Vortex Coolers

HUBBELL **WIEGMANN**®
Enclosures for Electrical/Electronic Equipment

NEMA 4/4X   **NEMA 12**

UL

Applications

- Compressed air cooling is used where conventional enclosure cooling by air conditioners or heat exchangers is not possible (Example: Small to medium size enclosures, nonmetallic enclosures, and areas where the size of cooling devices is restricted)

Features

- Suitable for harsh environments
- Small physical size
- Creates cool air without refrigerants (no CFCs, HCFCs)
- Exceptionally reliable - no moving parts and virtually no maintenance

Requirements

- Uses clean, dry, oil-free compressed air (100 PSIG / 70 degrees F or below) required to achieve published BTU/hr ratings. Lower pressures and higher temperatures will reduce BTU/Hr ratings.
- A 5-micron water and particulate removal filter must be installed prior to operating any vortex cooler (included in kits).
- An oil removal filter can be installed between the 5 micron filter and the Vortex Cooler if oil is present in the compressed air line.

Mounting holes

- NEMA 12 kits: (1) 1-3/32″ (28mm) or 3/4″ knockout hole for cooling tube and (1) 11/16″ hole for thermostat
- NEMA 4 and 4X kits: (1) 1-15/16″ (49mm) or 1-1/2″ knockout hole for cooling tube and (2) #8 holes for thermostat

Kit includes the following:

- Vortex cooling tube
- Solenoid valve 120V / 60Hz - 110V / 50Hz
- Filter: 5-micron water and particulate removal
- Ducting kit
- Thermostat

Standards

- UL Listed
- NEMA 12, NEMA 4 or NEMA 4X

How vortex coolers create cold air

Vortex coolers are powered by a vortex tube - a unique device that creates a vortex from compressed air and separates it into hot and cold airstreams. Here's how it works: The vortex tube's cylindrical generator causes the input compressed air to rotate, reaching speeds up to 1,000,000 rpm as it is forced down the inner walls of the hot longer end of the vortex tube. At the end of the hot tube, a small portion of this air exits through a needle valve as hot air exhaust. The remaining air is forced back through the center of the incoming air stream at a slower speed. The heat in the slower moving air is transferred to the faster moving incoming air. This super-cooled air flows through the center of the generator and exits through the cold air exhaust port.

Part Number	Price	Capacity BTU/H	Capacity KCAL/H	Air Consumption SCFM	Air Consumption SLPM	Air Consumption Thermostat (Factory Set)	Tube Surface Temp at BTU	Thermostat Mounting	NEMA Type	UL Type	Cooling Tube Material
W750400	<--->	400	101	8	227	90°F ± 2°	150°F	External	12	12	Aluminum
W740900	<--->	900	225	15	425	90°F ± 2°	150°F	External	12	12	Aluminum
W7901500	<--->	1500	378	25	708	90°F ± 2°	150°F	External	12	12	Aluminum
W7971700	<--->	1700	425	25	708	90°F ± 2°	150°F	Internal	4	4	Aluminum
W797SS1700	<--->	1700	425	25	708	90°F ± 2°	150°F	Internal	4X	4X	Stainless St.
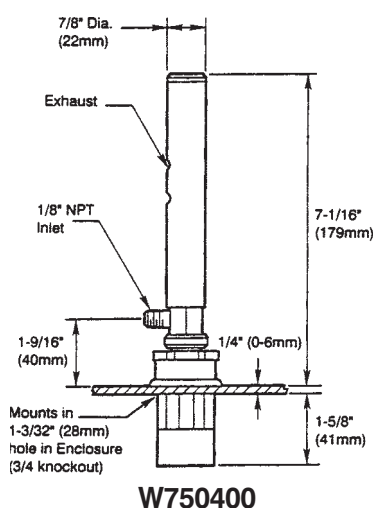
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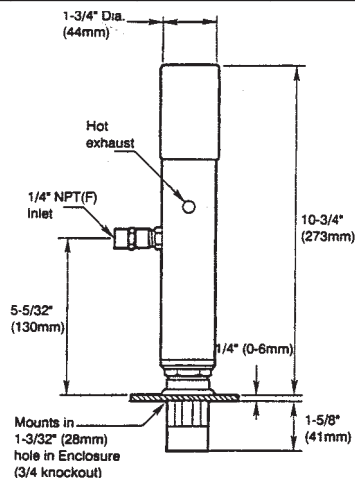
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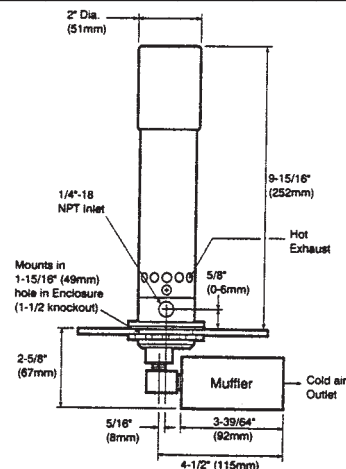
W7971700, W797SS1700

Enclosure Cooling – Selecting a Fan or Air Conditioner

Fan selection

To select the proper size (CFM) fan for your forced air cooling solution, you need to determine the amount of heat to be removed (in watts) and determine the Delta T (Max. allowable internal enclosure temperature °F – Max. outside ambient temperature°F).

CFM = Cubic Feet per Minute
P = Power to be dissipated in watts
CFM = (3.17 x P$_{watts}$) / Delta T °F

Delta T = max. allowable internal enclosure temperature °F – max. outside ambient temperature °F

Fan Selection Example

A NEMA 12 Hubbell Wiegmann N12302412 enclosure (30" high x 24" wide x 12" deep) contains a GS3-2020 AC drive (20 HP 230 volt) that has a maximum allowable operating temperature of 104°F and is located in a warehouse that has a maximum outside ambient air temperature of 95°F.

Power to be dissipated is stated in the specifications of the GS3-2020 and is found to be 750 watts, so P=750 watts

Delta T = Max. operating temperature for the GS3-2020 is 104°F – Max. ambient air temperature of 95°F

Delta T = 9°F
CFM = (3.17 x 750 watts) / 9°F
CFM = 264

Choose a Hubbell Wiegmann WPF60-115BK filter fan kit that provides 295 CFM with exhaust kit WPFA50-60BK

Air conditioner selection

To select the proper size air conditioner, the worst-case conditions should be considered, but take care not to choose an oversized unit.

There are two main factors in choosing an uninsulated metal NEMA rated enclosure located indoors:

• Internal heat load
• Heat load transfer

Internal Heat Load

Internal heat load is the heat generated by the components inside the enclosure. This can be determined by a few different methods. The preferred method is to add the maximum heat output specifications that the manufacturers list for all the equipment installed in the cabinet. This is typically given in Watts, so use the following conversion:

BTU per Hour = Watts x 3.413

Example: The Watt-loss chart for the GS3 Drives shows that a GS3-2020 AC drive has a Watt-loss of 750 watts.

BTU per Hour = 750 watts x 3.413
BTU per Hour = 2559

Heat Load Transfer

Heat load transfer is the heat lost (negative heat load transfer) or gained (positive heat load transfer) through the enclosure walls with the surrounding ambient air. This can be calculated by the following formula:

Heat load transfer (BTU/H) = 1.25 x surface area (sq. ft.) x (max. outside ambient air (°F) – max. allowable internal enclosure temperature air (°F))
Surface Area (sq. ft.) = 2 [(H x W) + (H x D) + (W x D)] / 144 sq. inches
Note: 1.25 is an industry standard constant for metal enclosures; 0.62 should be used for plastic enclosures.

Once you have determined your Internal Heat Load and the Heat Load Transfer, you can choose the proper size unit by calculating the needed cooling capacity.

Cooling capacity (BTU/H) = Internal Heat Load ± Heat Load Transfer

Air Conditioner Selection Example

A NEMA 12 Hubbell Wiegmann N12302412 enclosure (30" high x 24" wide x 12" deep) contains a GS3-4030 AC drive 30 HP 460 volt) that has a maximum allowable operating temperature of 104°F and is located in a warehouse that has a maximum outside ambient air temperature of 115°F.

Power to be dissipated is stated in the specifications of the GS3-4030 and is found to be 1290 watts.

Internal heat load:
BTU per Hour = 1290 watts x 3.413
BTU per Hour = 4403 BTU/H

Heat load transfer:
Heat load transfer (BTU/H) = 1.25 x 19 sq. ft. x (115°F – 104°F)
Heat load transfer (BTU/H) = 261.25 BTU/H

Cooling capacity:
Cooling capacity (BTU/H) = 4403 BTU/H + 261.25 BTU/H
Cooling capacity (BTU/H) = 4664.25 BTU/H

In this example, you are able to determine that a 5000 BTU/H unit is needed. Select a TA10-050-16-12 Stratus air conditioner.

Refrigeration Cycle

Company Information

Systems Overview

Programmable Controllers

Field I/O

Software

C-more & other HMI

Drives

Soft Starters

Motors & Gearbox

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temperature Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Safety

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