WHAT ARE F.R.L.’s?
HOW THEY WORK
WHERE TO USE THEM

REGULATOR INSTRUCTION SHEET
AIR LINE REGULATORS – SERIES 1/4” 3/8” 1/2” 3/4” and 1”
Standard Units: Relieving
Maximum Inlet Pressure: 250 PSI
Operating Temperatures 40º to 120º F

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FORM NO. 9X016 REGULATORS 3-2008
**MICRO-FILTERS**

Although the Micro-Filter is the simplest of the three basic air control devices, it is also the least understood and the one most frequently installed improperly. Read on.

**How they work** - These filters remove two kinds of contaminants: (1) solid, particulate matter such as rust and pipe scale and (2) water condensate. The first is removed by a normally rated 40 micron porous sintered metal element. However, because of its unique "tortuous path" design, it will actually trap particles down to 10 microns in size (about 0.0004 inches).

The water is removed through a violent swirling action imparted to the air by a set of fixed vanes at the top of the filter. The process is exactly like that of the spin-dry cycle in a washing machine. Centrifugal force throws the water droplets against the side of the bowl where they roll down and collect at the bottom.

Condensate removal in a Micro-Filter.

**Small is better** - The more rapidly the air is swirled, the more effectively the water condensate is thrown out against the filter wall. If you pass the same volume of air (SCFM) through a small filter and a large filter, it will swirl more rapidly in the small one.

Although you may think a big filter is more effective, the reverse may actually be true if too little air passes through. Always select filter size based on your air flow or SCFM requirements.

**How small is too small** - As long as the pressure difference between the inlet and the outlet of the filter does not exceed 3 PSI at the required air flow (SCFM), the filter is not too small. For more information, please refer to the FRL sizing chart in the Milton Catalog, page 60.

**What a filter does and doesn't do** - A properly selected and installed filter removes particulate matter and water condensate. However, it does not and cannot remove water vapor from the air. Water vapor must be converted to water condensate before this type of filter can remove it (See the OTHER FILTERS section).

**Water vapor and water condensate** - Water vapor is an invisible gas; water condensate is a liquid, even if it is in mist or droplet form. To convert water vapor to a condensate, the air must be cooled down - actually, down to or below the "dew point."

The dew point is the temperature at which dew or water condensate forms. It varies with the RH (Relative Humidity). It's low with low RH and approaches ambient temperature with high RH.

This explains why you sometimes see water droplets or mist coming from a blow gun or paint sprayer when there is no "apparent" water in the air lines. The rapid expansion of the air as it leaves the blow gun or sprayer causes the air's temperature to drop (same principle as an air conditioning system). If this temperature falls below the dew point, the water vapor in the air line converts instantly to water condensate.

If you sometimes experience a problem like this, you will require, in addition to the Micro-Filter, a desiccant dryer filter (see OTHER FILTERS section).

**Choosing a different drain system** - All filters (except the Mini) come with an Overnight Drain that opens when line pressure falls after turning off the compressor, to 5 PSI. These drains can also be opened manually by pushing them sideways (poly bowls) or twisting them in the direction of the arrow (metal bowls).

You can also install an Automatic Drain Valve (Model 1168) in place of the supplied Overnight Drain Valve. These valves open automatically whenever the water level in the bowl reaches a certain point, whether the system is under pressure or not. These are good for high humidity conditions or around-the-clock systems.

**Metal bowl vs. polycarbonate bowl** - The advantage of the polycarbonate bowl is in quick visual checks of water level. If you have a situation where water may fill the bowl before the overnight drain can function (e.g., high humidity), it is helpful to be able to visually check water level.

Other than this, the advantage is with the metal bowl. This is especially true if you are using synthetic oils in your compressor or have volatile solvents in the area. (See list of chemicals that are not compatible with poly bowls.)

- Since there are no moving parts to wear out, there is little to go wrong. Periodically wash the sintered filter element in a detergent solution and blow it out; if too clogged to be washed, replace it.

**OTHER FILTERS**

Sometimes a Micro-Filter alone is not the answer. Although they remove much of the water, in some applications, such as spraying, it’s not enough.

When you need exceptionally dry air or oil-free air, you can choose from two other filter types: (1) the desiccant dryer and (2) the oil removing filter.

**The desiccant dryer filter** - This is the ultimate filter for dry air; it takes over where the Micro-Filter leaves off. This filter absorbs directly, through a chemical process, the water vapor in the air.

So effectively does it remove water, that the air frequently has a dew point of 0°F or lower.
This is sufficiently dry for practically any purpose, including spray painting.

However, this drying efficiency comes with a price. The desiccant that absorbs the water vapor eventually becomes saturated with water and can no longer absorb anymore. Fortunately, you are alerted to this by a change in desiccant color - from bluish-white to pink.

When this happens, you have two choices, depending on which desiccant system you are using. If it is the rechargeable type, simply remove the desiccant, dry it in a vented oven at 275°F for two or three hours, then put it back in the filter.

If it is the disposable type, such as the Mini In-line Desiccant Dryer (Models 1173/1174), it's even easier - just throw it away.

The Mini In-line Dryer is designed for those users who do not need full-time dry air and who wish to avoid the cost of installing a rechargeable desiccant system. One Mini Dryer will supply enough bone-dry air, depending on humidity, to spray paint several cars.

Remember though, all desiccant dryers must be preceded by a Micro-Filter to remove the water condensate. In addition, they should also be preceded by an oil-removing filter (described below). Failure to do this will result in short desiccant life.

Oil-removing & Coalescing filters - In addition to water and particulate matter, oil can also be a contaminant in an air system. This is especially true in paint spraying.

A special series of Sub-Micron Oil Removing Filters is available for this purpose. It will remove particles down to 0.9 microns (0.03 microns for coalescing filters), over forty to one hundred times as small as those extracted by the standard Micro-Filter. This is small enough to capture oil vapors (e.g., compressor blow-by) as well as water mist too fine to be removed by a standard filter.

It achieves this exceptional filtration through a white borosilicate element that can be replaced when necessary. Similar to the standard filter, these units also have an over-night drain. Since they are not intended to remove large quantities of water, they should always be preceded by a Micro-Filter.

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<td>The basic air control device for all systems. Removes solid particulate matter and water condensate. Available in a wide variety of sizes.</td>
<td>A full line of regulators in both standard pressure (2-125 psi) and high pressure (10-250 psi). All metal construction.</td>
<td>Precision lubricators to automatically provide essential oil to all your pneumatic tools. Can be adjusted to deliver the correct amount.</td>
<td>The ideal package for a basic air control system. Same features as our standard regulator and standard Micro-Filter. Easy installation.</td>
<td>Removes oil and oil vapors from the air line. Prevents oil pull-over from entering your paint spray gun and marring the paint job.</td>
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**CHEMICALS**

Do not use synthetic oils or oils containing phosphate esters or chlorinated hydrocarbons. They can carry over from the compressor into the air lines and attack or crack poly bowls. Do not expose these bowls, even from external sources, to: alcohol, carbon tetrachloride, trichlorethylene, acetone, paint thinner, cleaning fluids and similar materials. These chemicals and other similar chemicals can craze or crack a poly bowl. If in doubt, use a metal bowl, especially since poly bowls damaged by chemicals are not covered by warranty.

**ROTARY SCREW COMPRESSORS**

For these applications use a metal bowl.

**METAL BOWL LUBRICATORS**

The sight glass in these units will crack if exposed to alcohol or alcohol based fluids.