

# SIZING THE SPARK ARRESTOR VENT TO THE ProtEX Vortex A/C

The ProtEX Vortex A/C must be used in conjunction with an enclosure purge and pressurization system. The purge system must have a spark arrestor vent that allows the cold air flow (produced by the ProtEX Vortex A/C) and the pressurization air flow to safely escape the protected enclosure, without creating too little or too much pressure in the enclosure. Add the pressurization air flow to the cold air flow as found in the table below to determine the total air flow through the spark arrestor vent.

ProtEX Vortex A/C Cold Air Flow (at 6–6.9 bar (90–100 psig) operating pressure)	
Models	Cold Air Flow (both cooling stages operating)
8170, 8170BSP	1330 liters/minute (47 ft <sup>3</sup> /minute)

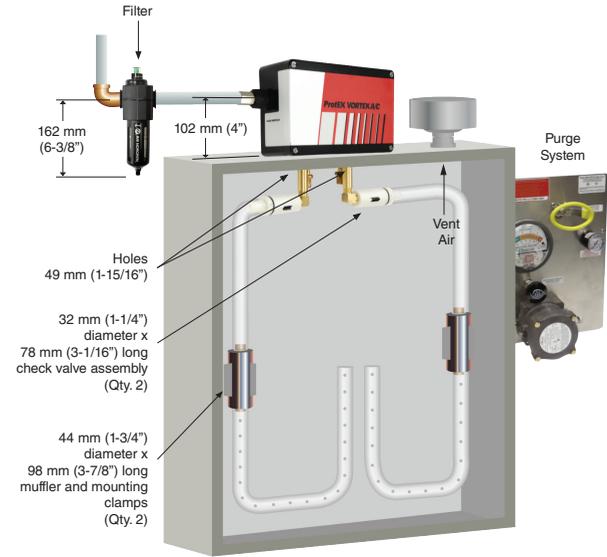
Contact the purge system manufacturer or Vortec if assistance is needed in selecting the correct spark arrestor vent to allow proper purging and pressurization.

## TROUBLESHOOTING

Insufficient cooling may be caused by the following:

1. Undersized compressed air line size.
2. Compressed air pressure at the cooler is too low.
3. Partial or complete blockage of internal compressed air paths, due to dirt.
4. Water vapor in the compressed air supply.
5. Loose cold air outlet fitting(s). This may occur if not tightened properly after being disassembled for cleaning.

If trouble persists, please contact Vortec at 1-800-441-7475.



**ProtEX Vortex A/C**  
(MODEL 8170 SHOWN TOP MOUNTED ON CUSTOMER'S ENCLOSURE)  
(USER SUPPLIED PURGE SYSTEM SHOWN FOR REFERENCE ONLY)

## TABLE 1: FILTER RECOMMENDATIONS

FILTER AND REPLACEMENT PART ITEM NUMBERS		
Vortec Model	Oil Removal Filter	Replacement Generator Kits (5 pc)
8170, 8170 BSP	701S-54	208GK-35H

## TABLE 2: DETERMINING COMPRESSED AIR LINE SIZE

1. Calculate total product compressed air consumption (SLPM, SCFM).
2. Determine length of compressed air line required for connection to main supply.
3. Locate pipe length in left column and read to the right to find the compressed air requirements.
4. Locate pipe size at top of column.

MAXIMUM AIRFLOW (SLPM) THROUGH PIPE AT 0.3 BAR PRESSURE DROP (6.9 BAR AND 21°C)									
Pipe Length (Meters)	Pipe Size (Nominal) - Schedule 40								
	1/4	3/8	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2
3	821	1840	3396	7188	13584	27677	42117	81023	128369
6	594	1302	2406	5094	9622	19584	29687	57279	90786
9	481	1047	1981	4160	7839	15990	24225	46780	74188
12	425	906	1698	3594	6792	13839	20999	40497	64184
15	368	821	1528	3226	6085	12367	18763	36224	57421
18	340	736	1387	2943	5547	11292	17150	33083	52412
21	311	708	1302	2717	5122	10471	15877	30621	48535
24	283	651	1217	2547	4811	9792	14829	28640	45393
27	269	623	1132	2406	4528	9226	13980	26998	42790
31	255	594	1075	2264	4302	8745	13273	25612	40611

MAXIMUM AIRFLOW (SCFM) THROUGH PIPE AT 5 PSIG PRESSURE DROP (100 PSIG AND 70°F)									
Pipe Length (Feet)	Pipe Size (Nominal) - Schedule 40								
	1/4	3/8	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2
10	29	65	120	254	480	978	1483	2863	4536
20	21	46	85	180	340	692	1049	2024	3208
30	17	37	70	147	277	565	856	1653	2619
40	15	32	60	127	240	489	792	1431	2268
50	13	29	54	114	215	437	663	1280	2029
60	12	26	49	104	196	399	606	1169	1852
70	11	25	46	96	181	370	561	1082	1715
80	10	23	43	90	170	346	524	1012	1604
90	10	22	40	85	160	326	494	954	1512
100	9	21	38	80	152	309	469	905	1435

Rubber hose maximum airflow rating: 1/2" I.D. rubber hose = 3/8" pipe; 3/4" I.D. rubber hose = 1/2" pipe

## TWO STAGE COOLING

Under normal operation, the first stage cooler (the cold air outlet that is nearest to the compressed air inlet) will activate first. This will either reduce the rate of temperature rise in the enclosure, or, it will begin to reduce the enclosure temperature, depending on the total heat load in the enclosure. If the total heat load is significant and the temperature continues to rise, the second stage cooler will activate, doubling the amount of cooling air. In locating the two Cold Air Ducting Kits, consideration should be given to the two stage cooling capability of the unit. The dual cold air outlets and Cold Air Ducting Kits provide for increased flexibility in directing refrigerated air into the enclosure. For example, the first stage cooler's output could be directed at a primary source of heat within the enclosure (PLC's, VFD's, transformers, etc.) and the second stage ducting could be punched or drilled (as described earlier) and routed for overall cold air distribution throughout the enclosure.

## LIMITED WARRANTY AND PRODUCT REPLACEMENT

ProtEX Vortex A/C compressed air enclosure cooling products manufactured by ITW Air Management will be replaced or repaired if found to be defective due to manufacture within three years from the date of invoice. The entire ProtEX Vortex A/C should be replaced after 3 years of operation (date reflected as "Expiration Date" on the product label) as some internal components may lose their functionality and the unit may no longer function as intended. Refer to our website [www.vortec.com](http://www.vortec.com) for full warranty details and limitations. ITW Air Management makes no specific warranty of merchantability or warrant of fitness for a particular purpose.



# OPERATION & SAFETY INSTRUCTIONS

## ProtEX Vortex A/C

Models 8170 and 8170BSP



Baseefa 16ATEX0166X  
 Ex II 2 GD  
 Ex h IIC T3 Gb  
 Ex h IIIC T200°C Db  
 Ta +10°C to +80°C



**IMPORTANT**  
 Please read all instructions BEFORE attempting to use this product



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## GENERAL SAFETY CONSIDERATIONS

### WARNING: COMPRESSED AIR COULD CAUSE DEATH, BLINDNESS OR INJURY. METAL SURFACES GET VERY HOT.

1. Do not operate a ProtEX Vortex A/C at compressed air pressures above 6.9 bar (100 psig).
2. Do not operate at compressed air temperatures above 49°C (120°F).
3. Avoid direct contact with compressed air.
4. Do not direct compressed air at any person.
5. When using compressed air, wear safety glasses with side shields.

**WARNING!** Explosion Hazard: Substitution of components may impair suitability for Zone 1 and Zone 21.

## SPECIFIC CONDITIONS OF USE

1. When the equipment is to be used on an enclosure intended to be protected by a concept according to EN 60079-2, the pressurised air supply to the equipment must be of the same quality as that used to purge and pressurise the enclosure to which it is installed on.
2. When the equipment is to be used on an enclosure intended to be protected by a concept according to EN 60079-2, the equipment shall be fitted to, and assessed/tested, as part of the enclosure.
3. The equipment shall be suitably earthed (grounded) prior to operation. Earth continuity shall be maintained between the equipment and the enclosure to which it is installed on.
4. The equipment shall be mounted to the top or side face of the enclosure to which it is to be installed.
5. Inlet pressure shall not exceed 6.9 bar (100 psig).
6. Inlet air temperature shall not exceed 49°C (120°F).
7. **WARNING:** Potential Electrostatic charging hazard ~ clean only with a damp cloth.
8. When installed, consideration shall be given to the guidance given in PD IEC/TS 60079-32-1 'Explosive atmospheres - Electrostatic hazards, guidance.'

## INTRODUCTION

The ProtEX Vortex A/C is designed to cool industrial control cabinets located in Zone 1 and Zone 21 hazardous locations, using only filtered and dried compressed air to generate the cooling. The ProtEX Vortex A/C shall only be used in conjunction with a properly sized enclosure purge and pressurization system that must be able to vent the additional air introduced by the ProtEX Vortex A/C. (The purge and pressurization system must be selected and supplied by the end user.)

The cooling air produced by the ProtEX Vortex A/C in the enclosure is vented into the hazardous area (outside of the enclosure) through the purge system's spark arrestor vent. The spark arrestor vent must be properly sized to accept the additional cold air flow generated by the ProtEX Vortex A/C to prevent over-pressurization of the enclosure.

It is the end user's responsibility to ensure that the correct spark arrestor vent is used and that the purge system functions properly when integrated with the ProtEX Vortex A/C.

DO NOT operate the ProtEX Vortex A/C on a sealed and unvented enclosure as pressure in the enclosure will increase and damage or injury could result. The ProtEX Vortex A/C has built-in mechanical thermostats that require no electricity.

## COMPRESSED AIR SUPPLY

The compressed air system's intake must originate in a non-hazardous area. Compressed air piping must be fabricated from noncombustible materials suitable for the conditions present. The pressurized air supply provided to the ProtEX Vortex A/C must be of the same quality as that used to purge and pressurize the enclosure it is installed on. The model 8170 will require up to 1980 lpm (70 scfm) of compressed air at 6–6.9 bar (90–100 psig) when both stages of the unit are operating at full capacity.

The compressed air supply must be filtered (5 micron maximum) to

remove water and dirt. The 5 micron filter is supplied for this purpose (Vortec model 704S-40A or model 705S-40A) with models 8170 and 8170BSP. If oil is present in the compressed air supply, remove the oil using an optional 0.01 micron coalescing filter (Vortec model 701S-54). If an oil removal filter is necessary, install it downstream of the 5 micron filter. Locate the filters in a non-hazardous location to facilitate easy filter element changes. Change the filter elements as needed (see Maintenance).

It is highly recommended to dry the compressed air (to remove water vapor) using a refrigerated air dryer. Failure to dry the air adequately may result in frost or ice forming internally and resulting in decreased cooling air flow and cooling capacity, and will void the warranty.

Supply compressed air to the ProtEX Vortex A/C with 3/8" schedule 40 pipe when the pipe length is less than 3 meters (10 feet). If pipe length exceeds 3 meters (10 feet) but is less than 9 meters (30 feet), use 1/2" pipe. If pipe length exceeds 9 meters (30 feet) but is less than 30 meters (100 feet), use 3/4" pipe. Use appropriate pipe adapter fittings when terminating the supply pipe at the ProtEX Vortex A/C. (The model 704S-40A compressed air filter that is supplied with the model 8170 has 3/4"-14 npt ports. The model 705S-40A compressed air filter that is supplied with the 8170BSP has 3/4"-14 BSPP ports.)

## INSTALLATION

1. The ProtEX Vortex A/C must be installed on the top of the enclosure on a flat horizontal surface of the enclosure. Alternately, the ProtEX Vortex A/C can be mounted on the side of the enclosure. When the unit is side mounted (on a flat vertical surface of the enclosure), the compressed air inlet must be pointing down, or the stainless steel shroud must face down toward the floor. If side mounted, it is best if the unit is located near the top of the enclosure.
2. Find a location for the ProtEX Vortex A/C on your enclosure so that there is sufficient clearance for the internal mechanical thermostats and cold air outlets and check valve assemblies, and, so that the entire mounting "footprint" of the ProtEX Vortex A/C is supported by the enclosure (A 260mm x 90mm (10-1/4" x 3-9/16") area). Position the unit so that the stainless steel shroud on the back of the unit is away from personnel, if possible. Also, position so that no internal enclosure components obstruct air flow around the mechanical thermostats. The ProtEX Vortex A/C should be located adjacent to the purge system's spark arrestor vent. This will allow the mechanical thermostats to sense temperature of the airflow exiting the vent and respond faster to the temperature changes in the enclosure.
3. Cut two 49mm (1-15/16") diameter holes (1-1/2" knockout size) on 102mm (4") centers in the selected location of the flat horizontal (or vertical) surface of the enclosure. De-burr any sharp edges around these holes.
4. Remove the 1-1/2" electrical locknuts from the ProtEX Vortex A/C. Insert the threaded portions of the ProtEX Vortex A/C into the 49mm (1-15/16") holes in the enclosure. (Be careful not to damage the mechanical thermostats during installation.)
5. From inside the enclosure, screw the two 1-1/2" electrical locknuts onto the threads of the ProtEX Vortex A/C. Tighten the locknuts securely to compress the 3mm (1/8") thick sealing gaskets that are located between the enclosure surface and the ProtEX Vortex A/C.
6. Attach the Check Valve assemblies to the cold air outlets of the ProtEX Vortex A/C (3/8"-18 npt threads) inside the enclosure. The Check Valves can be attached to the ProtEX Vortex A/C with the supplied 3/8" npt straight pipe nipples OR with the supplied 3/8" npt pipe elbows. The orientation of the Check Valve assemblies is not important, they will function in any position, however, the airflow direction through the Check Valves is important. Attach the Check Valves so that the arrow on the Valves point away from the ProtEX Vortex A/C. Suitability of the Check Valves, provided with the ProtEX Vortex A/C, to prevent air from leaking out from the purged and pressurized enclosure must be verified during installation.
7. Mount the Cold Air Mufflers inside the enclosure near the ProtEX Vortex A/C. (You will need a surface area of approximately 50mm 230mm (2" x 9") to mount each muffler.) The Mufflers can be mounted in any

orientation: horizontal or vertical. Using the supplied Muffler Mounting Clamps (with double sided tape), attach the Clamps at the desired locations. (Clean the mounting surfaces so that the double sided tape bonds securely.)

If desired, the Clamps can be permanently mounted to the enclosure using the supplied mounting hardware.

Two 4mm (5/32") diameter holes positioned on 19mm (3/4") centers must be drilled to mount each Muffler Clamp with the supplied plastic push-rivets.

8. Snap the Cold Air Mufflers into the Mounting Clamps.
9. Cut a sufficient length of the 16mm (5/8") inside diameter vinyl tubing from the supplied #7000-75 Cold Air Ducting Kits to connect the outlets of the Check Valves to the Cold Air Mufflers. Attach the lengths of vinyl tubing securely onto the hose barbs of the Check Valves and the Mufflers. Ensure that the vinyl tubing has no sharp bends or kinks. Direction of cold air flow through the Mufflers is not important.
10. Attach all (or a portion of) the remaining supplied vinyl tubing of the Cold Air Ducting Kits to the opposite hose barb connections on the Cold Air Mufflers. Holes can be punched or drilled into this 16mm (5/8") tubing to distribute the cold air evenly inside your enclosure, or, the entire cold air output can be directed to a heat sensitive component. (If the end of the 16mm (5/8") vinyl tubing is plugged, at least 25 x 3mm (1/8") diameter holes should be punched or drilled into the tubing to allow the cold air to escape. Use the six self adhesive tubing clamps provided with each kit to locate and hold the vinyl tubing in place.
11. Connect the compressed air filter to the compressed air inlet on the side of the ProtEX Vortex A/C with the appropriate size piping as recommended in Table 2. The filter should be located in a non-hazardous area and where the temperature does not exceed 52°C (125°F). The port sizes on the filter are 3/4"-14 NPT and 3/8"-18 NPT on the ProtEX Vortex A/C (3/4"-14 BSPP and 3/8"-19 BSPP on BSP models). Use a 21mm (13/16") wrench to hold the air fitting on the side of the ProtEX Vortex A/C stationary while tightening the pipe connections. Note the air flow direction arrow on top of the filter.
12. Connect the compressed air supply to the inlet of the air filter. See "Compressed Air Supply".

## OPERATION

It is recommended to operate the ProtEX Vortex A/C at 6–6.9 bar (90–100 psig) compressed air pressure. If compressed air pressure exceeds 6.9 bar (100 psig), it is recommended to regulate the pressure with ITW Vortec's model 208RX pressure regulator. Operation at pressures less than 6 bar (90 psig) and above 6.9 bar (100 psig) will affect the operation. When properly sized for the application, the ProtEX Vortex A/C will maintain the internal enclosure temperature between 24–38°C (75–100°F). Enclosure temperatures can momentarily reach 52°C (125°F) during initial start-up and after long periods of inactivity. Variations in heat load and compressed air conditions can effect thermostat operation. The mechanical thermostat will regulate an internal valve to minimize compressed air usage and maintain enclosure temperatures within the range specified. In some applications, the ProtEX Vortex A/C may run continuously at lower air usage with the benefit of always keeping the enclosure under slight internal pressure. In other applications, the ProtEX Vortex A/C may cycle on and off to maintain enclosure temperatures. When the ProtEX Vortex A/C is not cooling, the Check Valves close shutting off the air passage from the enclosure interior to the exterior and allowing the purge/pressurization system to maintain slight pressure in the enclosure. Do not apply excessive heat or a flame to the mechanical thermostats to "test" them for operation as this will void the warranty.

**NOTICE:** The thermostat's reaction to temperature change depends on several factors: the internal and external heat loads, enclosure size and proximity to the heat source. When the internal heat load is zero (or very low) and when external temperatures are below +10°C (+50°F), the thermostat will take longer to react to air temperature increases. There will be a lag between the rising air temperature and when the thermostat reacts, which can result in temperatures inside the enclosure exceeding 52°C (125°F). When air and thermostat temperatures equalize, the reaction

to temperature change is improved and the lag is minimized. This product is approved for use in ambient temperatures between 10° to 80°C (50° to 175°F).

## MAINTENANCE

The only maintenance involved with the ProtEX Vortex A/C is normal element changes to the compressed air filter. The filter element should be changed when there is a decrease in performance or when pressure drop across the filter exceeds 1.0 bar (15 psig).

When the service life indicator on top of the filter is completely red, this is evidence of a 1.0 bar (15 psig) pressure drop. Follow the instructions below to change the filter element.

The compressed air supply to the unit must be shut off before changing the filter element. The compressed air filter should be located in a nonhazardous area so that normal filter element maintenance can be carried out without risk of hazardous substances entering the enclosure. If the compressed air filter must be located in the hazardous area, electric power to the enclosure must be shut off while performing filter maintenance and then routine purge system startup procedures should be followed when filter maintenance is complete and before power is applied to the enclosure.

The ProtEX Vortex A/C has only two moving parts (the mechanical thermostat/valves and the check valves) which are not serviceable in the field. Do not disturb the setting of the thermostat. Evidence of tampering with the thermostat will void the warranty.

If it is suspected that the compressed air filter has not been maintained after an extended period of operation, there may be pipe scale or foreign material in the ProtEX Vortex A/C. If the unit is not cooling sufficiently, there may be pipe scale or foreign material in the orifices of the "generators" in the unit.

1. To check, shut off all electric power to the protected enclosure and follow any purge system shutdown procedures. Shut off the compressed air supply to the ProtEX Vortex A/C. Before opening the enclosure door, allow sufficient time for any internal components to cool down completely.
2. Detach the 16mm (5/8") ID vinyl tubing from the check valve assemblies and remove the check valve assemblies from the cold air outlet fittings of the ProtEX Vortex A/C.
3. Remove the two brass cold air outlet fittings from the bottom of the unit (with a 25mm (1") open end wrench).
4. Remove the O-Rings. Then remove the brown generators.
5. Inspect the six slots in each generator for foreign material and clean if necessary.
6. Clean the cavities in the ProtEX Vortex A/C that the generators were located in if necessary.
7. Reassemble the generators, O-Rings and cold air outlet fittings in reverse order. Tighten the cold air fittings to at least 11 newton meters (100 inch pounds) torque.
8. Attach the check valve assemblies to the cold outlet fittings making sure the air flow through the check valves is in the proper direction. Tighten all pipe connections securely. Re-attach the 16mm (5/8") vinyl tubing to the check valve outlets. Open the compressed air supply valve(s) to the ProtEX Vortex A/C. Follow purge system startup procedures before applying electric power to the enclosure.

## ELEVATED SURFACE TEMPERATURES

Because the ProtEX Vortex A/C operates using the vortex principle, hot exhaust air is generated and released at low pressure from the opening in the stainless steel shroud on the back of the unit. This exhaust air can reach temperatures up to 107°C (225°F) under normal conditions. (Normal conditions are compressed air inlet pressure of 6–6.9 bar (90–100 psig) and compressed air inlet temperature of 21°C (70°F)). The ProtEX Vortex A/C models can be operated at compressed air temperatures that do not exceed 49°C (120°F). The ProtEX Vortex A/C models have a Temperature Class of T3.