



Operating Manual

Vortex Tube

Contents

Section	Page
1. Introduction	5
2. Safety and Inspection	6
3. Fitting and Specifying Generator	7
4. Compressed Air Supply	9
5. Installation	12
6. Maintenance	12
7. Troubleshooting	13
8. Technical Drawing	13

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1. Introduction



The Meech Air Technology Stainless Steel Vortex Tubes and Experimental Kit from Meech Air Technology provide a cold airflow that is commonly used for spot cooling.

The cold air produced by the vortex tube can easily be directed on to an area to be cooled by attaching ducting or fastening the cold end to a bulkhead. The hot air created by the opposite end of the Vortex tube flows to atmosphere or can be directed through a silencer.

The cold airflow can be as low as 50°C below inlet air temperature and be maintained to +/- 0.6°C.

They are intrinsically safe and require virtually no maintenance as they have no moving parts. This makes them ideal for harsh environments.

2. Safety and Inspection

Meech Vortex Tubes and Experimental Kits are packed carefully at our factory. Nevertheless, we recommend careful examination of the carton and contents for any damage.

Warning – When compressed air is misused, it can cause serious injury or even death. To protect yourself and others when using compressed air, you should be aware of the following general safety guidelines:

- Never point an air hose at anyone in fun or to remove dirt from clothing or the body.
- Never use compressed air without adequate eye and ear protection. Use safety glasses with side shields or goggles and ear protectors.
- Before attempting to disconnect a hose from an airline, the air should be cut off, and the remaining air bled from the line.
- Keep air hoses off the floor where they become tripping hazards and are subject to damage by vehicles, doors, and dropped tools. If possible, suspend air hoses from overhead.
- Please be aware of the following safety guidelines specific to the Vortex Tube:
 - Vortex Tube create both hot and cold air so parts of the unit will become hot.
 - Do not operate the Vortex Tube at compressed air pressures above 11 Bar (160 psi)
 - Compressed air temperature must not exceed 55°C
 - Ambient operating temperature must not exceed 66°C
 - Ambient operating temperature cannot drop lower than -10°C
 - Ambient operating temperature must not exceed 66°C
 - Ambient operating temperature can not drop lower than -10°C

This operating manual covers products:



Vortex tube



Experimental Kit

3. Fitting and Specifying Generator

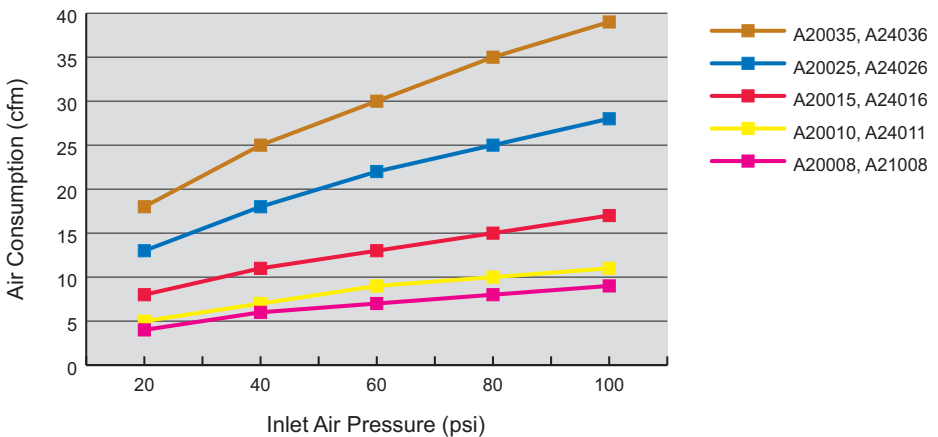
The generators within the Vortex Tube control the air consumption and air flow. They also influence the achievable temperatures.

The chart below shows achievable temperatures with different generators fitted.

Please note these are approximate temperatures and should only be used as a guide.

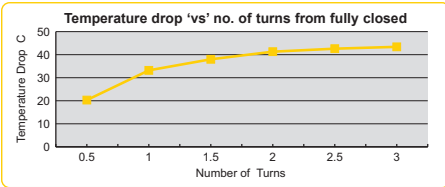
The Vortex Tube will perform differently when used in other environments.

Product Code	Generator Colour	Consumption in CFM (l/min)	Inlet air pressure					
			60 PSI (4.1 Bar)		80 PSI (5.5 Bar)		100 PSI (6.8 Bar)	
			CFM at test	2.5 turns of needle valve	CFM at test	2.5 turns of needle valve	CFM at test	2.5 turns of needle valve
			cfm (l/min)	°C	cfm (l/min)	°C	cfm (l/min)	°C
A21008	Green	8L (227)	15 (425)	-23.4	19 (538)	-30.1	21 (595)	-33.4
A20008	Yellow	8H (227)	13 (368)	-24.2	18 (510)	-28.5	20 (566)	-31.7
A21010	Green	10L (283)	15 (425)	-26.9	19 (538)	-35.5	21 (595)	-36.0
A20010	Yellow	10H (283)	13 (368)	-27.2	18 (510)	-35.0	21 (595)	-31.3
A21015	White	15L (425)	17 (481)	-29.8	22 (623)	-34.2	25 (708)	-35.4
A20015	Red	15H (425)	16 (453)	-28.3	21 (595)	-32.9	25 (708)	-32.6
A21025	Grey	25L (708)	23 (651)	-23.3	28 (793)	-23.7	30 (849)	-25.7
A20025	Blue	25H (708)	23 (651)	-19.0	30 (849)	-23.4	31 (878)	-24.9
A21035	Beige	35L (991)	27 (765)	-16.7	34 (963)	-16.5	39 (1104)	-18.6
A20035	Brown	35H (991)	30 (849)	-15.8	36 (1019)	-18.6	43 (1218)	-18.0

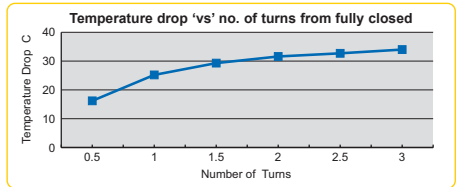


As standard the Vortex Tube is supplied with a red (Refrig) 15cfm, 293W (1000 Btu/hr) generator.

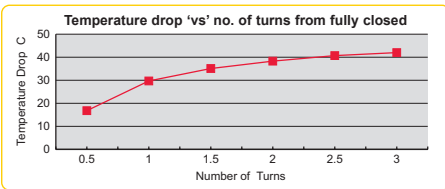
YELLOW GENERATOR:



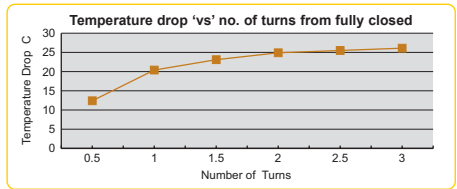
BLUE GENERATOR:



RED GENERATOR:



BROWN GENERATOR:



To change the generator simply unscrew the cold end cap and replace the generator with another colour. Please remember to re-fit the 'O'-ring and screw cold end cap fitting until tight.

Four Cold Fraction generators are available for the Meech Vortex Tube. Information on all generators and sizing can be seen in the chart.

Generator	Air Consumption		Cooling Capacity	
	cfm	lpm	W	Btu/hr
Yellow	10	283	190	650
Red	15	425	293	1000
Blue	25	708	499	1700
Brown	35	991	703	2400

4. Compressed Air Supply

It is recommended to use a 5-micron (or smaller) filter to remove water and dirt from the compressed air supply. A 5 micron filter will remove 99% of foreign material from the air supply; the use of an oil filter with an effective filtration of 0.01 ppm will remove the oil droplets for an even cleaner compressed air supply.

Failure to use a filter may cause clogging and freezing of the compressed air line and the components within the Vortex Tube.

When the temperature of the compressed air within the Vortex Tube reaches 0°C the water vapour in the air will start to freeze. This could potentially cause a problem with ice clogging the orifices of the Vortex Tube.

In this instance an air dryer must be used to lower the dew point and keep water vapour out of the airline. A dryer rated at -19°C will produce a dew point low enough to eliminate the water vapour freezing.

Figuring the correct pipe size for your compressed air system is an important task. Pipe that is sized too small can create big pressure losses and reduce operating efficiency.

Many people who plan the piping never consider the fittings or the future. **FITTINGS:** Every pipe fitting creates a certain amount of increased frictional air loss that is equal to a specified length of pipe. Any turns in the pipe at fittings, ells, tees, and valves increase pressure drops even more.

FUTURE: Are you planning to add more equipment in the next year or two? Then plan for larger piping now. Since the material costs in piping are low compared to installation or replacement cost, it's wise to select pipe of an adequate size. If there is any doubt that a pipe size may create a pressure drop, use the next largest size. Remember that an oversize pipe compensates for possible scale build-up and provides for future expansion of the overall air system.

Steps to calculating overall piping size for your compressed air system:

Determine your air compressor's maximum CFM.

Draw a piping schematic and show all pipe fittings, valves, etc.

Measure and write the corresponding lengths of pipe on your schematic, then total the length of all straight pipes needed and note that on your schematic.

Using TABLE 1 (over page), find your compressor's CFM number on the far left column, and then go to the right until you see the column header with nearest length in feet to your total pipe length. Find where the CFM & PIPE w the recommended pipe size for that length.

Take that pipe size to TABLE 2 and use the table to find all the EQUIVELENT LENGTHS OF PIPE needed for each PIPE FITTING. Write these lengths on your piping schematic at each fitting.

TOTAL all the EQUIVELENT LENGTHS OF PIPE needed for each PIPE FITTING and add to your total of straight length of pipe. This will give you a new and more accurate total pipe length needed.

Take your new total of EQUIVELENT LENGTH OF PIPE IN FEET back to.

TABLE 1 and use this number to determine the PIPE SIZE you need

- Determine your air compressor's maximum CFM.
- Draw a piping schematic and show all pipe fittings, valves, etc.
- Measure and write the corresponding lengths of pipe on your schematic, then total the length of all straight pipes needed and note that on your schematic.
- Using TABLE 1 (over page), find your compressor's CFM number on the far left column, and then go to the right until you see the column header with nearest length in feet to your total pipe length. Find where the CFM & PIPE LENGTH intersect on the chart and it will show the recommended pipe size for that length.

Specific Pipe Size

To obtain maximum performance from the Vortex Tube, accurate measures of air pressure and air volume must be obtained. Line pressure of 70-90 psi (5-6 Bar) can be present without a sufficient volume (cfm) of air.

To ensure that both pressure and volume are present to efficiently operate the Vortex Tube a line size of 3/8" pipe or 1/2" hose should be used for applications 10ft from the main header. Use 1/2" pipe or 3/4" hose up to 20ft. For pipe size over 20ft from the header please refer to the chart in Vortex Tube section 5.

How to determine what size of PIPE you need for compressed air lines:

Your Air Compressor's CFM	TABLE 1: EQUIVALENT LENGTH OF PIPE LINES IN FEET*							
	25 feet	50 feet	75 feet	100 feet	150 feet	200 feet	250 feet	300 feet
10	1/2	1/2	1/2	3/4	3/4	3/4	3/4	3/4
15	1/2	3/4	3/4	3/4	3/4	3/4	3/4	3/4
20	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
25	3/4	3/4	3/4	3/4	3/4	1	1	1
35	3/4	3/4	1	1	1	1	1	1

**Don't forget to include *PIPE FITTINGS in your final calculations*

TABLE 2: * EQUIVALENT LENGTH OF PIPE (FT.) for PIPE FITTINGS					
Pipe Size	Long Rad, Ell or run of tee	STD. Ell or Run of reduced tee	Tee Thru side outlet	Globe Valve	Gate Valve
1/2	0.62	1.55	3.1	17.3	0.36
3/4	0.82	2.06	4.12	22.9	0.48
1	1.05	2.62	5.24	29.1	0.61
1 - 1/4	1.38	3.45	6.9	38.3	0.81
1 - 1/2	1.61	4.02	8.04	44.7	0.94
2	2.07	5.17	10.3	57.4	1.21
2 - 1/2	2.47	6.16	12.3	68.5	1.44
3	3.07	6.16	15.3	85.2	1.79
4	4.03	7.67	20.2	112	2.35

**Add these numbers for each pipe fitting to total length of straight pipe*

5. Installation

The Vortex Tube is factory set to deliver the most efficient cooling needed to maintain a desired temperature inside your enclosure.

The medium Vortex Tube has a ¼" bsp female air inlet. The Small Vortex are fitted with a 1/8bsp male fitting. Standard pneumatic push-fit compressed air fittings can be used on the Vortex Tubes.

It is advised that the 5micron filter regulator and a stop valve is fitted between the ring main and the Vortex Tube.

6. Maintenance

The Meech Vortex Tube has no moving parts. Clean compressed air moving through the Vortex Tube will not cause wear on any of the components.

Occasionally, dirt, water or oil may enter the cooler from the compressed air supply, which could hinder the performance. If this happens simply take the unit apart, clean the parts with soapy water, allow drying time and then reassemble.

When reassembling ensure you tighten all the components. If the parts are not tightened correctly, it may affect the performance. Also, please ensure the generator is fitted. At the same time the element in the air filter should be changed.

7. Troubleshooting

Air flow

Problems with compressed air flow can be caused by:

- Air pressure too low – increase air pressure at the relevant regulator
- Undersized compressed air lines – replace pipes with correct sizes, see section 4
- Blocked compressed air line – remove blockage
- Insufficient compressor size – Check compressor size for fitting Cabinet Cooler

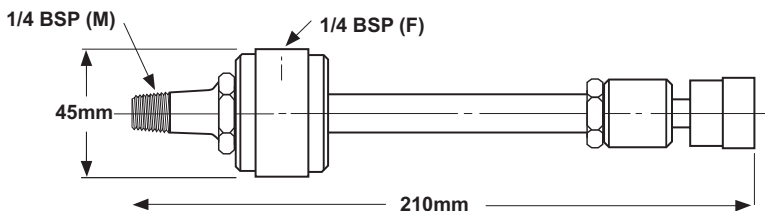
Air Temperature

Problems with air temperature can be caused by:

- Incorrect generator fitted – Check and replace generator, see section 7
- Compressed air line temperature too high – Check airline temperature.
- Loose/missing parts – Check all Vortex Tube parts are screwed in tightly and there are no missing parts.
- Water vapour in the compressed air supply – Check compressed air supply.

Air pressure too low – increase air pressure at the relevant regulator

8. Technical Drawing





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