

AiRTX STAINLESS STEEL VORTEX TUBES

Instant Cold Air — to -40°F — for Industrial Spot Cooling, or Hot Air — to 230°F for Heating, from Ordinary Compressed Air!

Two Sizes Available



▲ Model 20025



▲ Model 20008

▲ What is a Vortex Tube? *It's your answer for instant cold air, where and when you need it, using nothing but compressed air as a power source. There's no maintenance, no mess, no explosion hazard, no electricity, no moving parts — just clean, cold air for industrial or laboratory spot cooling.*



▲ The Model 20400 Application Development Kit includes all 8 generators, 12" Snap-Flex Hose, 5 micron filter, cold end muffler, and Stainless Steel AiRTX Vortex Tube.

Reliable, Predictable, Easy to Control Without Tools

A Vortex Tube turns factory compressed air into two air-streams, one very cold and one hot, using no moving parts. Simple and low-cost, a Vortex Tube can produce:

- temperatures from -40°F (-40°C) to +230°F (+110°C) from 70°F compressed air
- up to 2500 BTU/H (630 Kcal/H) refrigeration
- air flow rates up to 35 cfm (990 lpm)

You just set the cold temperature output with the handy control knob and your thermometer. **No tools are required.**

Assuming your compressed air input pressure and temperature remain constant, a Vortex Tube will hold output temperatures $\pm 1^\circ\text{F}$ ($\pm 0.6^\circ\text{C}$).

Our unique temperature control knob lets you adjust the cold air discharge without tools.

A simple, interchangeable part — the Vortex Generator — allows our Vortex Tube to deliver five different air flows: 8, 10, 15, 25, 35 cfm (220, 280, 420, 700, 990 lpm) — each with two ranges of cooling performance (high or low).

The User-Friendly Vortex Tube from AiRTX — Precision Stainless Steel for the Price of the “Other Guys” Aluminum Tubes

Starting with corrosion-resistant, food-grade Stainless Steel as the principal material of construction, AiRTX designers have optimized every aspect of Vortex Tube design for convenience, dependable performance, and long-lasting service.

The AiRTX Vortex Tube is as good-looking as it is functional. No cheap aluminum or plated brass parts. It's precision machined, assembled and tested.

Manufactured to exacting tolerances, AiRTX Vortex Tubes are produced under strict quality control to ensure years of reliable, maintenance-free operation.

Putting Vortex Tubes to Work: Packaged Systems, “Tube Only,” or an Application Development Kit

AiRTX offers Vortex Tubes in several ready-to-use packaged systems for common industrial applications. Packaged systems include the **Model 60040 Air Gun** and the **Control Cooler** — all described on subsequent pages.

We also offer an **Application Development Kit** for the system designer who needs a Vortex Tube for studies and design verification. By switching one interchangeable part supplied with the kit, you can produce the full range of air flows and cold fractions the tube is capable of. The **Application Development Kit** includes instructions, five-micron filter, and cold end muffler, and 8 generators

Lastly, you can purchase the Vortex Tube alone, or with other components to meet system requirements.

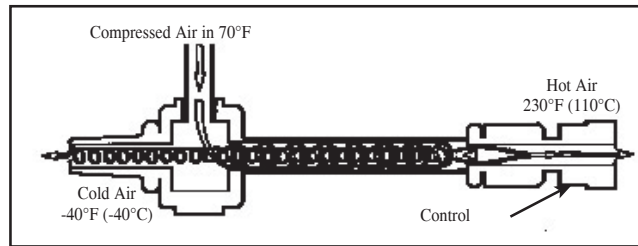
What You Can Do with Vortex Tubes

- Cool manufacturing processes: machining plastics or metals, wood-working, soldering, adhesive application, heat sealing, sewing needles, mold tooling and many others
- In the laboratory: cool and dehumidify gas samples, cool environmental chambers
- “Temperature cycle” electronic components, instruments, switches, thermostats
- Air condition electronic control enclosures: CNC cabinets, industrial PCs, PLCs, motor controls
- Generate hot air to +230°F (+110°C), without a spark or explosion hazard to soften plastic, melt glues, seal packaging
- Cool workers wearing protective gear

... see some application ideas on page 7.

Convenient, Safe, Easy-to-Use

- No moving parts, portable, lightweight, low cost
- Uses no electricity, freon or chemicals; just filtered, factory compressed air
- No spark hazard, RF/EMI interference
- Instant on/off, easy to control, cools without waste
- No residue to clean up, no parts washing needed
- Reliable, maintenance-free, durable Stainless Steel construction
- Input air flows of 8, 10, 15, 25, and 35 cfm (220, 280, 420, 700, 990 lpm); up to 2500 BTU/H (630 Kcal/H) cooling capacity
- Two sizes available



Conversion Formulas

$$^{\circ}\text{F} = 9/5 \text{ }^{\circ}\text{C} + 32^{\circ}$$

$$^{\circ}\text{C} = 5/9 (\text{F} - 32^{\circ})$$

$$\text{BAR} = \text{psi} \div 14.5$$

$$\text{Kcal} = \text{BTU} \times .2520$$

$$\text{LPM} = \text{cfm} \times 28.3$$

$$\text{m./min.} = \text{ft./min.} \times 0.3048$$

$$\text{oz} = \text{g} \times .035$$

$$\text{BTU} = \text{WATTS} \times 3.41$$

BTU conversion — HP to BTU/Hour

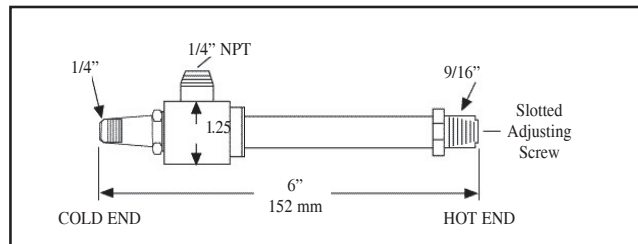
$$1 \text{ Hp} = 42.44 \text{ BTU/min.}$$

$$1 \text{ Hp} = 2546 \text{ BTU/hr.}$$

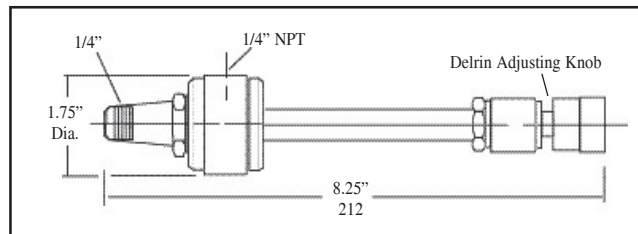
$$1 \text{ Hp} = 746 \text{ WATTS}$$

$$1 \text{ KWH} = 3414 \text{ BTU/hr.}$$

Models of Stainless Steel ARTX Tubes Available — Two Sizes



▲ Model 20008



▲ Vortex Tubes Models 20010-21035

*Available with 1/4" BSP

AIRTX STAINLESS STEEL VORTEX TUBES

Instant Cold Air — to -40° F — for Industrial Spot Cooling, or Hot Air — to 230° F — for Heating, from Ordinary Compressed Air!

Vortex Tube Performance Data

Inlet Pressure psiG	Cold Fraction, %						
	20	30	40	50	60	70	80
20	61.5	59.5	55.5	50.5	43.5	36.0	27.5
	14.5	24.5	36.0	49.5	64.0	82.5	107.0
40	88.0	85.0	80.0	73.0	62.5	51.5	38.0
	20.5	35.0	51.5	71.0	91.5	117.0	147.0
60	104.0	100.0	93.0	84.0	73.0	59.5	44.5
	23.5	40.0	58.5	80.0	104.0	132.0	168.0
80	115.0	110.0	102.0	92.0	80.0	65.5	49.0
	25.0	43.0	63.0	86.0	113.0	143.0	181.0
100	123.0	118.0	110.0	99.0	86.0	70.5	53.0
	26.0	45.0	66.5	91.0	119.0	151.0	192.0
120	129.0	124.0	116.0	104.0	90.5	74.0	55.0
	26.0	46.0	69.0	94.0	123.0	156.0	195.0
140	135.0	129.0	121.0	109.0	94.0	76.0	56.5
	25.5	46.0	70.5	96.0	124.0	156.0	193.0

Figures in pink area give temperature drop of cold air, °F Figures in grey area give temperature rise, °F

Air Conditioning Power

The cooling and heating power in BTU/H can be found by using these formulas.

For Cooling: BTU/H = 1.0746 (cfm c) (Ti-Tc)
 For Heating: BTU/H = 1.0746 (cfm h) (Th-Ti)

Where: CF = Cold Fraction Ti = Inlet Temperature
 cfm t = Total Air Flow Tc = Cold Air Outlet Temperature
 cfm c = Cold Air Flow = cfm t (CF) Th = Hot Air Outlet Temperature
 cfm h = Hot Air Flow = cfm t (100 - CF)

Heat Balance Formula

Cold fraction can be computed from the temperature readings from the inlet temperature (Ti), the cold air outlet temperature (Tc), and the hot air temperature (Th), so that:

$$\text{COLD FRACTION \% (CF)} = \frac{\text{Th-Ti} + 4}{\text{Th-Tc}} \times 100$$

Vortex Tube Capacities

Model	Inlet Pressure*		Air Consumption		Capacity	
	(psi)	(BAR)	(cfm)	(lpm)	(BTU/H)	(Kcal/H)
20008	100	7	8	220	400	100
20010	100	7	10	280	500	150
20015	100	7	15	420	1100	230
20025	100	7	25	700	1800	380
20035	100	7	35	990	2500	630

*Inlet temperature 70°F/21.1°C

How Does a Vortex Tube Work?

How **can** you get cold air and hot air from one compressed-air stream? Lots of people have tried to explain it, including the French physicist who invented the Vortex Tube in the 1930's, Georges Ranque. Many different theories have been put forward.

Vortex Tubes behave in a very predictable and controllable way. When compressed air is released into the tube through the Vortex Generator, you get hot air out of one end of the tube and cold air out the other. A small valve in the hot end, adjustable with the handy control knob, lets you adjust the volume and temperature of air released from the cold end.

The Vortex Generator — an interchangeable, stationary part — regulates the volume of compressed air, allowing you to alter the air flows and temperature ranges you can produce with the tube.

“Cold Fraction”: an Important Term for Understanding Vortex Tube Performance

“Cold fraction” is the percentage of input compressed air that's released through the cold end of the tube. As a rule of thumb, the less cold air you release, the colder the air will be. You adjust the cold fraction with the control knob. Cold fraction is also a function of the type of vortex generator that's in the tube, i.e., a “high cold fraction” or “low cold fraction” generator.

Most industrial process applications use a high cold fraction (above 50%). A high cold fraction tube can easily give you cold outputs 50-90°F (28-50°C) **below** your compressed air temperature. High cold fractions give you a greater air flow, but they don't give the lowest possible temperatures.

The high cold fraction combination of airflow and cold temperature **produces the maximum refrigeration capacity, or greatest BTU/H (Kcal/H).**

A low cold fraction (below 50%) means a smaller volume of air coming out that's **very cold** (down to -40°F/-40°C). In short, the less air you release, the colder the air.

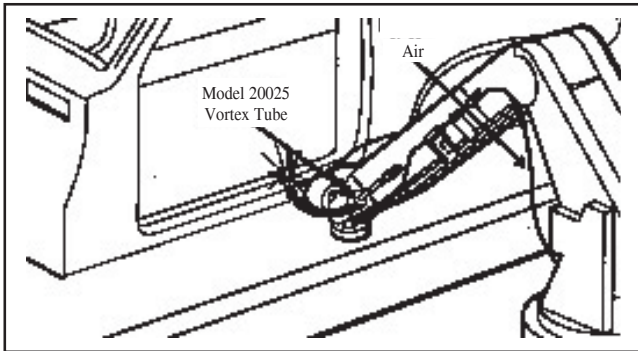
Just remember, your maximum BTU/H (Kcal/H) capacity (also called maximum cooling or refrigeration) occurs with a high cold fraction tube.

The chart to the left shows you the temperature drop (pink bar) and rise (grey bar) you can get at various inlet pressures and cold fraction settings.

Two Tubes, Ten Levels of Performance

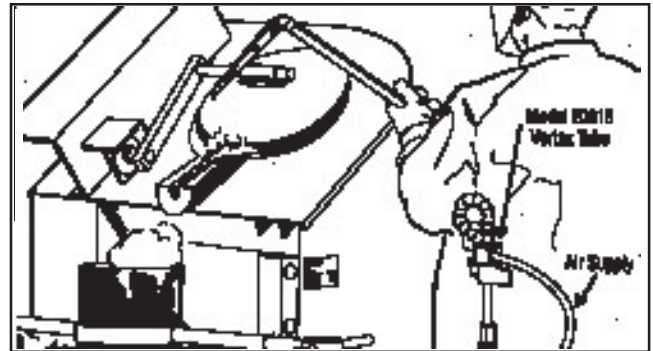
ARTX's modular design Vortex Tube gives you ten ranges of performance from a single tube, simply by changing the one-piece Vortex Generator. Both high and low cold fraction generators are available for 8, 10, 15, 25 and 35 cfm (220, 280, 420, 700, 990 lpm) input flows. You can purchase Vortex Generators individually or in a kit that includes all sizes.

Vortex Tubes at Work



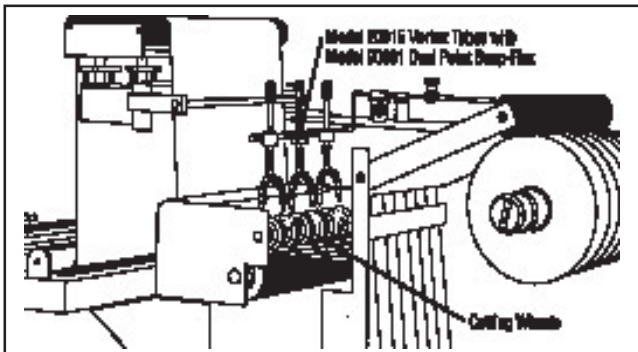
Transportation — Spot Welding

Cooling this spot welding operation with a Vortex Tube virtually eliminates secondary smoothing operations and greatly improves the appearance of the product.



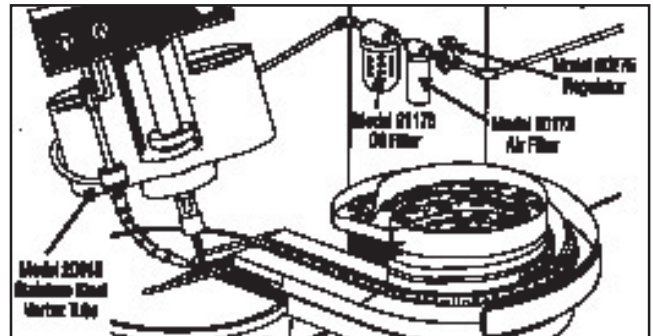
Foundry Operations

Cold air from a Vortex Tube is piped into a foundry worker's protective suit. The Vortex Tube has a large control knob, allowing the cold air to be adjusted while wearing gloves.



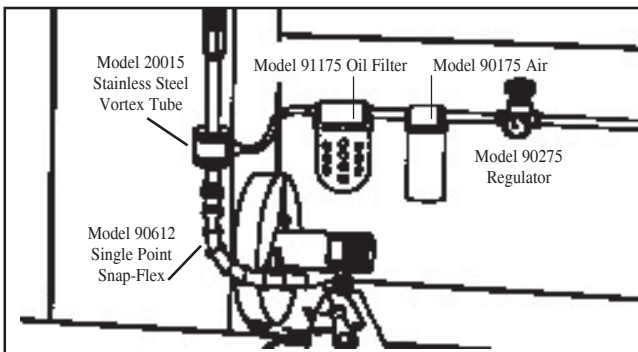
Plastics — Slitting

Cutting wheels on this slitter can work at top speed — and stay sharper longer — when cold air from Vortex Tubes eliminates the frictional heat buildup. The trim edge is also cleaner.



Metal Fabricating — Tapping

Tapping brass clips is completed without messy liquid coolants using 0°F (-18°C) air from a Vortex Tube to cool the tap. The brass does not have a chance to gum up, the cut is cleaner, and secondary cleaning operations are eliminated.



Metal-Working — Single-Point Threading

Heat buildup in this single-point threading operation can shorten tool life and produce a rough thread. Clean, dry, sub-zero air cooling allows increased speed, while eliminating tool microcracking and premature failure.

Parts Numbering System

- AiRTX Tubes series number 20000.
- 2nd digit 0 — Maximum cooling
 - 1 — Maximum cold temperature
- The last 2 digits of the part number indicate cfm usage at 100 psi.

Model	Description	CFM	LPM
20008	Maximum cooling, Stainless Steel Vortex Tube	8	226
20010	Maximum cooling, Stainless Steel Vortex Tube	10	283
21010	Maximum cold temperature Stainless Steel Vortex Tube	10	283
20015	Maximum cooling Stainless Steel Vortex Tube	15	425
21015	Maximum cold temperature Stainless Steel Vortex Tube	15	425
20025	Maximum cooling Stainless Steel Vortex Tube	25	708
21025	Maximum cold temperature Stainless Steel Vortex Tube	25	708
20035	Maximum cooling Stainless Steel Vortex Tube	35	991
21035	Maximum cold temperature Vortex Tube	35	991
20400	Application Development Kit containing:		