Cold air to -50°F (-46°C) from your compressed air supply — with no moving parts!

What Is A Vortex Tube?
A low cost, reliable, maintenance free solution to a variety of industrial spot cooling problems. Using an ordinary supply of compressed air as a power source, vortex tubes create two streams of air, one hot and one cold, with no moving parts. Vortex tubes can produce:

- Temperatures from -50°F to +260°F (-46° to +127°C)
- Flow rates from 1 to 150 SCFM (28 to 4,248 SLPM)
- Refrigeration up to 10,200 Btu/hr. (2,571 Kcal/hr.)

Temperatures, flows and refrigeration are adjustable over a wide range using the control valve on the hot end exhaust.

Why EXAIR Vortex Tubes?
EXAIR Vortex Tubes are constructed of stainless steel. The wear resistance of stainless steel, as well as its resistance to corrosion and oxidation, assures that EXAIR Vortex Tubes will provide years of reliable, maintenance-free operation.

Applications
- Cooling electronic controls
- Cooling machining operations
- Cooling CCTV cameras
- Setting hot melts
- Cooling soldered parts
- Cooling gas samples
- Electronic component cooling
- Cooling heat seals
- Cooling environmental chambers

Advantages
- No moving parts
- No electricity or chemicals
- Small, lightweight
- Low cost
- Maintenance free
- Instant cold air
- Durable - stainless steel
- Adjustable temperature
- Interchangeable generators

Contact Information:
Tel: +31 (0)20 - 497 67 80
Fax: +31 (0)20 - 497 67 05
Email: info@spraybest.nl
Website: www.spraybest.nl
Compressed air, normally 80-100 PSIG (5.5 - 6.9 BAR), is ejected tangentially (1) through a generator into the vortex spin chamber (2). At up to 1,000,000 RPM, this air stream revolves toward the hot end (3) where some escapes through the control valve (4). The remaining air, still spinning, is forced back through the center of this outer vortex. The inner stream gives off kinetic energy in the form of heat to the outer stream and exits the vortex tube as cold air (5). The outer stream exits the opposite end as hot air (6). There is a detailed discussion of vortex tube history and theory later on page 144 in this section.

Controlling Temperature And Flow In A Vortex Tube

Cold airflow and temperature are easily controlled by adjusting the slotted valve in the hot air outlet. Opening the valve reduces the cold airflow and the cold air temperature. Closing the valve increases the cold airflow and the cold air temperature. The percentage of air directed to the cold outlet of the vortex tube is called the “cold fraction”. In most applications, a cold fraction of 80% produces a combination of cold flow rate and temperature drop that maximizes refrigeration, or Btu/hr. (Kcal/hr.), output of a vortex tube. While low cold fractions (less than 50%) produce lowest temperatures, cold airflow volume is sacrificed to achieve them.

Most industrial applications, i.e., process cooling, part cooling, chamber cooling, require maximum refrigeration and utilize the 3200 series Vortex Tube. Certain “cryogenic” applications, i.e., cooling lab samples, circuit testing, are best served by the 3400 series Vortex Tube.

Setting a vortex tube is easy. Simply insert a thermometer in the cold air exhaust and set the temperature by adjusting the valve at the hot end. Maximum refrigeration (80% cold fraction) is achieved when cold air temperature is 50°F (28°C) below compressed air temperature.

If you are unsure of your flow and temperature requirements, EXAIR recommends the purchase of an EXAIR Cooling Kit. It contains a vortex tube, cold air muffler, air line filter and all generators required to experiment with the full range of airflows and temperatures.
Vortex Tubes

Selecting The Right Vortex Tube
EXAIR Vortex Tubes are available in three sizes. Each size can produce a number of flow rates, as determined by a small internal part called a generator. If Btu/hr. (Kcal/hr.) requirements, or flow and temperature requirements are known, simply select the appropriate vortex tube according to the specification information shown below or the performance charts shown on the following page. Keep in mind that the vortex generators are interchangeable. If, for example, a Model 3215 Vortex Tube does not provide sufficient cooling, you need only change generators within the vortex tube to upgrade the flow rate from 15 to 25, 30 or 40 SCFM (425 to 708, 850 or 1,133 SLPM). Generator part numbers are shown in the “Accessories” listing on page 145.

Vortex Tube Dimensions

Vortex Tube Specifications
3200 series Vortex Tubes optimize temperature drop and airflow to produce maximum cooling power or Btu/hr. (Kcal/hr.). Specify 3200 series Vortex Tubes for most general cooling applications.

3400 series Vortex Tubes provide lowest cold air temperatures, but at low cold airflow (when less than a 50% cold fraction is used). Specify 3400 series Vortex Tubes only where temperatures below 0°F (-18°C) are desired.

### 3200 Series Vortex Tube Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>SCFM*</th>
<th>SLPM*</th>
<th>Btu/hr.**</th>
<th>Kcal/hr.**</th>
<th>SIZE</th>
<th>dBA***</th>
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### 3400 Series Vortex Tube Specifications

<table>
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<th>Model</th>
<th>SCFM*</th>
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<th>Btu/hr.**</th>
<th>Kcal/hr.**</th>
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</tr>
<tr>
<td>3499</td>
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<td>4,248</td>
<td>-----</td>
<td>-----</td>
<td>Large</td>
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</tbody>
</table>

*SCFM (SLPM) at 100 PSIG (6.9 BAR) Inlet Pressure
**Btu/hr. (Kcal/hr.) Cooling Capacity at 100 PSIG (6.9 BAR)
***Noise levels taken with hot and cold mufflers installed.
Vortex Tube Performance

The Vortex Tube Performance Charts below give approximate temperature drops (and rises) from inlet air temperature produced by a vortex tube set at each cold fraction. Assuming no fluctuation of inlet temperature or pressure, a vortex tube will reliably maintain temperature within ±1°F.

### Back Pressure

The performance of a vortex tube deteriorates with back pressure on the cold air exhaust. Low back pressure, up to 2 PSIG (.1 BAR), will not change performance. 5 PSIG (.3 BAR) will change performance by approximately 5°F (2.8°C).

### Filtration

The use of clean air is essential, and filtration of 25 microns or less is recommended. EXAIR filters contain a 5 micron element and are properly sized for flow.

### Inlet Air Temperature

A vortex tube provides a temperature drop from supply air temperature (see Performance Charts above). Elevated inlet temperatures will produce a corresponding rise in cold air temperatures.

### Noise Muffling

EXAIR offers mufflers for both the hot and cold air discharge. Normally, muffling is not required if the cold air is ducted.

### Regulation

For best performance, use line pressures of 80 to 110 PSIG (5.5 to 7.6 BAR). Maximum pressure rating is 250 PSIG (17.2 BAR), minimum 20 PSIG (1.4 BAR).

### EXAIR Products Using Vortex Tubes

Over the years, the basic vortex tube has been used in virtually hundreds of industrial cooling applications. A few have become so popular as to warrant the development of an “applied product” designed to suit the specific application. These products include the Adjustable Spot Cooler, Mini Cooler, Cold Gun and Cabinet Coolers that can be found in this catalog.

### High Temperatures

High temperature vortex tubes for ambient temperatures above 200°F (93°C) are available. Contact an Application Engineer at 1-800-903-9247 for more details.

### Preset Vortex Tubes

EXAIR can provide vortex tubes preset to any combination of flow and temperature desired. To prevent tampering with the desired setting, a drilled orifice that replaces the adjustable hot valve is available. For more information, please contact an Application Engineer.

---

### Vortex Tube Performance Charts

<table>
<thead>
<tr>
<th>Pressure Supply</th>
<th>Cold Fraction %</th>
<th>Pressure Supply</th>
<th>Cold Fraction % (METRIC)</th>
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<tbody>
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</tr>
<tr>
<td>120</td>
<td>26</td>
<td>46</td>
<td>69</td>
</tr>
</tbody>
</table>

Numbers in shaded area give temperature drop of cold air, °F. Numbers in white area give temperature rise of hot air, °F.

Numbers in shaded area give temperature drop of cold air, °C. Numbers in white area give temperature rise of hot air, °C.
Cooling Vacuum Formed Parts

The Problem: A manufacturer of major appliances vacuum forms the plastic interior shell of refrigerators. The deep draw of the plastic and complex geometry left the four corners unacceptably thin. The corners would tear during assembly or bulge when insulation was inserted between the shell and exterior housing, resulting in a high rejection rate.

The Solution: (4) Model 3225 Vortex Tubes were positioned to cool the critical corner areas just prior to forming the plastic sheet. By cooling these areas, less stretching of the plastic occurred which resulted in thicker corners.

Comment: Rejected parts become very costly, especially when expensive materials and slow process times are involved. The cold air from the vortex tube is just the solution for big problems like this one. It can supply “instant” cold air down to -50°F (-46°C) from an ordinary compressed air supply. Along with cooling other vacuum formed parts such as spas, bathtubs, tote pans and waste cans, it is ideal for cooling hot melts, ultrasonic welders, environmental chambers, etc.

This is an ideal application for EXAIR’s EFC, an electronic flow control for compressed air, shown on page 4. It reduces air consumption by turning on the compressed air for a preset length of time, when sensing the plastic sheet is in position.

Cooling An Ultrasonic Weld

The Problem: A manufacturer of toothpaste seals the ends of plastic tubes with an ultrasonic welder prior to filling. As heat built up at the sealing jaw of the welder, release of the tubes was delayed. Tubes that were too hot would not seal resulting in a high rate of rejection.

The Solution: A Model 3215 Vortex Tube was used to direct cold air at the jaw of the welder. The cooling was transferred through the metal jaw to the tube seam while in the clamped position. Process time was reduced and rejected tubes were eliminated.

Comment: It amazes most people that the cooling from a small vortex tube can dramatically improve quality and throughput. The vortex tube is the low cost solution for cooling parts, chambers, heat seals and various processes. They’re easy to use, can be adjusted to produce cold air down to -50°F (-46°C) and have no moving parts to wear out.
**Cooling Blow Molded Fuel Tanks**

**The Problem:** Automobile fuel tanks are blow molded, then clamped to a fixture to prevent distortion during the cooling cycle. The cooling time of over 3 minutes required for each tank created a bottleneck in the production process.

**The Solution:** (2) Model 3250 Vortex Tubes were mounted to the cooling rack and connected to a compressed air line. Cold air produced by the vortex tubes was circulated inside the fuel tanks. **Cooling time was reduced from three minutes to two minutes for each tank, improving productivity by 33%**.

**Comment:** It’s hard to imagine an application better suited to vortex cooling than this one. The vortex tubes’ small size and light weight simplified mounting to the cooling rack. No moving parts assured reliability and maintenance-free operation in a hostile environment. Finally, the cold airstream was easily channeled to the fuel tank via the threaded cold air outlet. When the cooling problem includes the need for simplicity, reliability and compact design, a vortex tube is very often the best choice.

**Cooling Small Parts After Brazing**

**The Problem:** Air conditioner parts assembled on an automatic brazing machine must be cooled to handling temperature prior to removal. The machine was capable of brazing up to four hundred pieces per hour. However, the time required for the parts to cool severely limited the production rate. Water cooling was unacceptable from the standpoint of both housekeeping and part contamination.

**The Solution:** (2) Model 3230 Vortex Tubes (with cold air mufflers installed) were used to blow cold air on the parts after the brazing cycle. The vortex tubes were set at an 80% cold airflow (cold fraction) to produce maximum refrigeration. **The parts were cooled from a brazing temperature of 1,450°F (788°C) to a handling temperature of 120°F (49°C) within 20 seconds**, allowing the machine to operate at its maximum production rate.

**Comment:** Compared to conventional refrigeration or water cooling, vortex tubes offer a number of advantages: low cost, compact design, inherent reliability and cleanliness. These attributes make vortex tubes the cost effective choice for many small part cooling operations.
A Phenomenon of Physics

The two questions we’re most often asked about the vortex tube are, “How long has it been around?” and “How does the thing work?”.

Following is a brief history and theory of the vortex tube.

The vortex tube was invented quite by accident in 1928. George Ranque, a French physics student, was experimenting with a vortex-type pump he had developed when he noticed warm air exhausting from one end, and cold air from the other. Ranque soon forgot about his pump and started a small firm to exploit the commercial potential for this strange device that produced hot and cold air with no moving parts. However, it soon failed and the vortex tube slipped into obscurity until 1945 when Rudolph Hilsch, a German physicist, published a widely read scientific paper on the device.

Much earlier, the great nineteenth century physicist, James Clerk Maxwell, postulated that since heat involves the movement of molecules, we might someday be able to get hot and cold air from the same device with the help of a “friendly little demon” who would sort out and separate the hot and cold molecules of air.

Thus, the vortex tube has been variously known as the “Ranque Vortex Tube”, the “Hilsch Tube”, the “Ranque-Hilsch Tube”, and “Maxwell’s Demon”. By any name, it has in recent years gained acceptance as a simple, reliable and low cost answer to a wide variety of industrial spot cooling problems.

A vortex tube uses compressed air as a power source, has no moving parts, and produces hot air from one end and cold air from the other. The volume and temperature of these two airstreams are adjustable with a valve built into the hot air exhaust. Temperatures as low as -50°F (-46°C) and as high as +260°F (+127°C) are possible.

Theories abound regarding the dynamics of a vortex tube. Here is one widely accepted explanation of the phenomenon:

Compressed air is supplied to the vortex tube and passes through nozzles that are tangent to an internal counterbore. These nozzles set the air in a vortex motion. This spinning stream of air turns 90° and passes down the hot tube in the form of a spinning shell, similar to a tornado. A valve at one end of the tube allows some of the warmed air to escape. What does not escape, heads back down the tube as a second vortex inside the low-pressure area of the larger vortex. This inner vortex loses heat and exhausts through the other end as cold air.

While one airstream moves up the tube and the other down it, both rotate in the same direction at the same angular velocity. That is, a particle in the inner stream completes one rotation in the same amount of time as a particle in the outer stream. However, because of the principle of conservation of angular momentum, the rotational speed of the smaller vortex might be expected to increase. (The conservation principle is demonstrated by spinning skaters who can slow or speed up their spin by extending or drawing in their arms.) But in the vortex tube, the speed of the inner vortex remains the same. Angular momentum has been lost from the inner vortex. The energy that is lost shows up as heat in the outer vortex. Thus the outer vortex becomes warm, and the inner vortex is cooled.
EXAIR Cooling Kits
EXAIR Cooling Kits include a vortex tube, all generators, cold muffler, fitting, tubing and clips to duct cold air, and filter separator.

<table>
<thead>
<tr>
<th>Model #</th>
<th>Description</th>
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<tbody>
<tr>
<td>3908</td>
<td>Cooling Kit up to 550 Btu/hr. (139 Kcal/hr.), Small Size</td>
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<tr>
<td>3930</td>
<td>Cooling Kit up to 2,800 Btu/hr. (706 Kcal/hr.), Medium Size</td>
</tr>
<tr>
<td>3998</td>
<td>Cooling Kit up to 10,200 Btu/hr. (2,570 Kcal/hr.), Large Size</td>
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Vortex Tubes

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<tr>
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<th>Description</th>
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<tr>
<td>3202</td>
<td>Vortex Tube, 2 SCFM (57 SLPM), for max. refrigeration, 135 Btu/hr. (34 Kcal/hr.), Small Size</td>
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<td>3204</td>
<td>Vortex Tube, 4 SCFM (113 SLPM), for max. refrigeration, 275 Btu/hr. (69 Kcal/hr.), Small Size</td>
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<tr>
<td>3208</td>
<td>Vortex Tube, 8 SCFM (227 SLPM), for max. refrigeration, 550 Btu/hr. (139 Kcal/hr.), Small Size</td>
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<tr>
<td>3210</td>
<td>Vortex Tube, 10 SCFM (283 SLPM), for max. refrigeration, 650 Btu/hr. (164 Kcal/hr.), Medium Size</td>
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<tr>
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<td>Vortex Tube, 15 SCFM (425 SLPM), for max. refrigeration, 1,000 Btu/hr. (252 Kcal/hr.), Medium Size</td>
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<td>3298</td>
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<td>3299</td>
<td>Vortex Tube, 150 SCFM (4,248 SLPM), for max. refrigeration, 10,200 Btu/hr. (2,570 Kcal/hr.), Large Size</td>
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<td>Vortex Tube, 2 SCFM (57 SLPM), for max. cold temperature, Small Size</td>
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<td>Vortex Tube, 100 SCFM (2,832 SLPM), for max. cold temperature, Large Size</td>
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<tr>
<td>3499</td>
<td>Vortex Tube, 150 SCFM (4,248 SLPM), for max. cold temperature, Large Size</td>
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Vortex Tube Accessories and Components

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<th>Description</th>
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<td>Cold Muffler for 2 through 8 SCFM (57 - 227 SLPM) Vortex Tube, Small Size</td>
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<td>Cold Muffler for 10 through 40 SCFM (283 - 1,133 SLPM) Vortex Tube, Medium Size</td>
</tr>
<tr>
<td>3906</td>
<td>Cold Muffler for 50 through 150 SCFM (1,416 - 4,248 SLPM) Vortex Tube, Large Size</td>
</tr>
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<td>3903</td>
<td>Hot Muffler for 2 through 40 SCFM (57 - 1,133 SLPM) Vortex Tube, Small &amp; Medium Size</td>
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<tr>
<td>3907</td>
<td>Hot Muffler for 50 through 150 SCFM (1,416 - 4,248 SLPM) Vortex Tube, Large Size</td>
</tr>
<tr>
<td>3909</td>
<td>Generator Kit for 2 through 8 SCFM (57 - 227 SLPM) Vortex Tube, Small Size</td>
</tr>
<tr>
<td>3902</td>
<td>Generator Kit for 10 through 40 SCFM (283 - 1,133 SLPM) Vortex Tube, Medium Size</td>
</tr>
<tr>
<td>3910</td>
<td>Generator Kit for 50 through 150 SCFM (1,416 - 4,248 SLPM) Vortex Tube, Large Size</td>
</tr>
</tbody>
</table>

Generator Kits ordered with a vortex tube include all generators for the specified tube. Permits setting the vortex tube for all capacities and styles.

Generator Only — Specify capacity (SCFM) and style (“R” for max. refrigeration, “C” for max. cold temperature).

Example:
- 15-R = 15 SCFM Generator for max. refrigeration
- 50-C = 50 SCFM Generator for max. cold temperature

Note: Flow ratings shown (SCFM) assume 100 PSIG (6.9 BAR) inlet pressure. At other pressures, flow is proportional to absolute inlet pressure.
Adjustable Spot Cooler

Cold air to -30°F (-34°C) from your compressed air supply for spot cooling!

What Is The Adjustable Spot Cooler?

A low cost, reliable, maintenance free solution to a variety of industrial spot cooling problems. With the turn of a knob, you can select the temperature best suited to your application. The Adjustable Spot Cooler provides a precise temperature setting from -30°F (-34°C) to room temperature.

The Adjustable Spot Cooler incorporates a vortex tube that converts an ordinary supply of compressed air into cold air.

- It can produce temperatures from -30° to +70°F (-34° to +21°C)
- Parts included for flow rates of 15, 25, and 30 SCFM (425, 708 and 850 SLPM). 25 SCFM (708 SLPM) generator is factory installed.
- It can produce refrigeration up to 2,000 Btu/hr. (504 Kcal/hr.)

A swivel magnetic base provides easy mounting and portability. Flexible tubing that holds its position directs the cold air. No moving parts or CFC’s assures maintenance free operation.

Why The Adjustable Spot Cooler?

The Adjustable Spot Cooler is quiet (less than 75 dBA), easily set with a thermometer and holds the temperature setting. It’s ideal for applications where mist or liquid cooling can not be used due to part contamination or cost. Tolerances, product finish and production rates can improve dramatically.

The Adjustable Spot Cooler is available with either a single point or dual point hose kit. The single point system (Model 3825) is recommended for cooling a small surface like solder joints, hot melts or drilled plastics. The dual point system (Model 3925) is recommended when heat is generated over a larger surface area.

Applications

- Adjusting thermostats
- Cooling solder
- Cooling machined plastics
- Setting hot melts
- Cooling welding horns
- Cooling molded plastics
- Electronic component cooling
- Cooling gas samples
- Cooling environmental chambers

Advantages

- No moving parts
- No electricity or chemicals
- Small, lightweight
- Low cost
- Maintenance free
- Instant cold air
- Quiet - less than 75 dBA
- Swivel magnetic base
- Interchangeable generators

PVC hose is cooled at the exit of an extruder so it can be coiled immediately.

The Adjustable Spot Cooler replaces flood coolant and eliminates hours of cleanup on a cast iron machining operation.

The Adjustable Spot Cooler maintains critical tolerances on machined plastic parts.

Tel.: +31 (0)20 - 497 67 80  Fax: +31 (0)20 - 497 67 05  Email:  info@spraybest.nl  Website:  www.spraybest.nl
The Adjustable Spot Cooler incorporates a vortex tube to convert an ordinary supply of compressed air (1) into two low pressure streams, one hot and one cold. (For complete information on vortex tube operation, see page 139.) With the turn of a knob, the temperature control valve (2) allows some hot air to flow through a muffling sleeve and out the hot air exhaust (3). The opposite end provides a cold airstream (4) that is muffled and discharged through the flexible hose, which directs it to the point of use. The swivel magnetic base (5) provides easy mounting and portability.

### How The Adjustable Spot Cooler Works

![Diagram of Adjustable Spot Cooler](How_The_Adjustable_Spot_Cooler_Works.png)

The Adjustable Spot Cooler gives instant cold air when filtered compressed air is supplied to it. Cycling on and off is a good way to save air. For on and off control, use a Model 9012 Manual Shutoff Valve. To turn the Adjustable Spot Cooler on with the machine, the Model 9020 Solenoid Valve may be used and wired through the machine control switch. The EFC electronic flow control shown on page 4 can also be used.

### Specifications

<table>
<thead>
<tr>
<th>Pressure Supply</th>
<th>Air Consumption</th>
<th>Sound Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSIG</td>
<td>SCFM</td>
<td>SLPM</td>
</tr>
<tr>
<td>100</td>
<td>6.9</td>
<td>15</td>
</tr>
<tr>
<td>100</td>
<td>6.9*</td>
<td>25</td>
</tr>
<tr>
<td>100</td>
<td>6.9</td>
<td>30</td>
</tr>
</tbody>
</table>

*25 SCFM (708 SLPM) generator is factory installed

### Dimensions

![Diagram of Adjustable Spot Cooler dimensions](Dimensions.png)

### Adjusting the Spot Cooler

The Adjustable Spot Cooler System can produce a full range of airflows and temperatures as determined by the knob setting and a small internal part called a generator. The generators control the SCFM (SLPM) of air consumption and are easily interchangeable.

The Adjustable Spot Cooler has a 25 SCFM (708 SLPM) generator installed that produces up to 1,700 Btu/hr. (429 Kcal/hr.). If less cooling is desired, the 15 SCFM (425 SLPM) generator which delivers 1,000 Btu/hr. (252 Kcal/hr.) can be installed. If more cooling is needed, the 30 SCFM (850 SLPM) generator can be installed for up to 2,000 Btu/hr. (504 Kcal/hr.).

### Controlling the Cold Air

The Adjustable Spot Cooler gives instant cold air when filtered compressed air is supplied to it. Cycling on and off is a good way to save air. For on and off control, use a Model 9012 Manual Shutoff Valve. To turn the Adjustable Spot Cooler on with the machine, the Model 9020 Solenoid Valve may be used and wired through the machine control switch. The EFC electronic flow control shown on page 4 can also be used.

### Adjusting the Spot Cooler

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### Adjusting the Spot Cooler

The Adjustable Spot Cooler gives instant cold air when filtered compressed air is supplied to it. Cycling on and off is a good way to save air. For on and off control, use a Model 9012 Manual Shutoff Valve. To turn the Adjustable Spot Cooler on with the machine, the Model 9020 Solenoid Valve may be used and wired through the machine control switch. The EFC electronic flow control shown on page 4 can also be used.
Adjustable Spot Cooler

Testing Heat Tape Thermostats

The Problem: A manufacturer of electrical heat tapes had a problem testing thermostats for accuracy. The heat tape is supposed to switch on when the outdoor temperature dips below 40°F to prevent pipes from freezing or ice from building up on a roof’s edge. The liquid-tight thermostat of every tape had to be dipped into a bowl of ice water (thermometer checked at 36°F (2°C)) to make sure the indicator light came on and the tape got warm. Summertime heat caused the water to heat up so quickly that more time was spent regulating the water temperature than testing thermostats.

The Solution: The water bath was replaced with a Model 3825 Adjustable Spot Cooler. Once set to their desired temperature of 36°F (2°C), it provided a stable temperature all day long without adjustment. Drying each heat tape was no longer required and testing was over in seconds.

Comment: The Adjustable Spot Cooler paid for itself in no time as a result of the increased productivity. In this case, the company used the included 15 SCFM (425 SLPM) generator which minimized the compressed air use, costing only 23 cents per hour of continuous use! When testing thermostats, cooling machined plastics, setting hot melts or controlling tolerances, the Adjustable Spot Cooler is the best choice.

Adjustable Spot Cooler Systems

Model 3825 Adjustable Spot Cooler System includes the Adjustable Spot Cooler, single point hose kit with cone and fan nozzle, swivel magnetic base, filter separator, 15 and 30 SCFM (425 and 850 SLPM) generators. (25 SCFM/708 SLPM generator installed.)

<table>
<thead>
<tr>
<th>Model #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5901</td>
<td>Single Point Hose Kit (Included with 3825)</td>
</tr>
<tr>
<td>5902</td>
<td>Dual Point Hose Kit (Included with 3925)</td>
</tr>
</tbody>
</table>

Model 3925 Adjustable Spot Cooler System includes the Adjustable Spot Cooler, dual point hose kit with cone and fan nozzles, swivel magnetic base, filter separator, 15 and 30 SCFM (425 and 850 SLPM) generators. (25 SCFM/708 SLPM generator installed.) (Adjustable Spot Cooler with dual point hose kit is recommended when heat is generated over a larger surface area.)
Mini Cooler™

Cool small parts and tools with clean, cold air!

Prevent burning, melting or breakage!

What Is The Mini Cooler?
A proven way to reduce downtime and increase productivity on a variety of operations involving small parts where heat is a problem. EXAIR’s Mini Cooler produces a stream of 20°F (-7°C) cold air to prevent heat build-up. The Mini Cooler is particularly effective on high speed operations to prevent burning, melting and heat related breakage. Operation is quiet (76 dBA) and there are no moving parts to wear out.

Applications
- Small tool cooling
- Needle cooling
- Blade cooling
- Lens grinding

Advantages
- Low cost
- Increases production rates
- Improves tolerances
- Quiet, compact

Mini Cooler Specifications

<table>
<thead>
<tr>
<th>Air Consumption</th>
<th>Temperature Out</th>
<th>Sound @ 3’ (914mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCFM</td>
<td>SLPM</td>
<td>°F</td>
</tr>
<tr>
<td>8</td>
<td>227</td>
<td>20</td>
</tr>
</tbody>
</table>

Supply air at 100 PSIG (6.9 BAR) & 70°F (21°C)

How The Mini Cooler Works
The Mini Cooler incorporates a vortex tube to convert a small amount of compressed air into two low pressure streams, one moving within the other in opposite directions (see page 139). The two airstreams exchange heat, producing cold air from one end of the tube and hot air from the other. A flexible hose directs the cold airstream at the surface to be cooled.

Dimensions

Mini Cooler System prevents premature tool wear on a slotting operation.

Mini Cooler

<table>
<thead>
<tr>
<th>Model #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3808</td>
<td>Mini Cooler System includes the Mini Cooler, swivel magnetic base, mini single point hose kit and manual drain filter</td>
</tr>
</tbody>
</table>

Mini Cooler Accessories

<table>
<thead>
<tr>
<th>Model #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5904</td>
<td>Mini Cooler Single Point Hose Kit (Included with 3808)</td>
</tr>
<tr>
<td>5905</td>
<td>Mini Cooler Dual Point Hose Kit</td>
</tr>
</tbody>
</table>

Tel. : +31 (0)20 - 497 67 80
Fax : +31 (0)20 - 497 67 05
Email : info@spraybest.nl
Website : www.spraybest.nl
Cold Gun Aircoolant System™

Replace messy mist systems - improve dry machining with clean, cold air!

What Is The Cold Gun Aircoolant System?
A new solution to an old problem. Heat build up on dry machining operations reduces tool life and machining rates. The Cold Gun Aircoolant System produces a stream of clean, cold air at 50°F (28°C) below supply air temperature. Operation is quiet and there are no moving parts to wear out. It will remove heat to prolong tool life and increase productivity on machining operations when liquid coolants cannot be used.

The Cold Gun is also an alternative to expensive mist systems. It eliminates the costs associated with the purchase and disposal of cutting fluids and worker related health problems from breathing airborne coolants or slipping on wet floors.

EXAIR’s Cold Gun is non-adjustable to prevent freeze-up during use. Cold airflow and temperature drop are factory set to optimize the gun’s cooling capability.

Applications
- Tool sharpening
- Drill and cutter grinding
- Routing
- Plunge and form grinding
- Milling
- Surface grinding
- Drilling
- Tire grinding
- Band sawing
- Plastic machining
- Laser cutting
- Chill rolls
- Setting hot melt adhesives

Advantages
- Improves production rates
- Prevents burning
- Extends tool life - reduces breakage
- Improves tolerance control
- Prevents smearing of metal or plastics
- Finished part is dry
- Eliminates wheel loading
- Low cost
- Compact, lightweight, portable
- No moving parts - maintenance free
- Quiet
- No coolant cost
- No electricity

The Model 5215 Cold Gun keeps the part cool to the touch and prevents discoloration.

Cold air eliminates heat cracking of the carbide tool during sharpening.

The Model 5315 Cold Gun cools a two flute 3/8” carbide cutter on a CNC, increasing tool life by 50%.

Watch the video!
www.exair.com/cgvideo.htm
Applications

Tool Grinding
Cold air eliminates heat cracking of carbide and tool edge burning during grinding and sharpening operations. Increased tool life between regrinds is the result.

Milling & Drilling
Fly cutters up to 460mm in diameter have been cooled with the Cold Gun. Dissipating heat with cold air extends tool life, increases speeds and feeds, and improves finishes.

Chill Roll
Cooling a roll with 20°F (-7°C) air keeps the material on the surface from bunching up, jamming or tearing. The metal surface transfers the cold temperature to the product.

Laser Cutting
Cold air cools a laser cut part so it can be handled seconds later. The High Power Cold Gun has twice the cooling capacity of the standard Cold Gun, cooling the part in less time.
Cold Gun Aircoolant System

How The Cold Gun Works

The standard Cold Gun and High Power Cold Gun incorporate a vortex tube to convert an ordinary supply of compressed air (1) into two low pressure streams, one hot and one cold. (For complete information on vortex tube operation, see page 139 of this catalog.) The Cold Gun’s hot airstream is muffled and discharged through the hot air exhaust (2). The cold air (3) is muffled and discharged through the flexible hose (4), which directs it to the point of use. Easy mounting and portability are provided through the use of an attached magnetic base (5).

Specifications

<table>
<thead>
<tr>
<th>Model #</th>
<th>Pressure Supply</th>
<th>Air Consumption</th>
<th>Sound Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PSIG</td>
<td>BAR</td>
<td>SCFM</td>
</tr>
<tr>
<td>Cold Gun</td>
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</tr>
<tr>
<td>5215, 5315</td>
<td>100</td>
<td>6.9</td>
<td>15</td>
</tr>
<tr>
<td>High Power Cold Gun</td>
<td>5230, 5330</td>
<td>100</td>
<td>6.9</td>
</tr>
</tbody>
</table>

Cold Gun Dimensions

Controlling the Cold Air
The EXAIR Cold Gun gives instant cold air when filtered compressed air is supplied to it. Cycling on and off is a good way to save air. For on and off control, use a Model 9012 Manual Shutoff Valve. To turn the Cold Gun on with the machine, the Model 9020 Solenoid Valve may be used and wired through the machine control switch. This method is ideal for hand grinders and drill sharpeners.

The Compressed Air Supply
The Cold Gun is designed to use full line pressure of 80-100 PSIG (5.5-6.9 BAR). Temperature drop and flow are reduced when lower input pressures are applied. The use of clean, filtered air is essential to the operation of the Cold Gun. A filter separator that removes moisture, dirt and other particulates from the compressed air is included with each Cold Gun System.

Selecting The Right Model
Cold Gun Aircoolant Systems are available with either a Single Point or Dual Point Hose Kit.

The Single Point Hose Kit (included with the Model 5215 Cold Gun and Model 5230 High Power Cold Gun) is recommended for applications where a concentrated airflow is needed such as drilling and grinding operations.

The Dual Point Hose Kit (included with the Model 5315 Cold Gun and Model 5330 High Power Cold Gun) is recommended for applications where the heat is generated over a larger surface area such as band sawing, milling, chill rolls and hot melt adhesives.

A Cold Gun System with the Model 5901 Single Point Hose Kit can be easily converted to a “dual point” system with the purchase of the Model 5902 Dual Point Hose Kit.

Need More Cooling?
EXAIR’s High Power Cold Gun Aircoolant System™ produces twice the airflow of the standard Cold Gun, doubling the cooling capability. It produces cold air at 50°F (28°C) below the supply air temperature so the air is as cold as possible without freezing up. Two systems are available: the Model 5230 High Power Cold Gun with Single Point Hose Kit and Model 5330 High Power Cold Gun with Dual Point Hose Kit.
Purdue University Study Confirms Benefits Of The EXAIR Cold Gun

Tooling costs a lot of money to replace. That’s only part of the problem. As the tools wear out, you can expect:
- Slowed production and downtime to change out the tooling
- Poor tolerances and dimensional accuracy due to increased temperature
- Increased cutting force is required (generates more heat and uses more electricity)

If you could just make the tooling last longer, you’d not only cut the tool cost but could increase profits by reducing scrapped parts and downtime.

A long term study on the effect of refrigerated air on tool wear in wood machining was conducted at the Forestry Products Department of Purdue University by Ms. Judith Gisip. The project was under the direction of Dr. Rado Gazo (department professor) and Harold Stewart (professor at North Carolina State University with 35 years in wood machining research). Wood is brutal on tooling. In metalworking, most of the heat goes away with the machined chip. Wood is an excellent insulator and doesn’t conduct the heat away, which keeps it all there at the tool. Temperatures can exceed 1472°F (800°C)!

The extensive tests at Purdue were conducted in a 70°F climate controlled room. They tested (4) 1/2” (12.7mm) two-flute cutters on a CNC router at 16,000 rpm. (22) sheets of 3/4” thick MDF (medium density fiberboard) were fed one at a time, cutting away 1/4” (6mm) depth of cut on each pass. Power consumption of the CNC was recorded (current draw increases as the tool starts to dull). When finished, the surface of the tools was examined using a scanning electron microscope. Machining with the Cold Gun’s 20°F air reduced tool wear by over 21% compared to the results with no cooling.

For complete details of the Purdue study, visit our web site at www.exair.com/purdue.htm.

Cold Gun Aircoolant Systems

Model 5215 Cold Gun System (one cold outlet)
includes Cold Gun, Single Point Hose Kit, 3/8” (10mm) Cone Nozzle, 1-1/4” (32mm) Fan Nozzle, Manual Drain Filter Separator.

Model 5315 Cold Gun System (two cold outlets)
includes Cold Gun, Dual Point Hose Kit, (2) 1/4” (6mm) Cone Nozzles, (2) 1” (25mm) Fan Nozzles, Manual Drain Filter Separator.

Model 5230 High Power Cold Gun System (one cold outlet)
includes High Power Cold Gun, Single Point Hose Kit, 3/8” (10mm) Cone Nozzle, 1-1/4” (32mm) Fan Nozzle, Automatic Drain Filter Separator.

Model 5330 High Power Cold Gun System (two cold outlets)
includes High Power Cold Gun, Dual Point Hose Kit, (2) 1/4” (6mm) Cone Nozzles, (2) 1” (25mm) Fan Nozzles, Automatic Drain Filter Separator.

How Much Can You Save?
- A 1/2” two flute router bit for wood is approximately $67.
- The 21% reduction in tool wear when using a Cold Gun is $67 x 0.21 = $14.07 savings per bit.
- If you use (1) router bit per working day, the savings is $14.07 x 5 working days = $70.35 per week / $3,658 per year For One Bit!