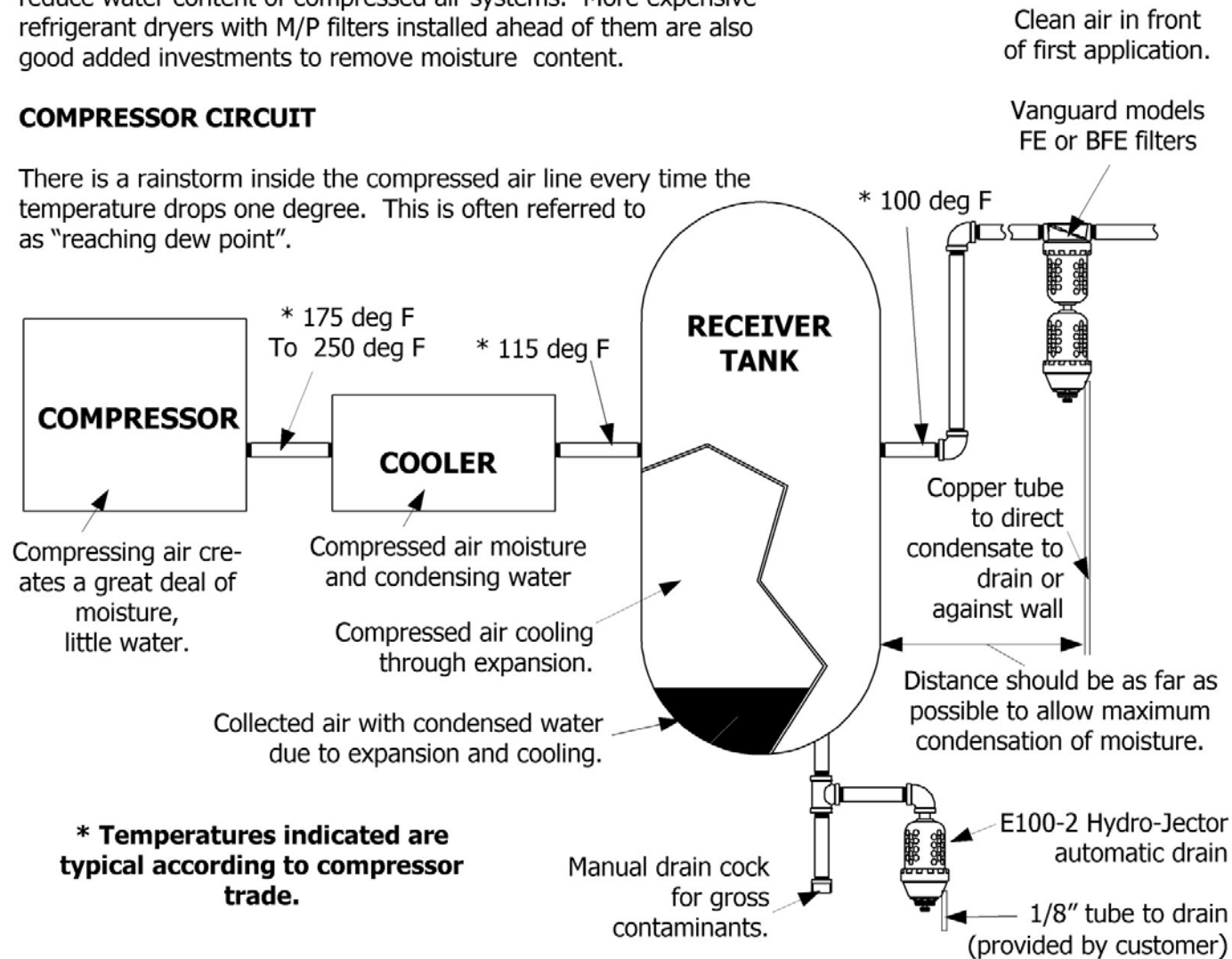
When enough fluid is present to raise the float, the .023 orifice is opened allowing compressed air into the air chamber. This action forces the piston to open discharge valve allowing fluid to exit the 1/4" port in body. Since the bleed-off screw has a smaller orifice (.010), there is practically zero air loss as the fluid exits the body and the float falls, closing upper chamber seal.

Hydro-Jector Usages

Master Pneumatic heavy duty filters and hydro-jectors dramatically reduce water content of compressed air systems. More expensive refrigerant dryers with M/P filters installed ahead of them are also good added investments to remove moisture content.

COMPRESSOR CIRCUIT

There is a rainstorm inside the compressed air line every time the temperature drops one degree. This is often referred to as "reaching dew point".



How to Select MP Filters

■ **Flow requirement SCFM (l/s)**

- Pipe size and thread type
- Inlet & Outlet pressure(s)
- Metal or Polycarbonate Bowl
- Drain Type
- Temperature Range
- $1 C_v = 25 \text{ SCFM (11.8 l/s) @100 psig (6.9 bar)}$ (*ballpark*)
- **Compressor Horse Power X 4 or 4.5 = SCFM** (*ballpark*)

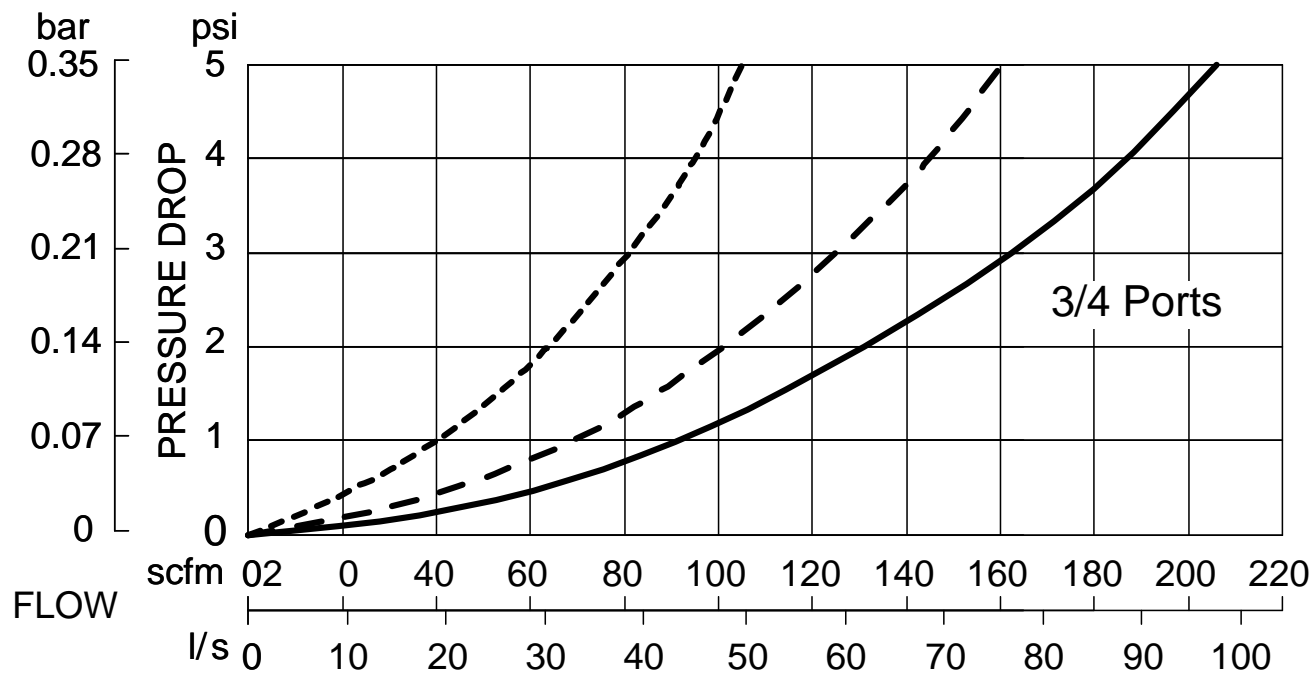
* **SCFM**

Standard Cubic Feet per Minute (SCFM) is a volumetric flow-rate corrected to a set of "standardized" conditions of pressure and temperature. The standard conditions are often defined as some pressure (e.g., 14.7 psia and some temperature (e.g. 68 F), depending on the "standard" used.



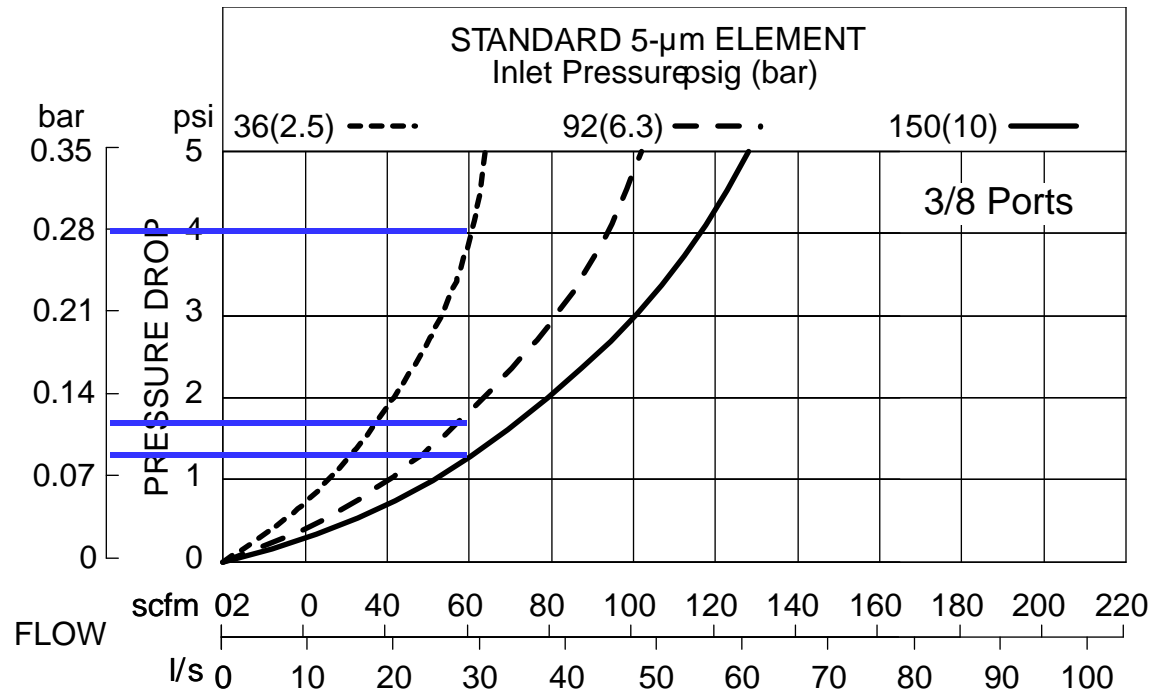
How to Select MP Filters

- **Flow requirement-** This is critical to using the correct Filter in the application. MP may have several different Filters with a particular port size, but all will have different flow capabilities.
- Typically, you want to specify the product with the lowest pressure drop at your desired flow rate.



How to Select MP Filters

- The graph below shows (3) different inlet pressures per the ISO standards. (NOTE: The flow v. pressure drop curves are based on a dry element. A wet element will have lower flow/higher pressure drop ratings).



As shown above, if desired flow is 60 scfm (28 l/s), pressure drop will be higher with lower inlet pressure.

36 psig (2.5 bar) inlet-4 psig (0.28 bar) drop at 60 scfm (28 l/s)

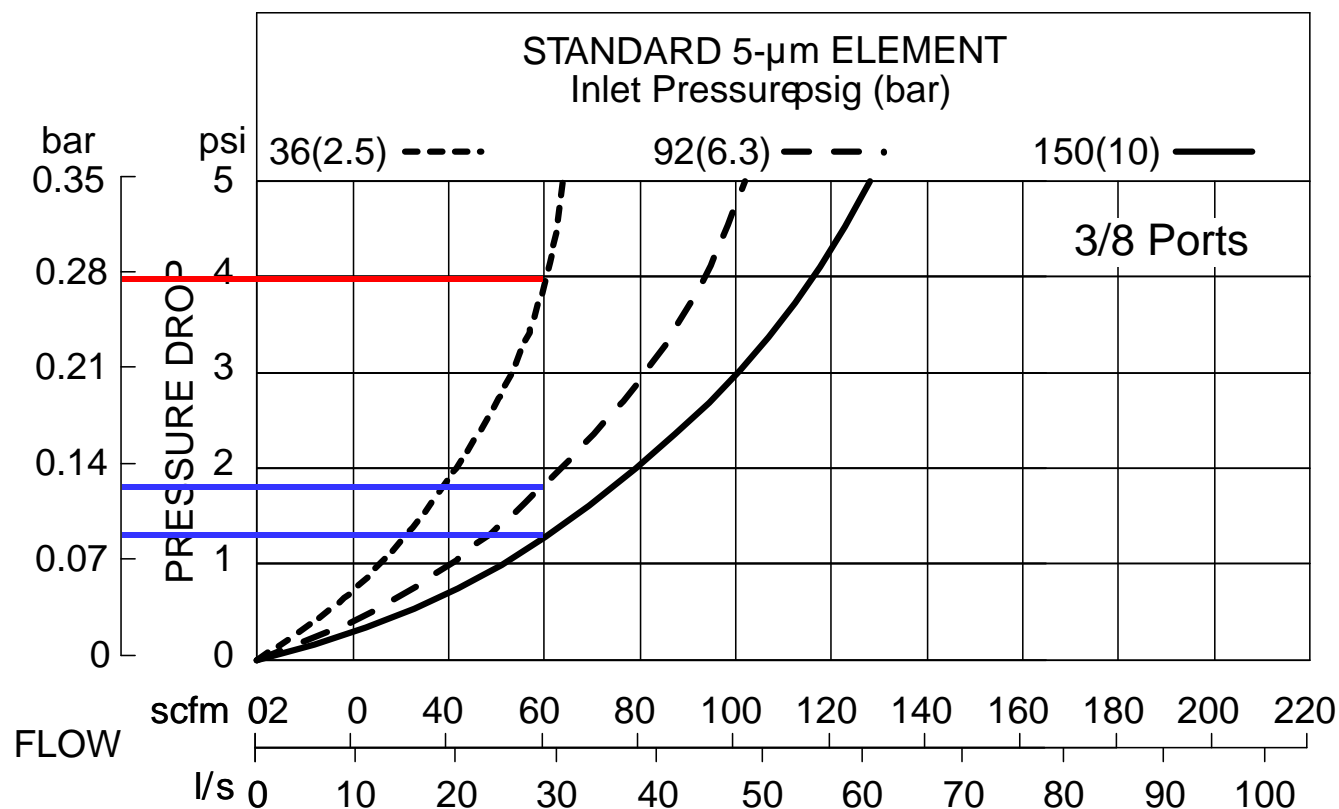
92 psig (6.3 bar) inlet-1.75 (0.12 bar)psig drop at 60 scfm (28 l/s)

150 psig (10 bar) inlet-1.25 psig (0.08 bar) drop at 60 scfm (28 l/s)



Sizing (cont'd)

In this example, if your inlet pressure is low, you should consider another MP filter that has a lower pressure drop at the desired flow rate. Starting out with a new filter that has a 4 psig (0.28 bar) drop is not a good practice.

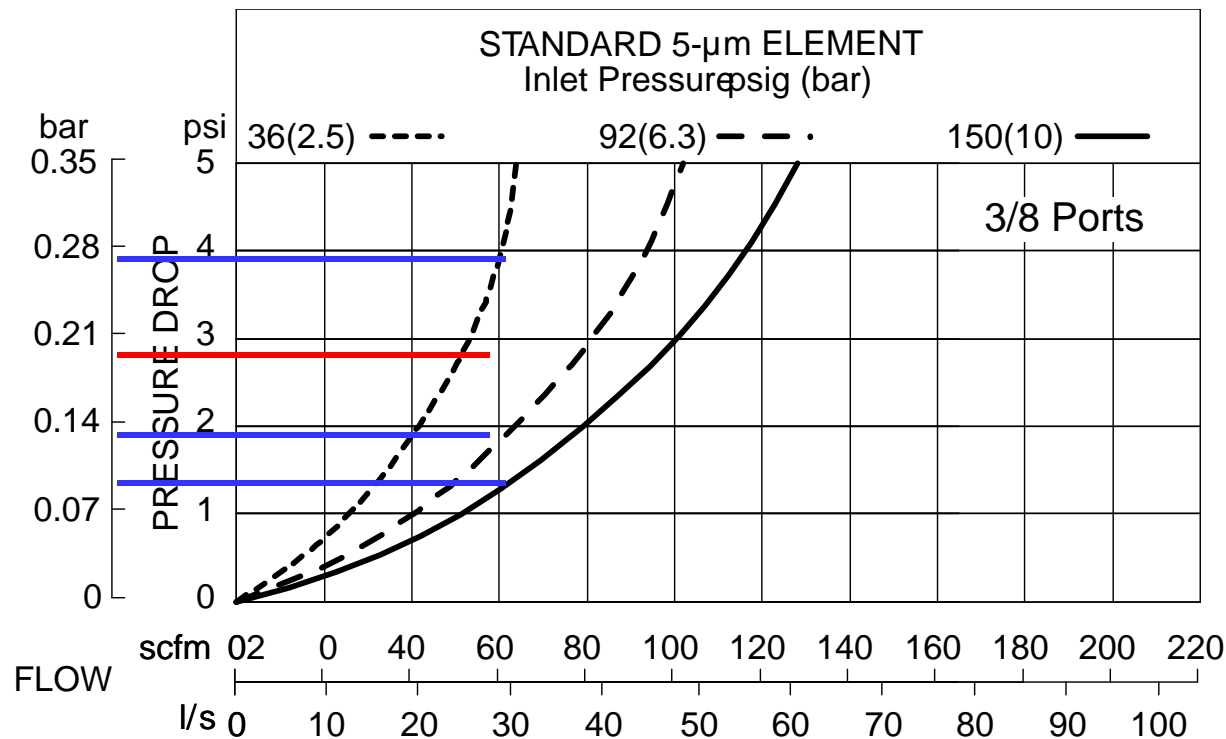


More coarse elements (20 μ or 40 μ) will decrease pressure drop but will also allow larger particles to pass downstream.



Sizing (cont'd)

- If your inlet pressure is between the inlet pressures shown, you can approximate where the pressure drop would intersect the flow curve for your inlet pressure. The red line below would show the approximate pressure drop at 60 scfm (28 l/s) with an inlet pressure of 55 psig (3.8 bar).



- Contact MP if more exact information is required.
Calculations can be done for other inlet pressures.



General Purpose Air Filter & Port Sizes.

(Approximate size relationship as shown)



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This slide and the next slide are also available as a 1 page, front & back handout.

The “Complete Product Sheet” gives an overall picture of MP’s range of general purpose filters. See catalog for more detailed information.



General Purpose Air Filter & Port Sizes.

Boxes that are marked with yellow are available options for the product listed. Numbers and letters inside each yellow box reflects the proper suffix / prefix needed. See Master Pneumatic catalog for complete product breakdown chart.

PIPE SIZE CHART

	TUBING						NPTF AND BSPP PIPE THREADS									
	1/4	3/8	1/2	3/4	1	1 1/4	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	
FD10	04	08	M4	M8	M8	M10	1	2								
FD50							1	2								
FD80								2	3	4						
BF070								2	3	4						
FD100								2	3	4	8X					
PSA350								2	3	4						
FD380									3	4						
FD100											8	R				
BF0200											8	R	10	12		
BF0400													10	12	18	

To download go to:

www.masterpneumatic.com,

Catalog & Literature tab;

English Version;

Catalog;

Complete Product Sheets

	FD10	FD50	FD80	BF070	FD100	PSA350	FD380	FD100	BF0200	BF0400
BOWL (prefix)										
Metal	B	B	B	B	B	B	B	B	B	B
Plastic										
DRAIN (prefix)										
Automatic	FD	FD	FD	FD	FD	FD	FD	FD	FD	FD
Float - brass stem (only with metal bowl option)					BF6A	BF6A	BF6A	BF6A	BF6A	BF6A
Float - plastic stem (Only with plastic bowl option)					FSA	FSA	FSA	FSA	FSA	FSA
Manual	F	F	F	F	F	F	F	F	F	F
No Drain	LDC	LDC			LDC	LDC	LDC	LDC	LDC	F7A
Hydro-jector (Float)					LDC	LDC	LDC	LDC	LDC	F7AE
ELEMENTS (suffix)										
5µm bronze	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5
5µm polyethylene										
20µm bronze	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4
40µm bronze	E3	E3	E3	E3	E3	E3	E3	E3	E3	E3
BOWL LENGTH (prefix)										
Standard										
Extended					H					
DIFFERENTIAL PRESSURE GAUGE (prefix)										
No gauge										
Small gauge						S	S	S	S	S
Large gauge						L	L	L	L	L
Reed switch (normally open)						E	E	E	E	E
Reed switch (normally closed)						E2	E2	E2	E2	E2

	PORT SIZE	FLOW RATE		INLET OPERATING PSI	
		PSIG (bar)	SCFM @ 1 PSI	Range	
FD10	1/4	(100 PSIG)	31 SCFM	15-150 PSIG	
FD50	1/8	(100 PSIG)	11 SCFM	15-150 PSIG (plastic bowl)	
	1/4	(100 PSIG)	22 SCFM	15-200 PSIG (metal bowl)	
FD80	1/4	(100 PSIG)	46 SCFM	15-150 PSIG (plastic bowl)	
	3/8	(100 PSIG)	65 SCFM	15-200 PSIG (metal bowl)	
	1/2	(100 PSIG)	76 SCFM		
BF070	1/4	(100 PSIG)	51 SCFM	15-200 PSIG (diff metal bowl)	
	3/8	(100 PSIG)	70 SCFM	30-200 PSIG (float metal bowl)	
	1/2	(100 PSIG)	76 SCFM		
FD100	1/4	(100 PSIG)	42 SCFM	15-150 PSIG (diff plastic bowl)	
	3/8	(100 PSIG)	81 SCFM	15-200 PSIG (diff metal bowl)	
	1/2	(100 PSIG)	132 SCFM	30-150 PSIG (float plastic bowl)	
	3/4	(100 PSIG)	152 SCFM	30-200 PSIG (float metal bowl)	
PSA350	1/4	(91 PSIG)	52 SCFM	40-125 PSIG (float plastic bowl)	
	3/8	(91 PSIG)	65 SCFM	40-175 PSIG (float metal bowl)	
	1/2	(91 PSIG)	72 SCFM		
FD380	3/8	(92 PSIG)	100 SCFM	15-150 PSIG (diff plastic bowl)	
	1/2	(92 PSIG)	135 SCFM	15-200 PSIG (diff metal bowl)	
	3/4	(92 PSIG)	160 SCFM	30-150 PSIG (float plastic bowl)	
				30-200 PSIG (float metal bowl)	
FD100	3/4	(100 PSIG)	250 SCFM	15-150 PSIG (diff plastic bowl)	
	1	(100 PSIG)	275 SCFM	15-200 PSIG (diff metal bowl)	
				30-150 PSIG (float plastic bowl)	
				30-200 PSIG (float metal bowl)	
BF0200	3/4	(100 PSIG)	345 SCFM	15-200 PSIG (diff metal bowl)	
	1	(100 PSIG)	450 SCFM	30-200 PSIG (float metal bowl)	
	1-1/4	(100 PSIG)	625 SCFM		
	1-1/2	(100 PSIG)	650 SCFM		
BF0400	1-1/4	(92 PSIG)	700 SCFM	15-200 PSIG (diff metal bowl)	
	1-1/2	(92 PSIG)	750 SCFM	30-200 PSIG (float metal bowl)	
	2	(92 PSIG)	850 SCFM		



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What is the purpose of a Coalescing Filter?

- Used in a compressed air system, often to remove oil created by an oil-lubricated compressor
- Why remove the oil?
 - Can affect product quality
 - Surface blemishes in paint applications
 - Oil can cause seals in pneumatic valves and cylinders to swell causing sluggish operation or, in severe cases, complete seizure.
- Application
 - Use as close as possible before the component it protects
 - Removes contaminating water emulsions and particle removal down to 0.01 microns.
 - Replace elements when gauge indicates to improve effectiveness



Series 350

Coalescing filters operate the **opposite** of General Purpose Filters. Air flows from the inside out of the Coalescing Filter element.

The Coalescing element, by having *extremely* fine mesh size 'holes', brings an additional function not available from general purpose elements - removing oil from the compressed air stream.



Coalescing Filter Elements

The elements are epoxy-resin-coated,
borosilicate, glass-fiber

How They Work

- Inertial impaction - Impact on fibers
- Direct Interception – Molecular attraction to fiber
- Diffusion – Random Brownian motion



Series 380

Note:

A 0.3 μ coalescing element is standard and removes 99.99% of oil and solid contaminants larger than 0.3 μ .
0.01 μ element is optional.



MP Coalescing Filters



High Flow
Vanguard

- **Product port sizes range from 1/8" to 2"**
- **Flow Rate from 8 scfm (3.8 l/s) to 840 scfm (396 l/s)**
- **Element sizes from .3 μ (std) to .01 μ**
- **Differential pressure gauges are standard on every series except the 10 & 50 series.**
- **Other options can be accommodated**



Differential Pressure Gauges for MP Coalescing Filters

- Used to indicate remaining element life
- Standard on all but Series 10 & 50
- Three versions available



Large - Indicating
Clean, Change, Dirty



Large version available
with reed switch
normally open or
normally closed.



Small Slide –
Go / No-Go

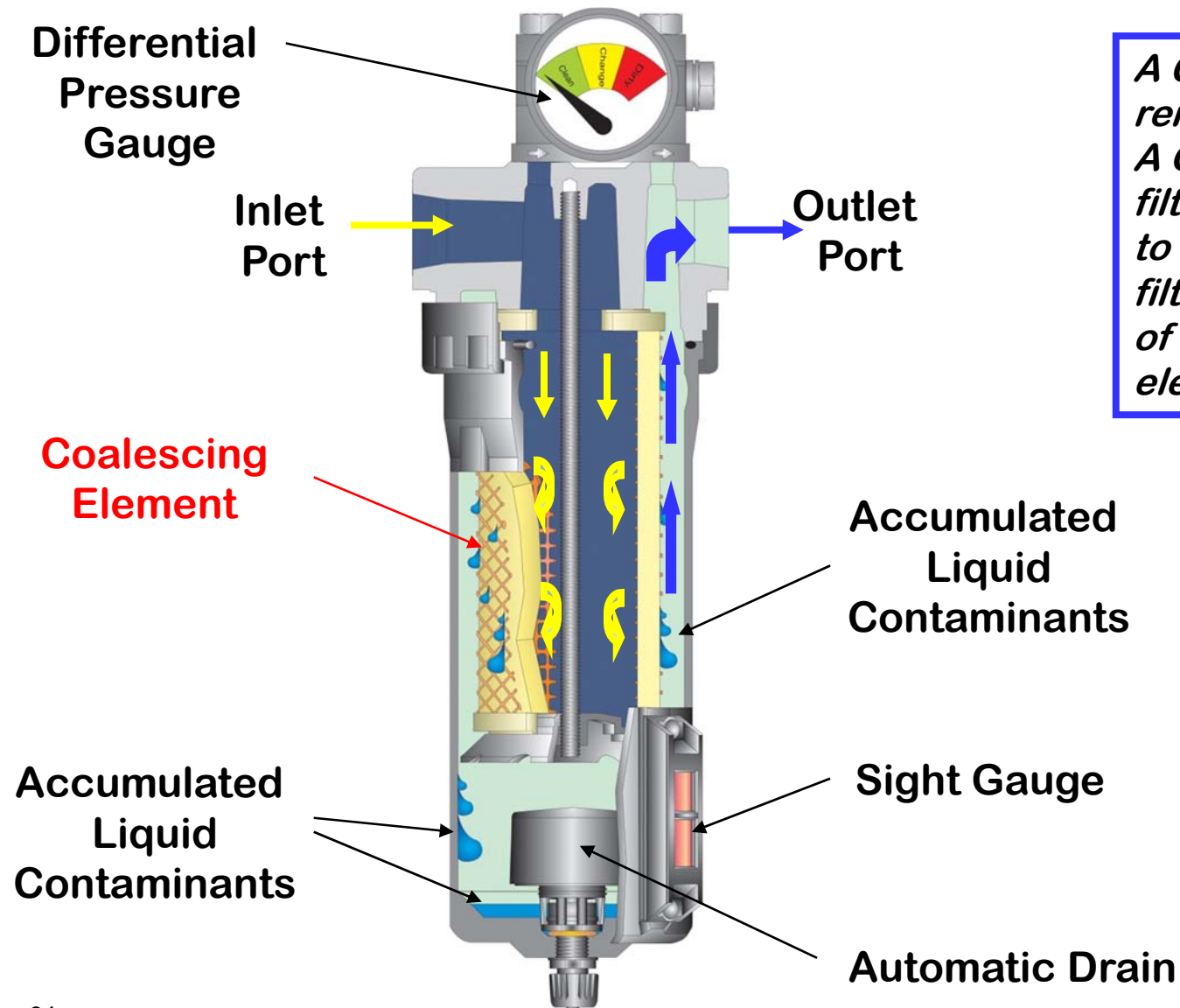


Filter Maintenance - Elements

- **Accumulation of solid contaminants will result in excessive pressure drop across element.**
- **Differential Pressure Gauge will indicate when an element change is required.**
- **Note: A particulate filter should be installed upstream of coalescing filter to extend the life of the element.**



Coalescing Filter – Section View



A Coalescing Filter removes oil droplets. A General Purpose filter is required prior to the coalescing filter to extend the life of the coalescing element.

MP Coalescing Filter - Benefits

- Remove unwanted oil from compressed air system
- A few examples/applications:
 - Sensitive air gauging equipment
 - Assembly operations where oil film on parts is a problem
 - Food and Beverage
 - Packaging operations
 - Painting and other film applications where oil presence will cause stencil or adhesion problems



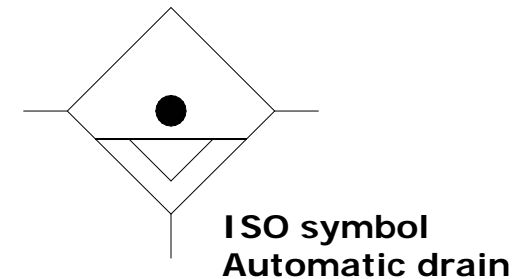
High Flow



MP offers Several Drains for Coalescing Filters

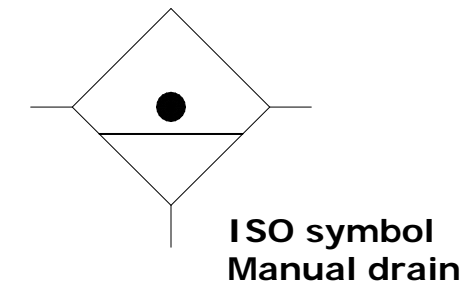
Internal

- *Automatic
 - » Differential Pressure
 - » Float Design
- *Manual



External

- *Automatic
 - » Warrior Electronic Control



Hydro-Jector is not recommended for a Coalescing Filter.

MP Coalescing Filter Drains

External Drain



Electronic Controlled
Warrior Drain

Internal Drains



Auto Brass Float Drain

Auto Poly Float Drain

AID (Differential)

Manual

Note: Hydro-Jector is not recommended for a Coalescing Filter.

How to Select a Coalescing Filter

- **Flow requirement SCFM (l/s)**

- Pipe Size and thread type
- Inlet & Outlet Pressure(s)
- Bowl material and Drain Type
- Temperature
- Chemicals present environment
- How fine of element required
- $1 C_v = 25 \text{ SCFM (11.8 l/s) @100 psig (6.9 bar)}$ (ballpark)
- $\text{Compressor Horse Power} \times 4 \text{ or } 4.5 = \text{SCFM}$ (ballpark)



Coalescing Filters & Port Sizes.

(Approximate size relationship as shown)



FCD10 Sentry Modular
NPTF & BSPP Port Sizes:
1/8, 1/4
Tubing Sizes: 1/4, 3/8,
4mm, 6mm, 8mm, & 10mm



FCD50 Miniature
NPTF & BSPP Port Sizes:
1/8, 1/4



FCD60 Guardsman
NPTF & BSPP Port Sizes:
1/4, 3/8, & 1/2



BFC070 Guardsman II
NPTF & BSPP Port Sizes:
1/4, 3/8, & 1/2



FD101 Vanguard Modular
NPTF & BSPP Port Sizes:
1/4, 3/8, 1/2 & 3/4



FCSA350 Modular
NPTF & BSPP Port Sizes:
1/4, 3/8 & 1/2



FCD380 Modular
NPTF & BSPP Port Sizes:
3/8, 1/2 & 3/4



FCD101 High Flow
NPTF & BSPP Port Sizes:
3/4 & 1



BFC0201 High Flow
NPTF & BSPP Port Sizes:
3/4 & 1



BFC6A401 High Flow
NPTF & BSPP Port Sizes:
1-1/4 & 1-1/2



BFC6A401H High Flow
NPTF & BSPP Port Sizes:
2



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1/4	1/8
3/8	1/4
1/2	3/8
3/4	1/2
1	3/4
1 1/4	1
1 1/2	1 1/4
2	1 1/2

OPTIONS CHART

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Remember-

- ***General Purpose Filters** remove WATER and PARTICULATES and should always be installed upstream of Coalescing Filters.*
- ***Coalescing Filters** remove 99.99% of oil & solids greater than 0.3 μ in size. An optional 0.01 μ element is available.*





Series 350

Thank you!

