1.0 CDA

Clean dry process gas is essential to the proper operation of an RTC, GBT or FurnacePros IR furnace. This technical bulletin provides information for assuring process gas is suitable for your furnace.

Process Gas Specifications

Parameter	Furnace requirements	
Pressure	≥70 psi	≥4.8 bar
Moisture (ppm) Moisture (dew point) @ furnace	<100 ppmv -25.8°C@70 psig	<62 ppmw -25.8°C@4.8 bar
Moisture (dew point) @ compressor	-25.8°C@100 psig	-22.5°C@7 bar
Oil (Hydrocarbons)	<0.5 ppmw	<0.6 mg/m3
Particulate size, max	0.5 µm	0.5 µm

2.0 Oil

The principle source of oil contamination within a compressed air system is from the compressor. An oil lubricated compressor of 50 dm3/s capacity may introduce as much as 0.16 litres of oil per week into the system. Oil is used for lubrication of the compressor but when it emerges with the compressed air prior to distribution the oil is now in a totally unusable state. Having been subjected to high temperatures during air compression it becomes oxidized and acidic and can be considered as an aggressive contaminant rather than a lubricant and so must be removed. Normal air line filters will remove sufficient liquid oil (along with water) to leave the air in a suitable condition to supply most pneumatic tools and cylinders, but certain processes demand completely oil-free air. (One solution is to use oil-free compressors. These will still produce air contaminated with dirt and water) It is often more economical to use lubricated compressors in conjunction with after coolers and standard air line filters, only fitting high efficiency oil removal filters at the points in the system which demand oil-free air. This ensures that the amount of air needing special treatment is kept to a minimum by allowing a smaller specialised filter in the affected area and not a large specialised filter for the whole plant.

Oil in a compressed air system can exist in three forms, oil/water emulsions, aerosols (small particles suspended in the air) and oil vapours.

While particulate filters are the right choice for combating dirt and liquid water and oil, they do not lower dew points or remove oil aerosols. Dew point, a measure of relative humidity, is the temperature at which water begins to condense as compressed air cools. As long as the compressed air temperature does not drop below the established dew point the system will remain dry.

What is not commonly known is that liquid oil aerosols must be removed, along with the water, for a system to be truly clean and dry. These small submicron aerosols can cause just as much damage as wet air. The reason is that the oil is burnt, acidic, and will condense inside pneumatic components causing sticking and downtime. Thus, the demand for clean, dry air is the impetus behind the popular use of coalescing filters.

3.0 Coalescing Filters

Essentially, coalescing filters rely on mechanical filtration for their effectiveness. The main mechanisms of mechanical filtration are direct interception, inertial impaction and diffusion. Electrostatic attraction can have some bearing although the efficiency of many coalescing filters is not dependent on this mechanism.

Direct Interception occurs when a particle collides with and adheres to a fiber of the filter material without deviating out of the streamline flow. This mechanism tends to take place on the surface of the filter material and affects mainly larger particles over 1 micron in size.

Inertial Impaction occurs when a particle is unable to follow the tortuous path around the filter fibers and eventually collides with and adheres to one of the fibers. Typically affecting particles in the 0.3 micron -1 micron size range.

Diffusion or Brownian Movement, as it is sometimes called, occurs with extremely small particles which tend to wander within the gas stream, increasing their chances of colliding with and adhering to a fiber. This usually affects particles below 0.3 micron in size. A degree of overlap takes place with the mechanisms, the extent varying on the conditions.

Coalescing filters are specifically designed for the removal of solid particles, water and oil aerosols down to 0.01 micron. Maximum remaining oil content of air leaving the filter down to 0.01ppm at 70°F (21°C) at a pressure of 100 PSIG (6,9 bar g) using a typical compressor lubricant. Two filter element grades are offered to better meet your air quality requirements. Grade B and B1 filter elements are used for most air coalescing applications where the removal of liquid aerosols and submicronic particles for general air quality is required.

4.0 Filter Location and Installation

1) Generally, install filters downstream of aftercoolers / separators and air receivers at the lowest temperature point and as close to the point of application as possible. This reduces the chance of additional water and oil vapor condensing after the filter.

2) Filters should not be installed downstream of quick opening valves and should be protected from possible reverse flow or other shock conditions.

3) It may be necessary to install a combination of mainline filtration near the compressor installation before entry to the main air distribution system as well as installing terminal filtration at the critical application points. Remember, especially in existing installations, the contamination already in the pipe system downstream of the filters will take a long time to disappear and probably never will completely.

4) Purge all lines leading from the filters to the final application to be protected.

5) Install filters in a vertical position ensuring that there is sufficient room below the filters to facilitate element change.

6) Provide a facility to drain away collected liquids from the filter drains via properly sized tubing, taking care there are no restrictions in the drain line.

7) Install differential pressure gauge or pop-up indicator to monitor the pressure drop across the filters. This will provide an easy way of visually monitoring the filter element condition, indicating when to replace the element.

5.0 Filter Selection

We recommend a type A filter/regulator with a 5 µm filter followed by a Type B 0.5 µm coalescing filter installed at the entrance of the furnace.

5.1 Filter/Regulator

For removal of solid particulate contaminants and the separation of bulk liquids. Increases life of coalescing filter.

Coalescing Filter Specifications	Most furnaces	Very large furnaces
Pressure, adjustment range	0-125 psig	0-125 psig
Gage port	¼ inch NPT	¼ inch NPT
Fittings	1/2 inch FNPT	3/4 inch FNPT
Filter	Class A, 5 µm	Class A, 5 µm
Flow	70-120 scfm	150-170 scfm
Pressure, max rating	150-200 psig	150-200 psig
Part Number, Filter with element	590-076589-01	

Note polycarbonate bowls can be used on most applications where synthetic compressor oils are NOT used.

5.2 Coalescing Filter

For removal of extremely fine liquid, oil and solid particles. Generally type B filters fitted with a 0.5 µm filter when properly installed will reduce particulate, moisture and residual oil to 0.5 ppmw, a level suitable for most IR furnace applications.

Coalescing Filter Specifications	Most furnaces	Very large furnaces
Fittings	1/2 inch FNPT	3/4 inch FNPT
Filter	Class B, 0.5 µm	Class B, 0.5 µm
Flow	120 scfm	170 scfm
Pressure, max rating	150 psig	150 psig
Part Number, Filter with element	590-076588-01	
Part Number, Filter Element	590-076588-11	

Note polycarbonate bowls can be used on most applications where synthetic compressor oils are NOT used.