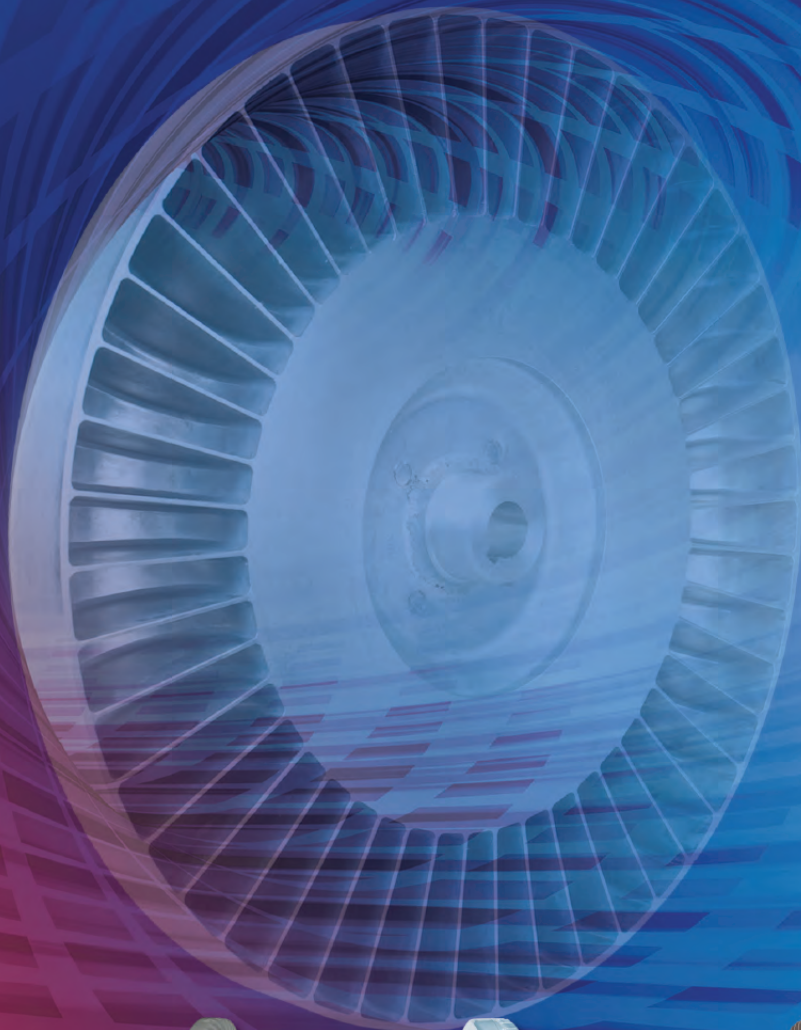


# Spencer<sup>®</sup>

## Vortex<sup>®</sup> Regenerative Blowers



## Introduction

### **Vortex blowers are manufactured and stocked in the U.S. by Spencer, the air handling specialist.**

#### **U.S. production using domestic components**

Vortex regenerative (side channel) blowers are products of The Spencer Turbine Company, manufactured in the United States with U.S.-made components.

They are produced in Spencer's 200,000 sq.ft. world headquarters in Windsor, Connecticut.

#### **A single focus, a single mandate since 1892**

Vortex blowers are just one of Spencer's product lines for efficient air and gas movement, which has been our sole focus since 1892. As a privately held company, Spencer concentrates all its resources on product innovations, application solutions and customer service in this field.

There are two advantages for customers in Spencer's independent status: one, by devoting more than a century to air and gas handling exclusively, we have accumulated an unmatched body of technical knowledge that can be applied to customer problems.

Two, since this is our only profession, we have to be constantly on the "top of our game"—giving excellent advice, attention and service to customers.

#### **A broad selection of air and gas handling products**

Besides regenerative blowers, Spencer offers centrifugal blowers, both single and multi-stage, custom blowers for special conditions and positive displacement blowers. Among our vacuum equipment are heavy-duty central and mobile vacuum systems, dust collectors and separators.



These products are served by Spencer's own electrical control panels for blower and vacuum system operation.

Spencer machines are used in the most demanding industrial, commercial, municipal, utility and governmental applications. These range from blower systems for continuous-duty chemical processing and wastewater treatment to central vacuum systems serving semiconductor cleaning rooms, industrial plants...and such unique sites as the Statue of Liberty in New York Harbor and Moscow Trade Center in Russia.

Vortex blowers continue the Spencer tradition of "industrial strength" machines that customers rely on through years of dependable operation.

**Extensive product distribution network**

Spencer has direct sales offices, manufacturers' representatives and stocking distributors across North America. They are supplemented by independent representatives in many countries internationally.

A call to Spencer at 800-232-4321 will start the ball rolling and assure fast attention. In-depth technical support is available regarding blower sizing, selection and application; multi-blower purchases for OEM equipment; and blower customizing for special needs.

*The blower selection and application advice in this catalog is based on information we believe to be accurate, but it is the buyer's responsibility to determine the suitability of any product for a particular purpose. Before installing blowers with explosion-proof motors, the buyer must check federal, state and local codes to see if such motors are appropriate for the intended application environment.*

*For warranty information, obtain Spencer's Form 706, "Terms and Conditions of Sales."*

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## The Vortex Story

### Product Characteristics

## Vortex blowers offer your best total package of product features and performance advantages.

#### Compact, lightweight design

- Single stage blower with C-faced motor in a small package.
- Aluminum castings reduce weight.

#### Excellent performance range

- Volumes to 645 SCFM.
- Vacuum ratings to 104" H<sub>2</sub>O.
- Pressures to 108" H<sub>2</sub>O.

#### Long-life reliability

- Cast aluminum impeller and housing for high strength.
- Simple construction with only five major components—base, housing, impeller, bearings, motor.
- Sealed bearings prevent contaminant failure.
- Single annular compression cell prevents heat stress failure.
- Double lip elastomeric shaft seal minimizes leaks.
- Fully retained impeller prevents vane fracture and blower failure.
- Single seal gap reduces tolerance requirement and blower failures during high temperature operation.

#### Oil-free air delivery

- No hydrocarbon entrainment.
- Suitable for healthcare and scientific applications.

#### Less heat and noise

- Single-sided impeller with single vortex generates less heat and noise than "paddle wheel" designs.
- Unique annular chamber with smooth laminar airflow lessens noise.
- Aluminum housing offers excellent heat dispersion.

#### Application flexibility

- Constant velocity blower has no pulsation or surging.
- All blowers can be run in reverse without loss of performance.
- All TEFC models can operate on 50 Hz without modification.



# The Vortex Story

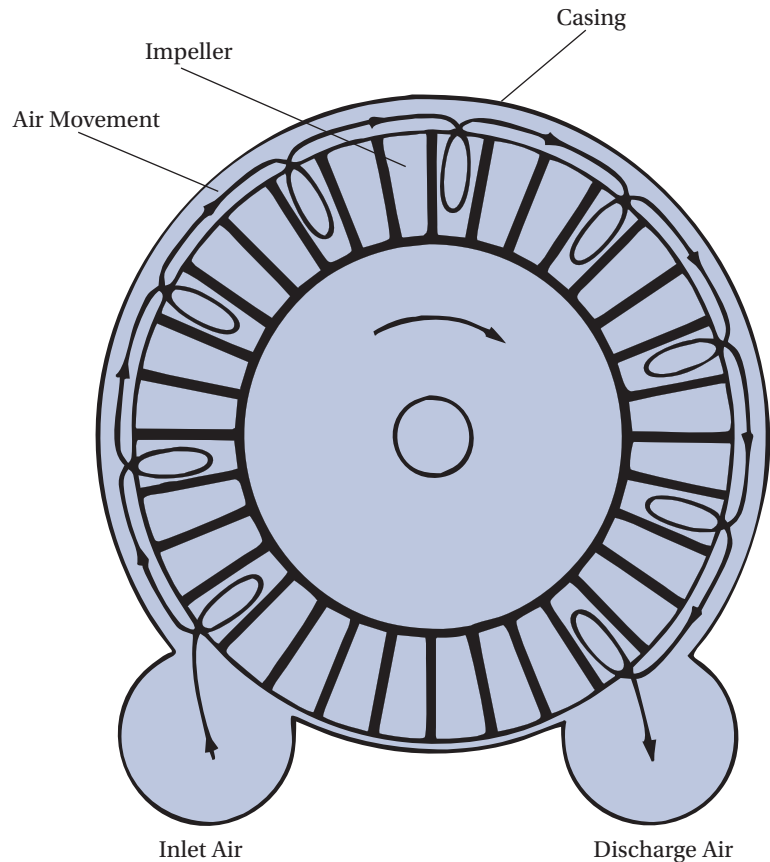
## Operating Principle

Vortex blowers generate high-pressure airflow during each rotation of a unique one-sided, single-stage impeller. The impeller has 30 to 50 vanes that create discrete air pockets. Air entering these pockets is accelerated in two directions, axially and outward (radially). Air entering the outer casing's annular chamber is redirected into successive pockets of the spinning impeller. This airflow cycle forms a vortex or stretched spring pattern (see diagram). Velocity energy is increased or regenerated many times as air moves between the blower inlet and discharge.

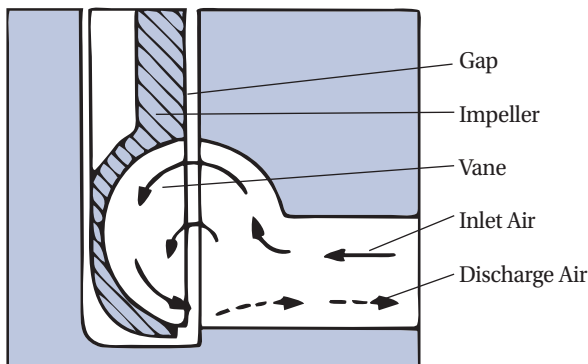
### Competitive designs

Other regenerative blowers have a double-sided or "paddle wheel" impeller. This design, with its twin vortices, is characterized by higher noise levels as the vortices are created at the inlet and merged at the discharge.

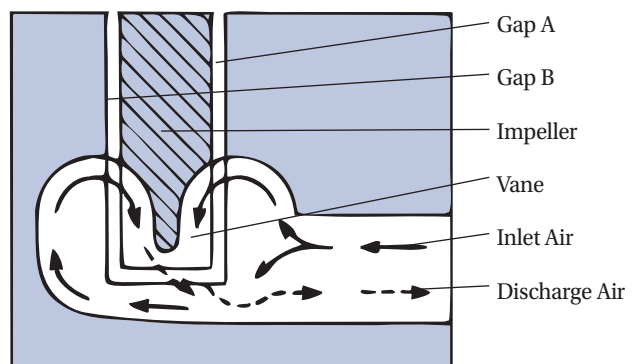
These blowers have two seal gaps between the housing and impeller, complicating tolerances during operation at high ambient temperatures.



### Spencer One-Sided Impeller



### Two-Sided Impeller



## Blower Features

**Standard and special features make it easy to customize blowers for OEM applications.**

### Versatile Standard Features

To adapt Spencer Vortex blowers for specific applications, often all you need is the flexibility built into the standard product line.

For example, Spencer has invented and patented a unique inlet/discharge flange (U.S. Patent 5,791,870) that is standard equipment on small blowers. This flange can be simply reversed to make either tube stub connections or threaded connections as desired.

All Vortex models offer:

- Pressure or vacuum use.
- Rotation in either direction without loss of performance (not possible with "paddle wheel" designs).

In addition, these specifications are selectable within the standard product line:

- Single or three phase power.
- 50 Hz or 60 Hz operation (all TEFC models).
- TEFC or explosion-proof motor.
- Variety of voltages.
- Airflow to 645 SCFM, vacuum to 104" H<sub>2</sub>O, pressure to 108" H<sub>2</sub>O.

### Customizing Alternatives

These are some of the easily arranged product changes which can adapt these machines for special needs:

- Special voltages.
- Special motor configurations (e.g., for severe duty or premium efficiency).
- Custom paint color.
- Special coatings.
- Special labeling.

Here are more custom possibilities for your shipping convenience:

- Flexible release schedules.
- Just-in-time shipments.
- Special blower packaging or palletizing.

Uncertain about whether we can meet your need? Just call 800-232-4321 for specialized assistance from Spencer.



# Selection Tips

## What you need to consider...

Here are some questions to consider regarding Vortex blower selection. Thinking about these issues now will “jump start” the selection process. You might also copy this page and write down your answers before you talk to a Spencer Representative. If you don’t know every detail, skip over it and discuss it with your representative later.

**1. What is the pressure or vacuum application?** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**2. Will the blower use be continuous or intermittent?** \_\_\_\_\_

**3. What electrical input (volts, phase, Hz) will be used?** \_\_\_\_\_

**4. What airflow is required, in either SCFM or ICFM?** \_\_\_\_\_

\_\_\_\_\_ SCFM (Standard Cubic Feet per Minute; flow based on industry standard 70°F, sea level, 36% relative humidity).

\_\_\_\_\_ ICFM (Inlet Cubic Feet per Minute; flow based on your blower’s actual operating conditions).

**5. What is your pressure or vacuum requirement?**

\_\_\_\_\_ Inches H<sub>2</sub>O      \_\_\_\_\_ PSIG      \_\_\_\_\_ Inches Hg (mercury)

**6. What are the inlet temperature and relative humidity?**

\_\_\_\_\_ °F      \_\_\_\_\_ %RH

**7. What is the inlet pressure?**

\_\_\_\_\_ Elevation (feet above sea level)      \_\_\_\_\_ PSIA (atmospheric pressure)

(If blower will be used in a closed loop, indicate \_\_\_\_\_ PSIG or \_\_\_\_\_ inches Hg.)

**8. Do you have any of these special considerations? (check all that apply)**

- Noise level restrictions       Discharge air temperature restrictions
- Risk from corrosive vapors

**9. What accessory equipment do you need? (check all that apply)**

- Inlet or inline filter (suggested)       Silencer or filter/silencer
- Relief valve (suggested)       Pressure gauge
- Temperature gauge       Weather or sound enclosure

# Sample Applications

There are many types of pressure and vacuum applications for Vortex blowers. Their compact size, low noise and reliable operation are particularly well-suited for OEM applications within printing, food and chemical processing, textile, metalworking, waste treatment, environmental protection, aquaculture, business machine and medical equipment. These are some typical uses involving holding, carrying, evacuating, transferring, aerating and ventilating:

## Pressure

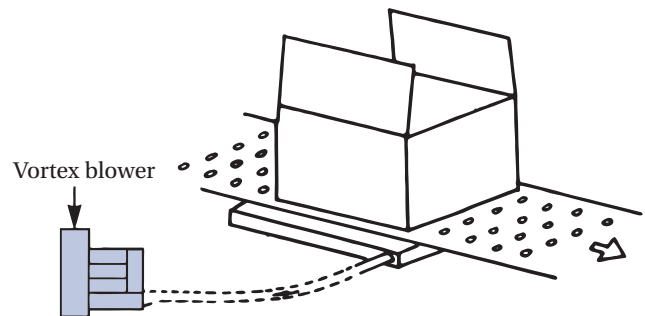
- Air beds and tables
- Refuse burning
- Automatic loading
- Product drying
- Air cushioning
- Liquid agitation
- Sewage aeration
- Pellet conveying
- Blister packaging
- Liquid spraying
- Fuel atomization
- Air knives
- Stack sampling
- Fluidized beds
- Respiratory systems

## Vacuum

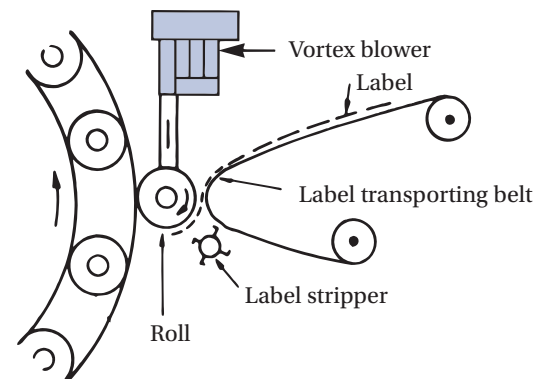
- Radon gas elimination
- Automatic bottling
- Pneumatic conveying
- Vacuum hold-down
- Soil remediation
- Paper transporting
- Scrap collection
- Powder recovery
- Gas sampling
- Thread holding
- Dust collection
- Trim removal
- Small vacuum systems
- Parts handling
- Material pickup

Applications listed here and in the following diagrams are presented as “thought-starter” examples to help you identify where Vortex blowers can help you.

## Vacuum Applications

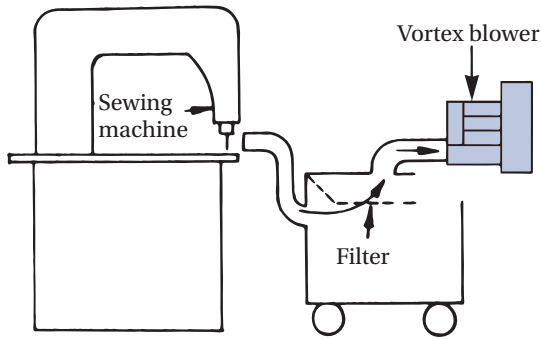


**Corrugated box packer.** A vacuum applied through a suction plate holds boxes in stable position for filling.

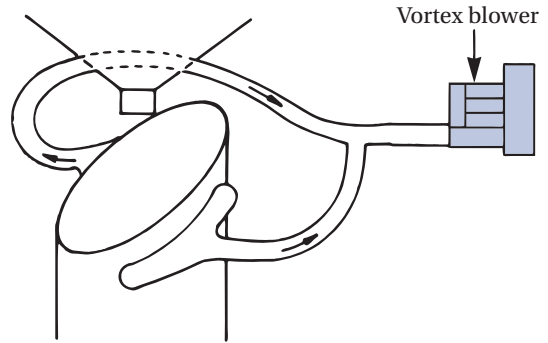


**Automatic labeling machine.** As a label stripper frees labels from their backing paper, they are held by suction on a roller for transfer to labeling equipment.

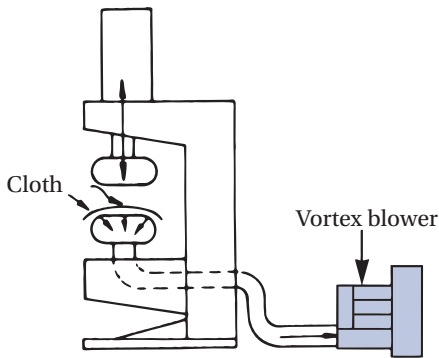
## Sample Applications



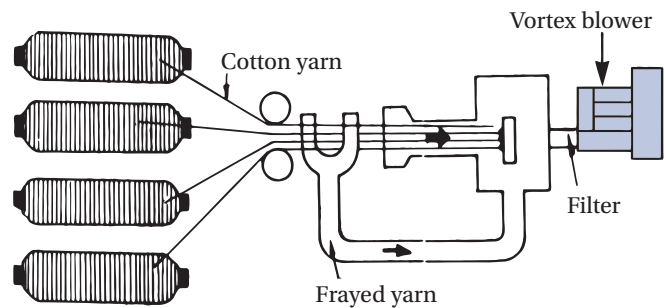
**Industrial sewing machine.** High-speed industrial sewing machines create large volumes of lint and waste yarn, which is scavenged by a Vortex vacuum system.



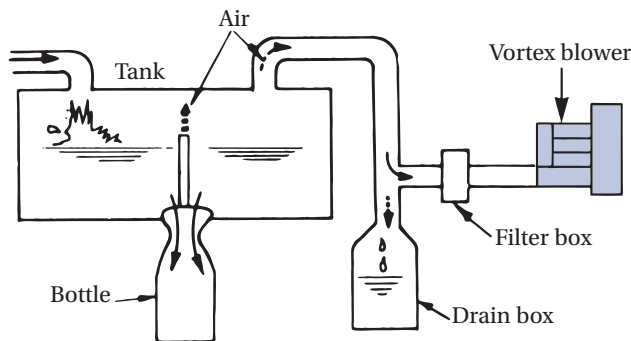
**Bag filling equipment.** Vacuum from a Vortex blower is used to hold bags open during filling operation for flour and other dry materials.



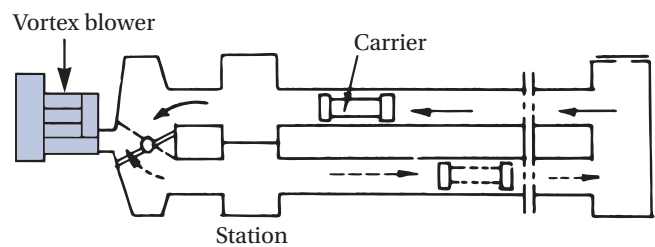
**Commercial ironing machine.** In this ironing machine, clothing is ironed on a padded surface with the aid of steam. The Vortex blower sucks the steam through the padded surface for evacuation.



**Automatic loom.** Cotton yarn is held in a vacuum stream before being supplied to the loom. The vacuum system also removes cotton scraps and frayed yarn.

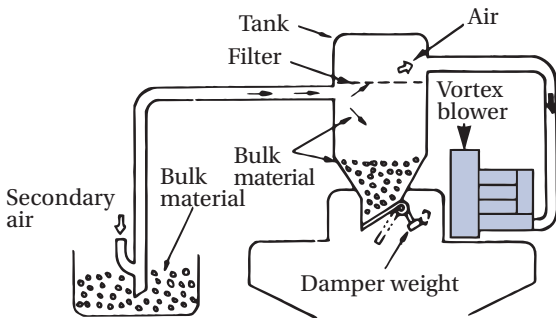


**Automatic bottling machine.** A Vortex blower facilitates high-speed bottling by removing air from the bottles during the filling operation.

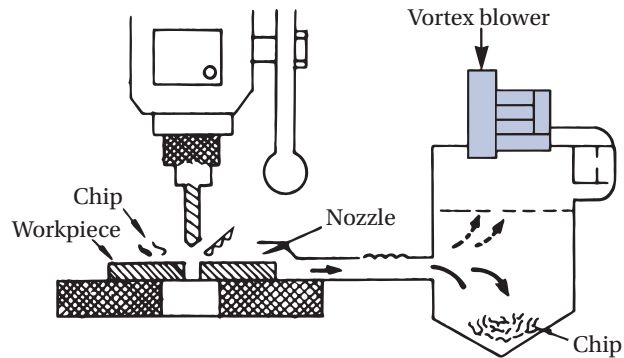


**Pneumatic conveyor.** Vortex vacuum systems convey checks, cash and documents in banks, hospitals, offices, etc. With its reversible operation, the Vortex blower eliminates the need for a diverter valve.

## Sample Applications

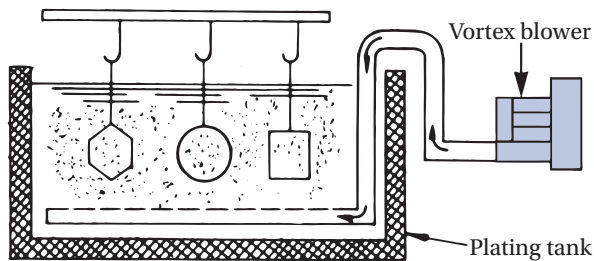


**Bulk material handling.** Air transport systems use Vortex blowers to convey dry materials such as pellets, granules and chips with either vacuum or pressure.

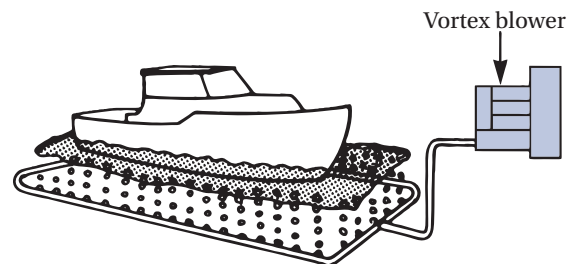


**Chip removal.** Chips generated during operations are automatically evacuated by a Vortex vacuum system.

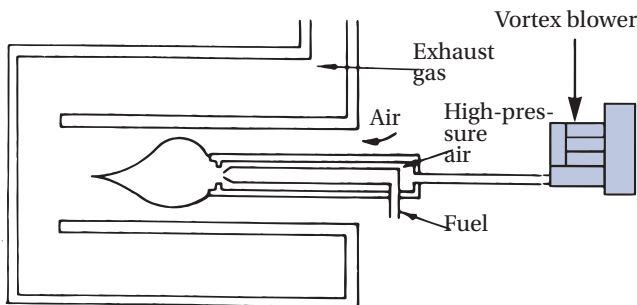
## Pressure Applications



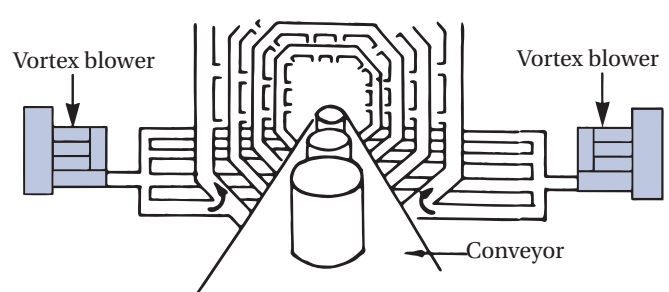
**Plating tank agitation.** High-pressure air circulates the electrolytic solution in a plating bath to promote uniform, rapid plating.



**Ice prevention system.** Air bubbles streaming from a diffuser ring keep water circulating to prevent icing.

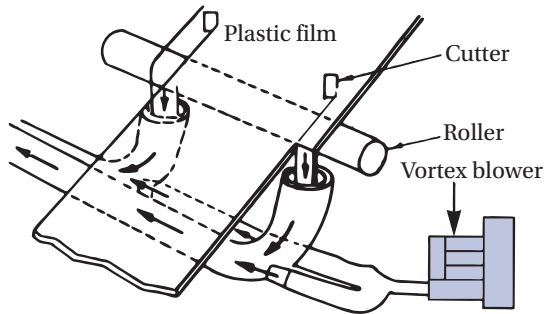


**Gas burner.** A steady flow of high-pressure air from a Vortex blower aids efficient combustion in gas burners.

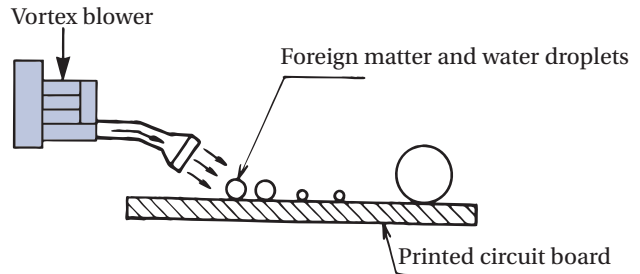


**Component drying.** Air discharge from single or ganged blowers powers a small drying system for parts or products.

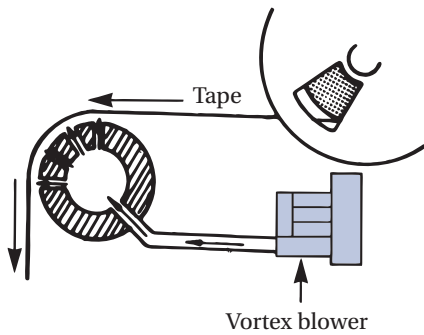
# Sample Applications



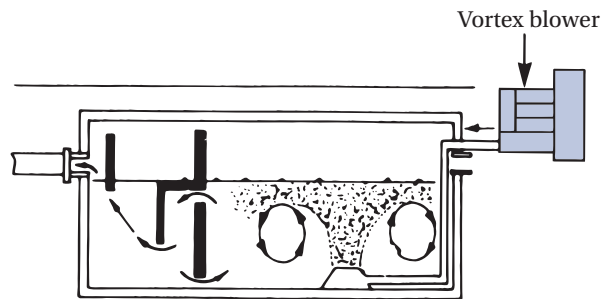
**Film scrap collection.** Scrap from plastic and paper slitting operations is collected by a pressure or vacuum evacuation system.



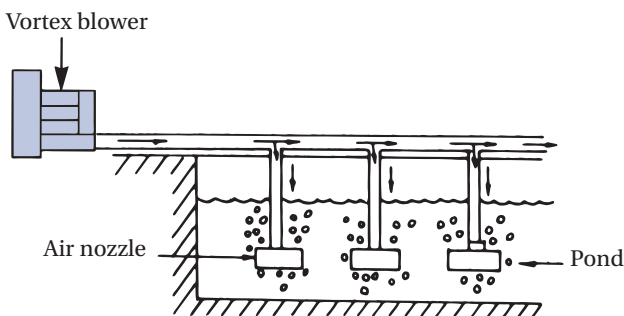
**Air knife.** High-pressure air jets remove foreign matter and liquid droplets from parts before further processing.



**Air bearings.** Air film rolls and air bearings create a cushion of air to guide sensitive, adhesive or wet films without contact and damage.



**Septic tank.** Vortex blowers are used in relatively shallow tanks to agitate effluent, promote bacterial action and separate sediment.



**Fish pond aeration.** Commercial fish farming is aided by aeration systems that increase the underwater oxygen supply in fish ponds.

# VB001S, VB001

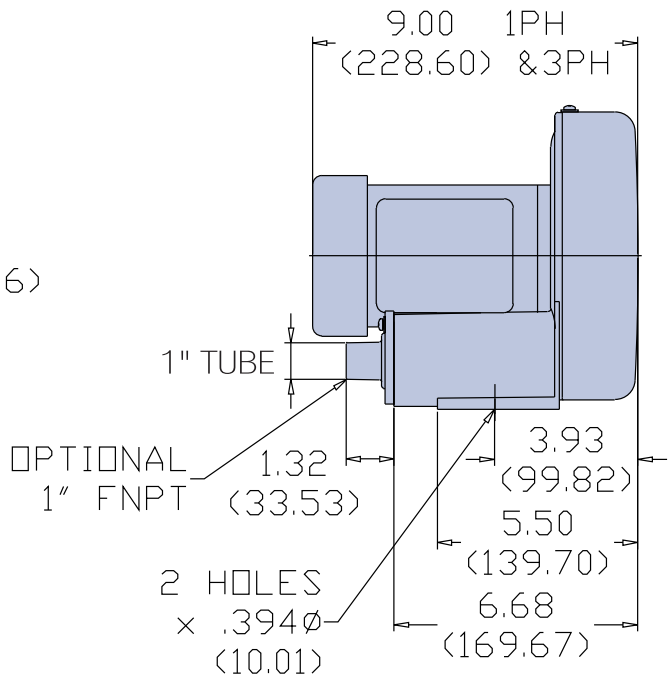
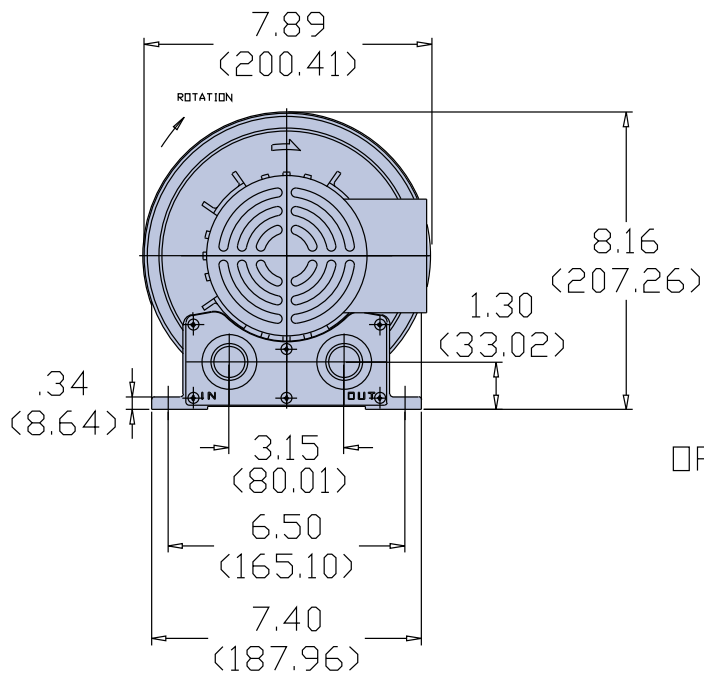
## Single Phase or Three Phase TEFC Motor

- Flow to 25 cfm
- 1/8 hp
- NEMA Class F Insulation
- CE, UL Listed, CSA Certified Motor
- Patented Reversible Flange for Threaded or Tube Connection



### DIMENSIONS

Inches  
(Millimeters)



# VB001S, VB001

## Single Phase or Three Phase TEFC Motor

### SPECIFICATIONS

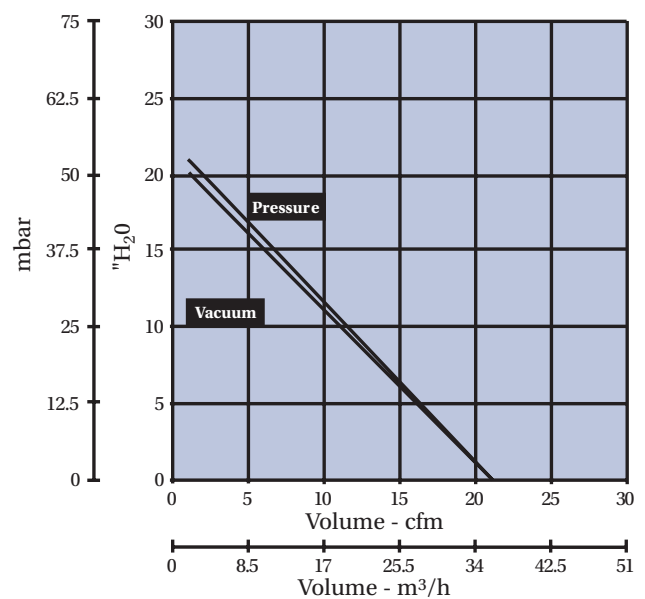
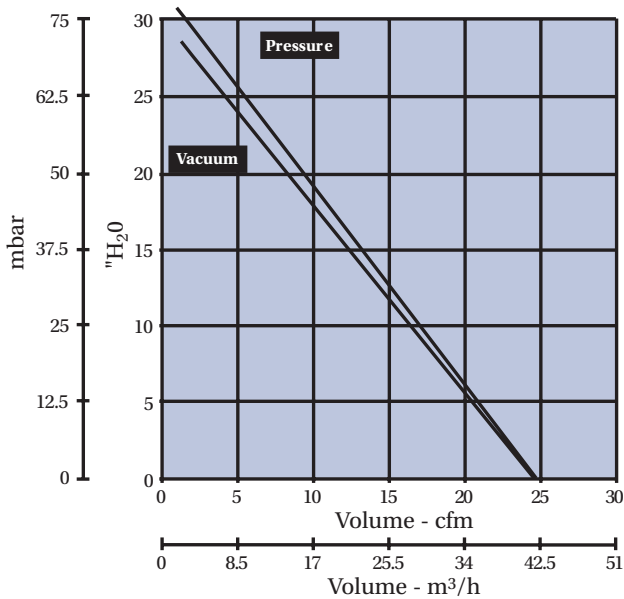
Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum		hp	Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level @ 1.5m	Weight	
		cfm	m <sup>3</sup> /h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar		Volts	Amperes	Amperes			lb	kg
VB001S	60	25	42.5	30.7	76.5	28.5	71	.13	115/230, 1Ø	1.25/.63	6.2/3.1	3450	62dba@60Hz	16	7.3
	50	21	35.7	21.3	53.1	20	49.8	.13	110/220, 1Ø	1.34/.67	6/3	2850		16	7.3
VB001	60	25	42.5	30.7	76.5	28.5	71	.13	200-230/460, 3Ø	.5-.48/.24	3.1-3.5/1.75	3450	61dba@60Hz	15	6.81
	50	21	35.7	21.3	53.1	20	49.8	.13	190-220/380-415, 3Ø	.5-.52/.25-.26	3.6-3.1/1.7-1.5	2850		15	6.81

Maximum Ambient Temperature: 140°F/60°C. Maximum Internal Motor Temperature: 311°F/155°C.

### PERFORMANCE

**60Hz**

**50Hz**



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.

## VB002S, VB002

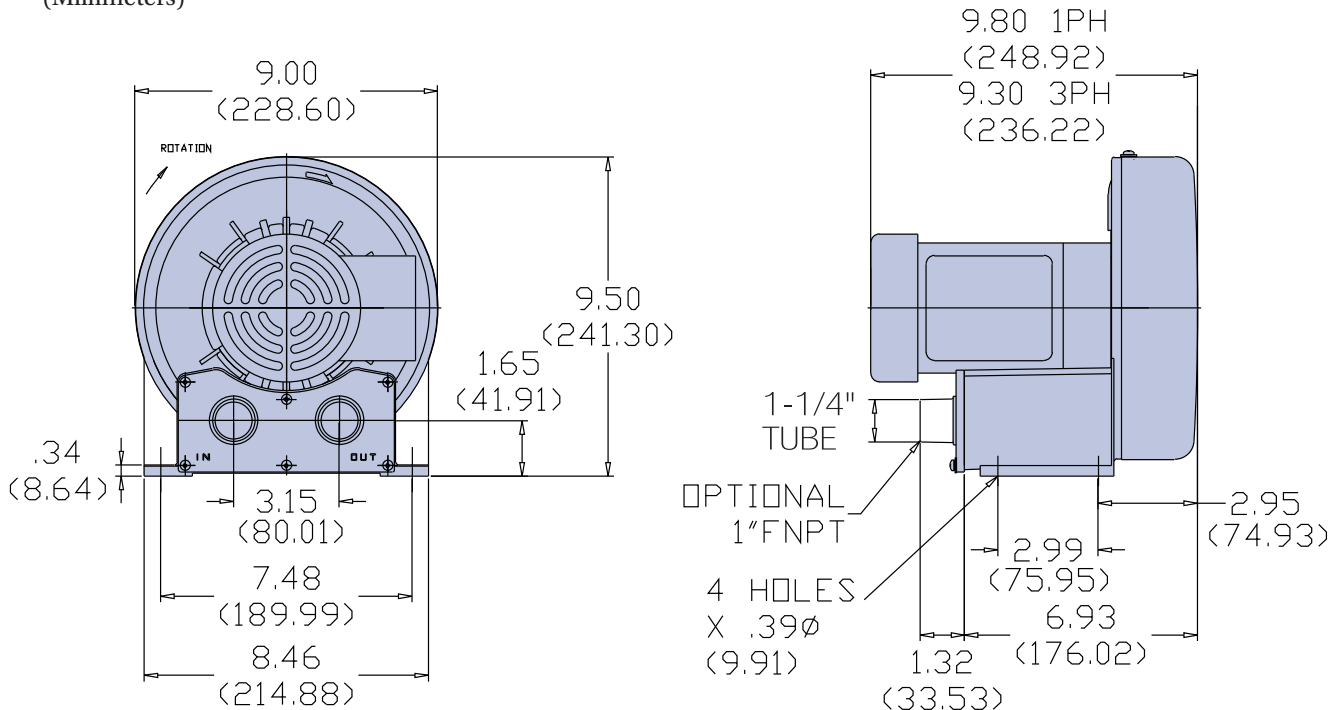
### Single Phase or Three Phase TEFC Motor

- Flow to 40 cfm
- ¼ hp
- NEMA Class F Insulation
- CE, UL Listed, CSA Certified Motor
- Patented Reversible Flange for Threaded or Tube Connection



### DIMENSIONS

Inches  
(Millimeters)



# VB002S, VB002

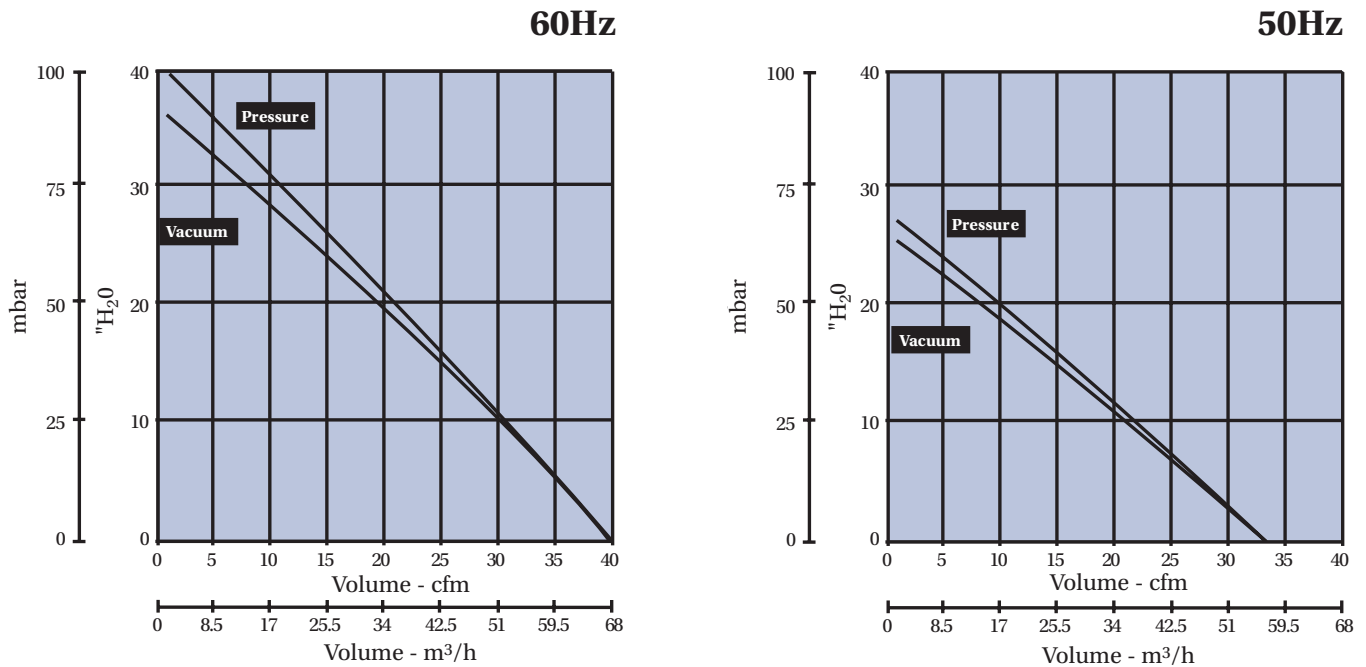
## Single Phase or Three Phase TEFC Motor

### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum		hp	Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level @ 1.5m	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar		Volts	Amperes	Amperes			lb	kg
VB002S	60	40	68	40	99.6	36.5	90.9	.25	115/230, 1Ø	2.3/1.15	7.3/3.65	3300	61dba@60Hz	20.7	9.4
	50	33	56.1	27.5	68.5	25.5	63.5	.21	110/220, 1Ø	2.1/1.05	7/3.5	2700		20.7	9.4
VB002	60	40	68	40	99.6	36.5	90.9	.25	200-230/460, 3Ø	.86-.78/.39	3.4-3.9/1.95	3400	61dba@60Hz	19.5	8.9
	50	33	56.1	27.5	68.5	25.5	63.5	.21	190-220/380-415,3Ø	.79-.74/.39-.38	3.3-3.8/1.6-1.8	2800		19.5	8.9

Maximum Ambient Temperature: 140°F/60°C. Maximum Internal Motor Temperature: 311°F/155°C.

### PERFORMANCE



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.

## VB003S, VB003

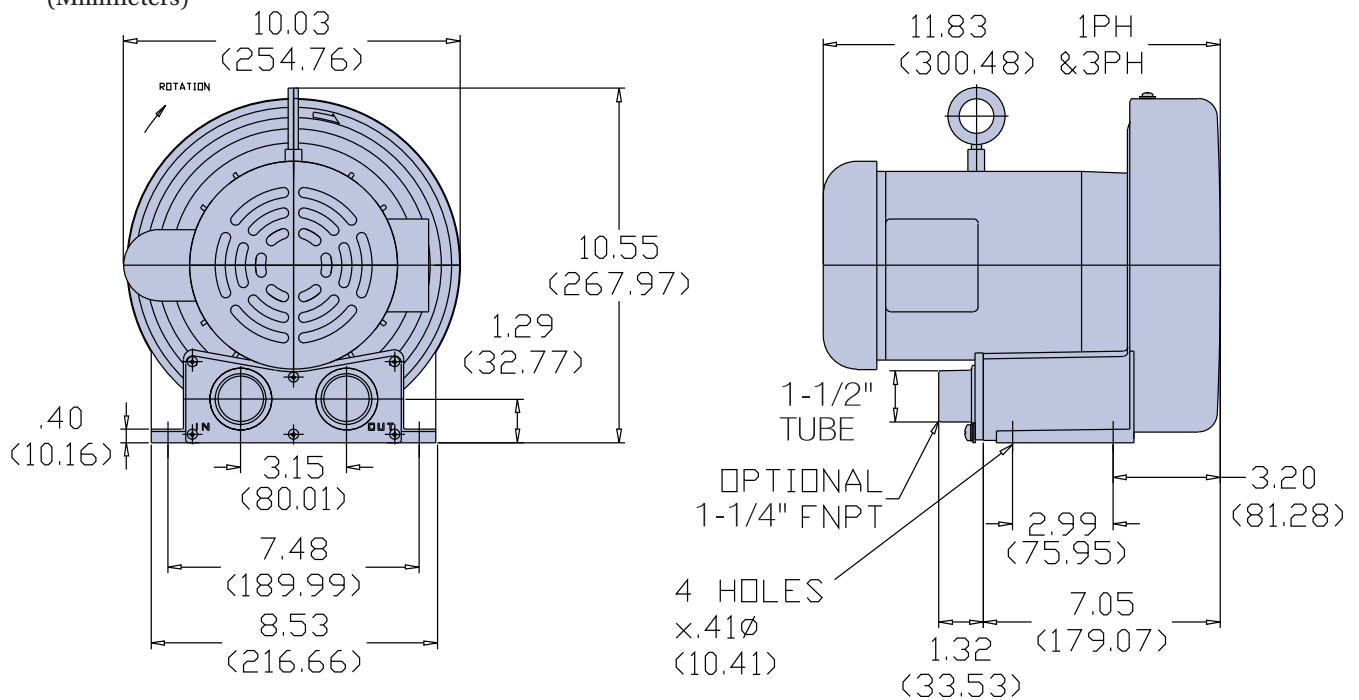
### Single Phase or Three Phase TEFC Motor

- Flow to 60 cfm
- ½ hp
- NEMA Class F Insulation
- CE, UL Listed, CSA Certified Motor
- Patented Reversible Flange for Threaded or Tube Connection



### DIMENSIONS

Inches  
(Millimeters)



# VB003S, VB003

## Single Phase or Three Phase TEFC Motor

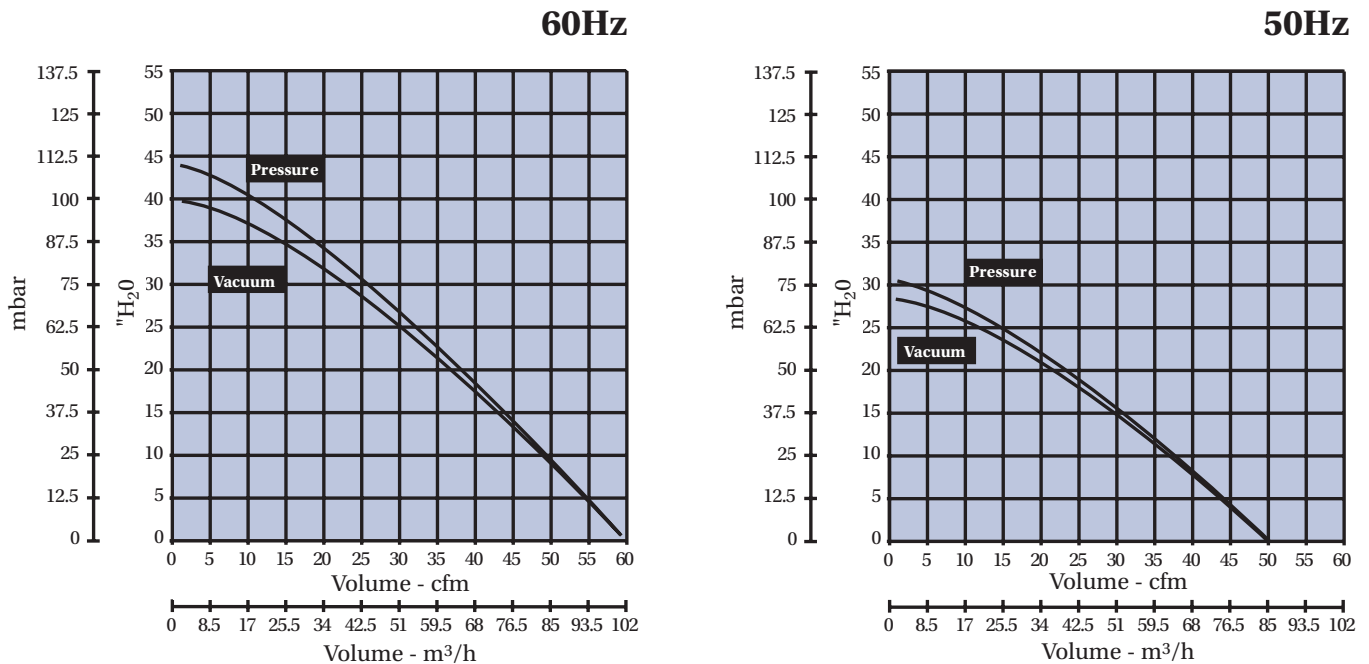
### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum		Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level @ 1.5m	Weight		
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar						hp	Volts	Amperes
VB003S*	60	60	102	44	109.6	40	99.6	.5	115/230, 1Ø	5.2/2.6	22.7/11.35	3400	66dba@60Hz	35	15.9
	50	49	83.3	30.2	75.2	28.2	70.2	.5	110/220, 1Ø	5.6/2.8	22.12/11.06	2800		35	15.9
VB003**	60	60	102	44	109.6	40	99.6	.5	208-230/460, 3Ø	1.8-1.6/.8	11.25-10.42/5.21	3450	66dba@60Hz	29	13.2
	50	49	83.3	30.2	75.2	28.2	70.2	.5	190/380-415, 3Ø	2/1-.9	9.6/4.8-4.7	2850		29	13.2

\*Maximum Ambient Temperature: 140°F/60°C. Maximum Internal Motor Temperature: 311°F/155°C.

\*\*Maximum Ambient Temperature: 140°F/60°C. Maximum Internal Motor Temperature: 356°F/180°C.

### PERFORMANCE



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.

## VB004S, VB004

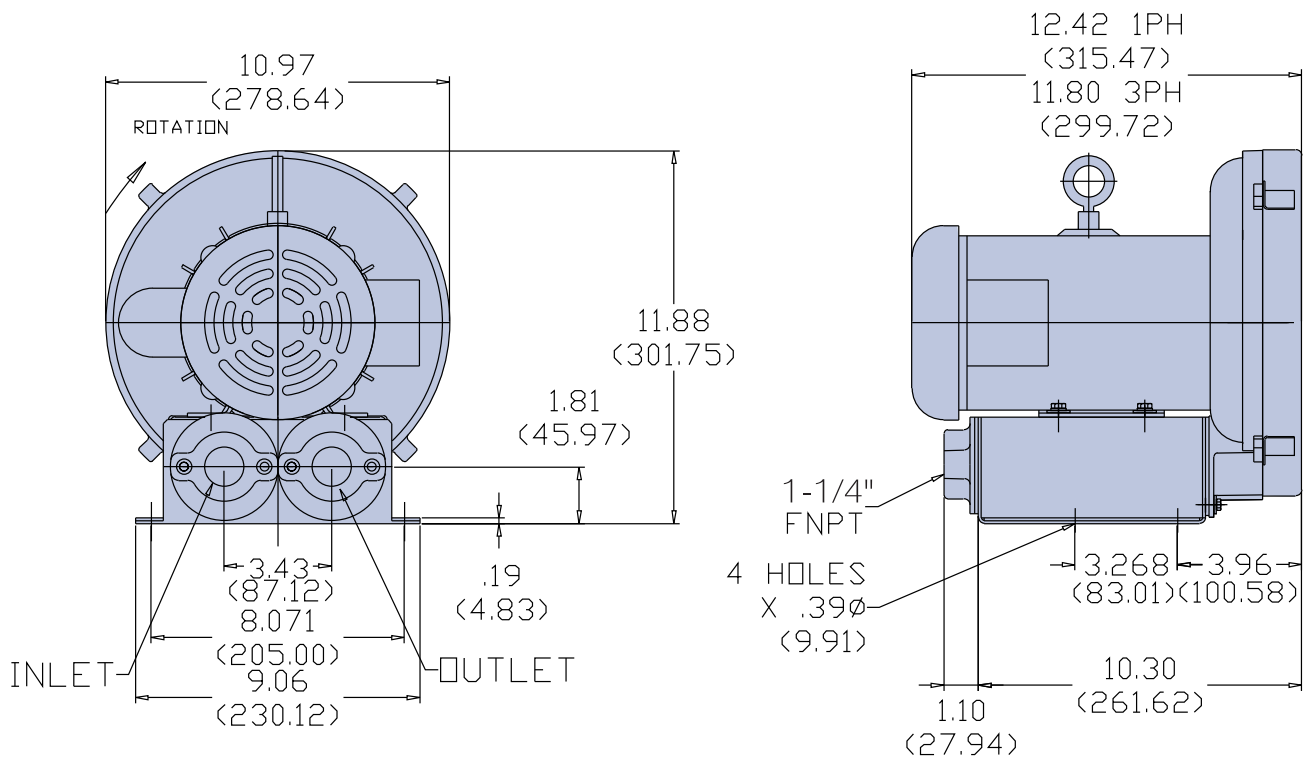
### Single Phase or Three Phase TEFC Motor

- Flow to 72 cfm
- ¾ hp
- NEMA Class F Insulation
- CE, UL Listed, CSA Certified Motor



### DIMENSIONS

Inches  
(Millimeters)



# VB004S, VB004

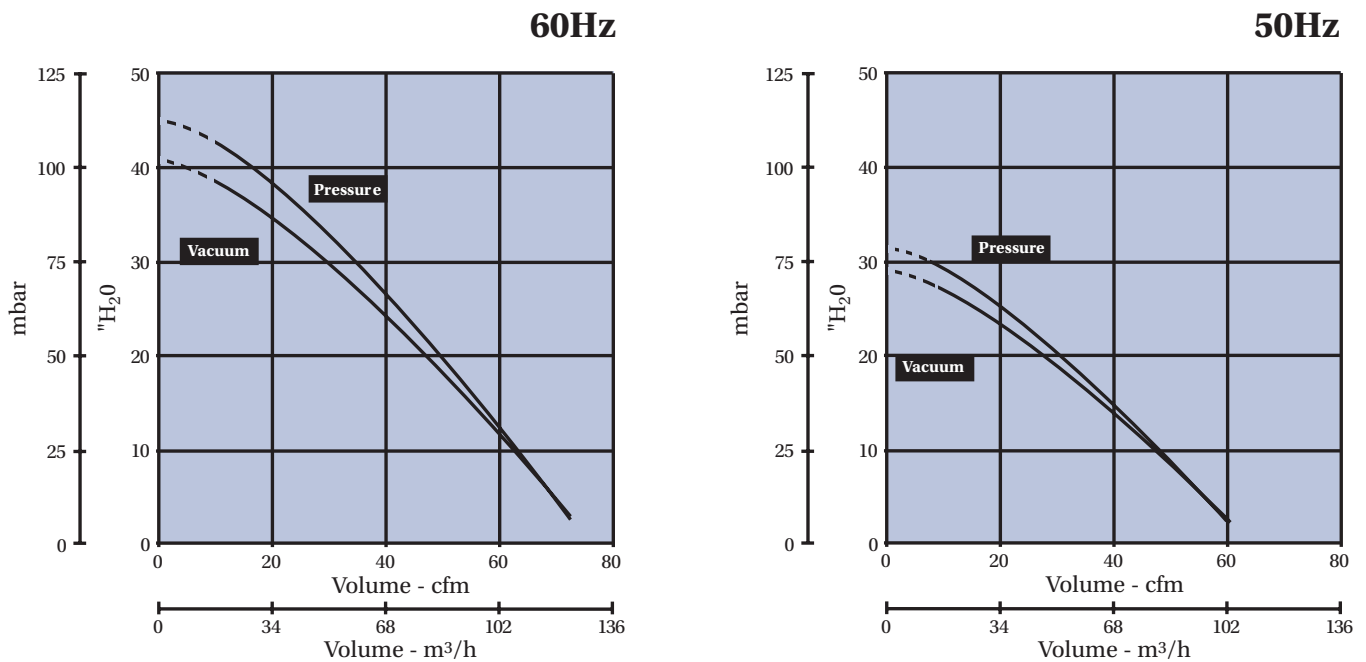
## Single Phase or Three Phase TEFC Motor

### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum			Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level @ 1.5m	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar	hp						Volts	Amperes
VB004S	60	72	122.3	43.5	108.4	39.7	98.9	.75	115/208-230, 1Ø	9.6/5-4.8	56/25.3-28	3450	63dba@60Hz	45	20.4
	50	60	102	30	74.7	28	69.7	.63	100-110/220, 1Ø	9.9-11.6/5.8	48.2-53/26.5	2850		45	20.4
VB004	60	72	122.3	43.5	108.4	39.7	98.9	.75	200-230/460,3Ø	2.3-2.4/1.2	13.7-15.8/7.9	3450	63dba@60Hz	40	18.2
	50	60	102	30	74.7	28	69.7	.63	190/380-415,3Ø	2.4/1.2-1.3	14.6/7.3-6.7	2850		40	18.2

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 311°F/155°C.

### PERFORMANCE



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.

## VB007S, VB007

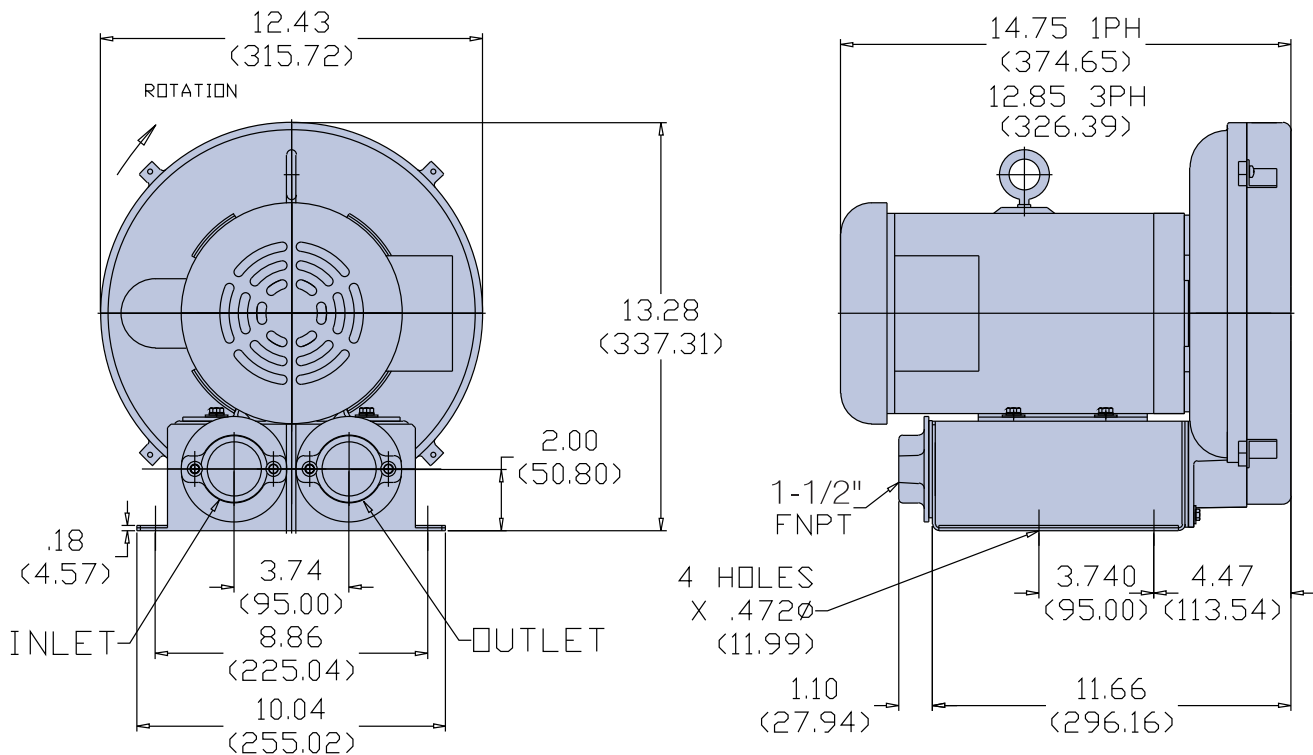
### Single Phase or Three Phase TEFC Motor

- Flow to 107 cfm
- 1½ hp
- NEMA Class F Insulation
- CE, UL Listed, CSA Certified Motor



### DIMENSIONS

Inches  
(Millimeters)



# VB007S, VB007

## Single Phase or Three Phase TEFC Motor

### SPECIFICATIONS

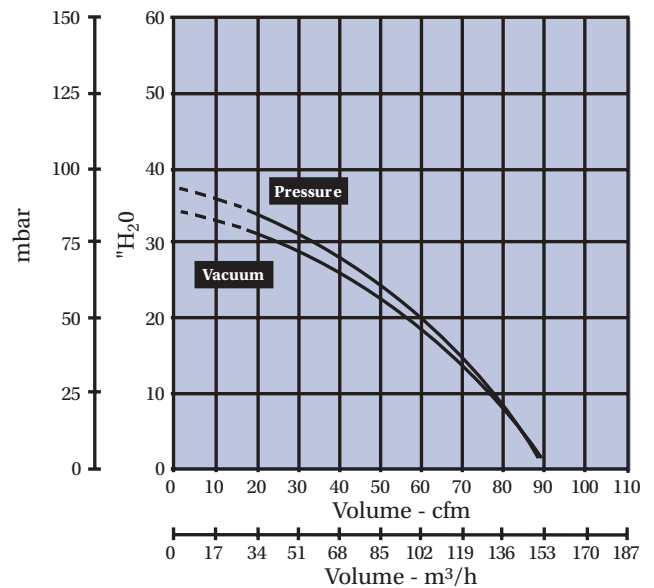
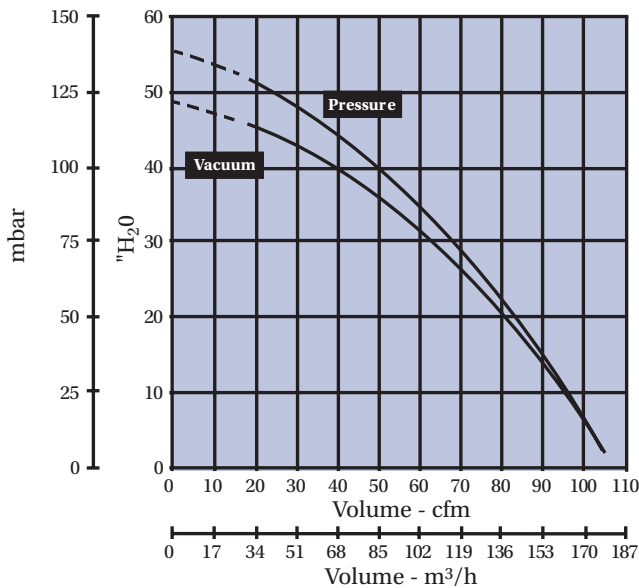
Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum			Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level @ 1.5m	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar	hp						Volts	Amperes
VB007S	60	107	181.8	51	127	45	112.1	1.5	115/230, 1Ø	13.4/6.7	97.8/49	3450	70dba@60Hz	65	29.5
	50	89	151.2	35	87.2	32	79.7	1.5	110/220, 1Ø	15.4/7.7	102.3/51	2850		65	29.5
VB007	60	107	181.8	51	127	45	112.1	1.5	200-230/460,3Ø	4.4/3.8-1.9	41-35.7/18	3470	64dba@60Hz	50	22.7
	50	89	151.2	35	87.2	32	79.7	1.25	190/380-415,3Ø	3.4/1.7-1.9	48.3/24-22	2890		50	22.7

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 311°F/155°C.

### PERFORMANCE

**60Hz**

**50Hz**



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.



# VB019S, VB019

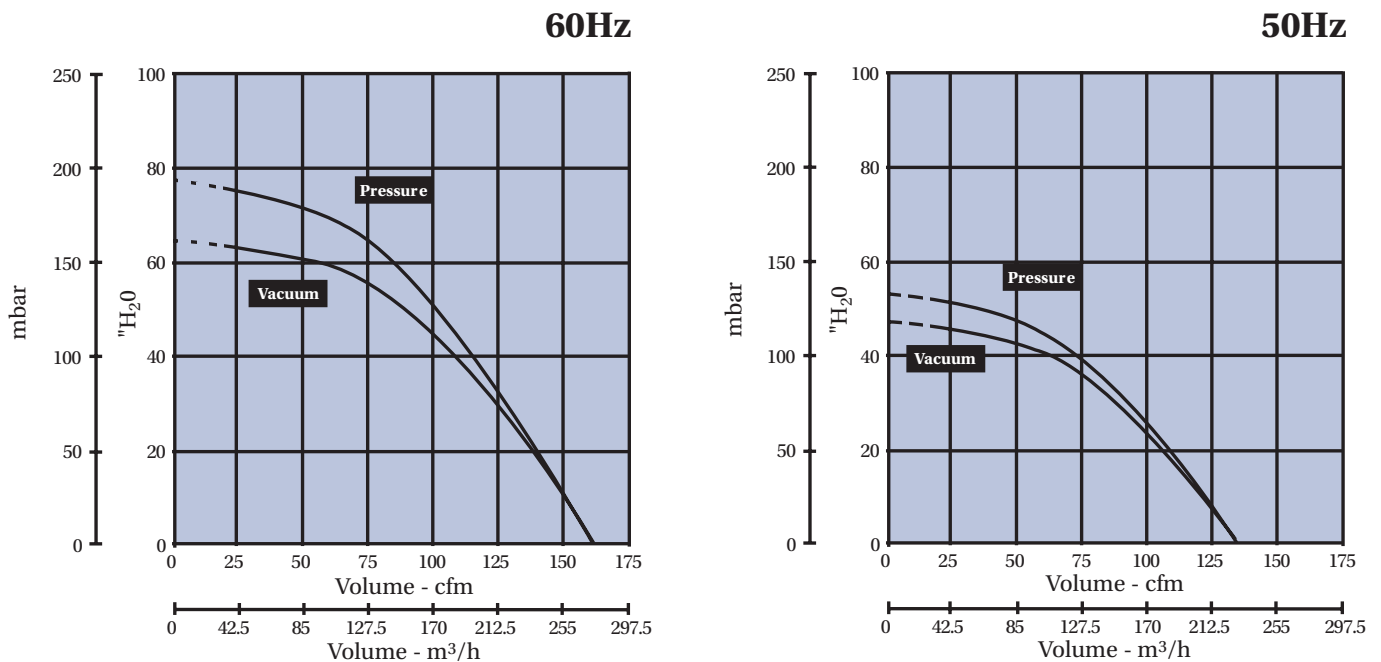
## Single Phase or Three Phase TEFC Motor

### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum			Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar	hp						Volts	Amperes
VB019S	60	160	271.9	76	189.3	64	159.4	2.5	115/208-230, 1Ø	22/11.5-11	138/62.4-69	3450	70dba@60Hz	90	40.9
	50	133	226	52	129.5	46	114.6	2.1	100-110/220, 1Ø	22-21/10.5	122.7-135/67.5	2850		90	40.9
VB019	60	160	271.9	76	189.3	64	159.4	2.5	200-230/460, 3Ø	6.6-6/3	47-54/27	3450	73dba@60Hz	85	38.6
	50	133	226	52	129.5	46	114.6	2.1	190/380-415, 3Ø	6.2-3.1/2.9	55.7/27.8-25.5	2900		85	38.6

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 311°F/155°C.

### PERFORMANCE



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.

# VB030S, VB030

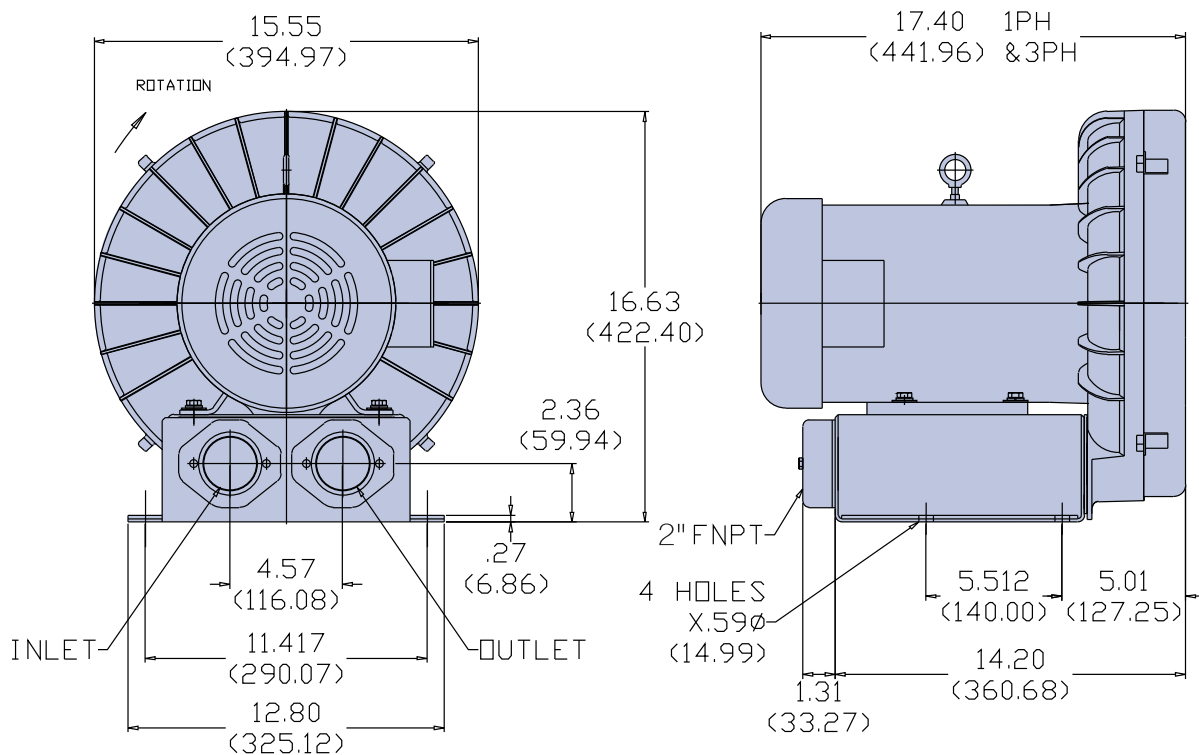
## Single Phase or Three Phase TEFC Motor

- Flow to 210 cfm
- 4 hp
- NEMA Class F Insulation
- CE, UL Listed, CSA Certified Motor



### DIMENSIONS

Inches  
(Millimeters)



# VB030S, VB030

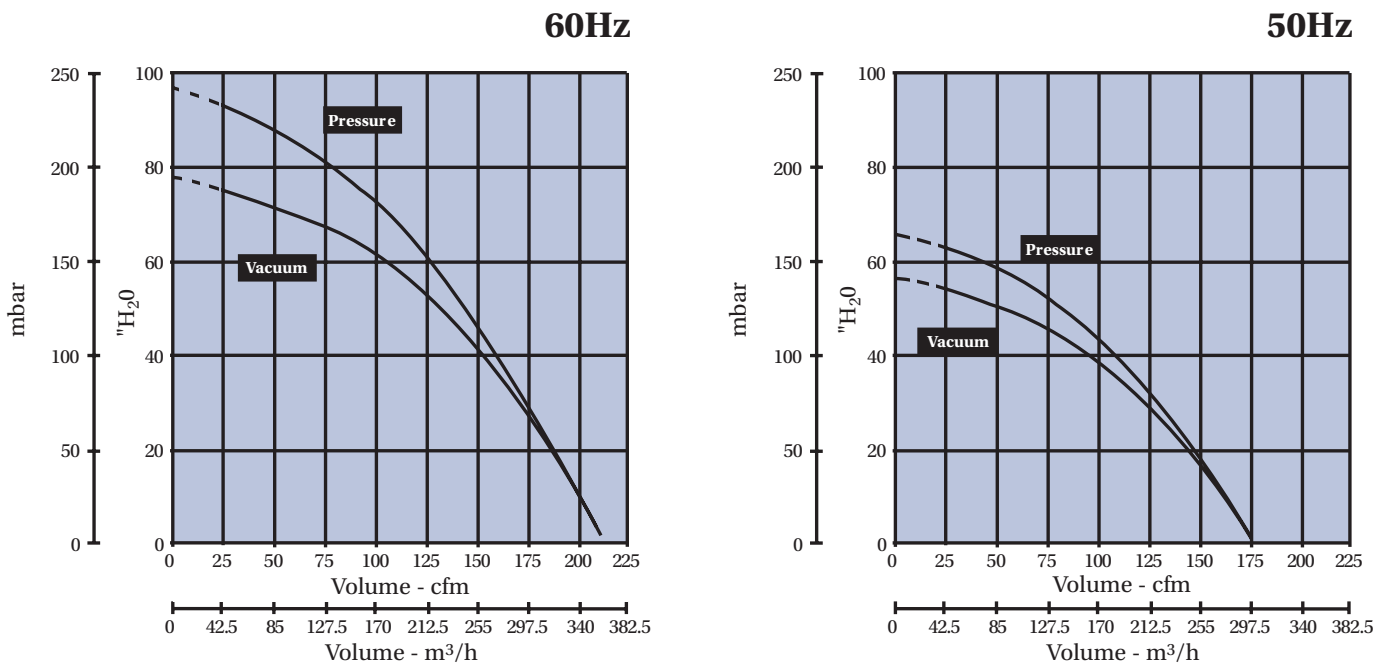
## Single Phase or Three Phase TEFC Motor

### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum			Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level @ 1.5m	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar	hp						Volts	Amperes
VB030S	60	210	356.8	94	234.2	76	189.3	4	115/208-230, 1Ø	34.8/18.5-17.4	210/95-105	3450	71dba@60Hz	133	60.4
	50	175	297.4	63	156.9	57	142	3.3	100-110/220, 1Ø	42-38.6/19.3	176-194/97	2850		133	60.4
VB030	60	210	356.8	94	234.2	76	189.3	4	208-230/460, 3Ø	10.6-9.6/4.8	101.3-112/56	3450	73dba@60Hz	106	48.1
	50	175	297.4	63	156.9	57	142	3.4	190/380-415, 3Ø	9.8/4.9-4.8	102.6/51.3-47	2875		106	48.1

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 311°F/155°C.

### PERFORMANCE



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.

# VB037S, VB037

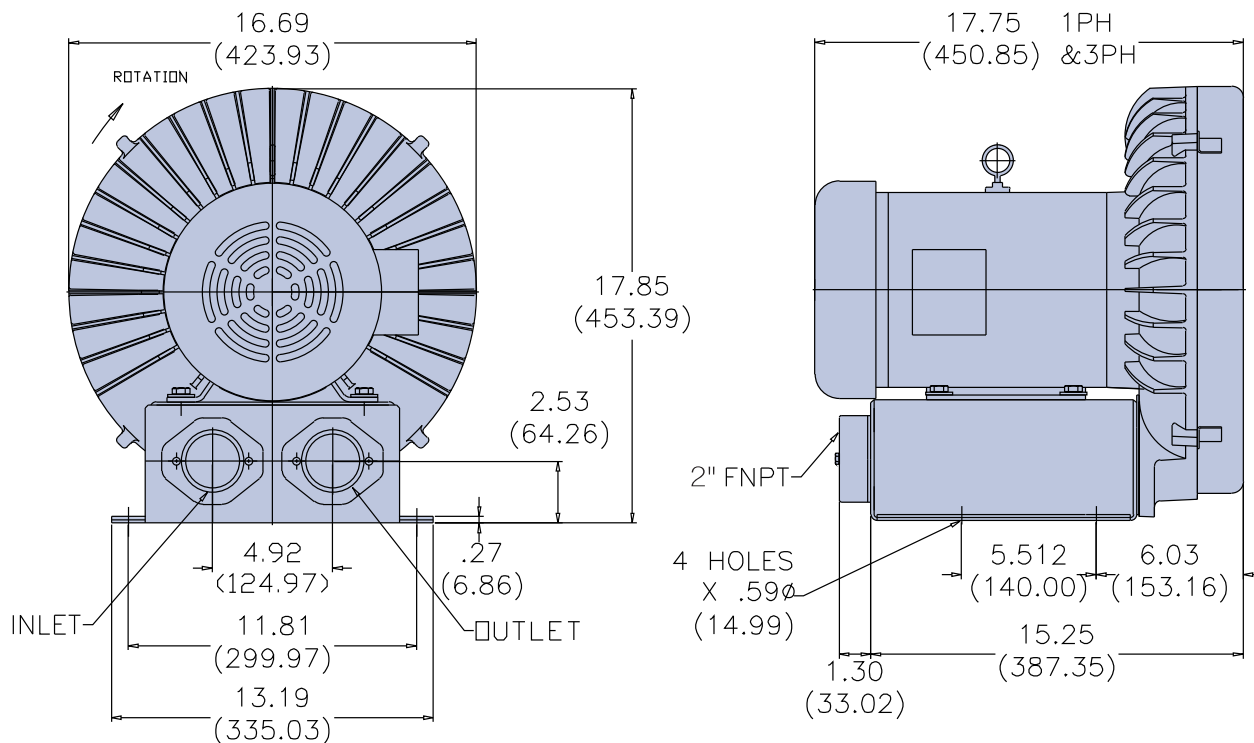
## Single Phase or Three Phase TEFC Motor

- Flow to 262 cfm
- 5 hp
- NEMA Class F Insulation
- CE, UL Listed, CSA Certified Motor



### DIMENSIONS

Inches  
(Millimeters)



# VB037S, VB037

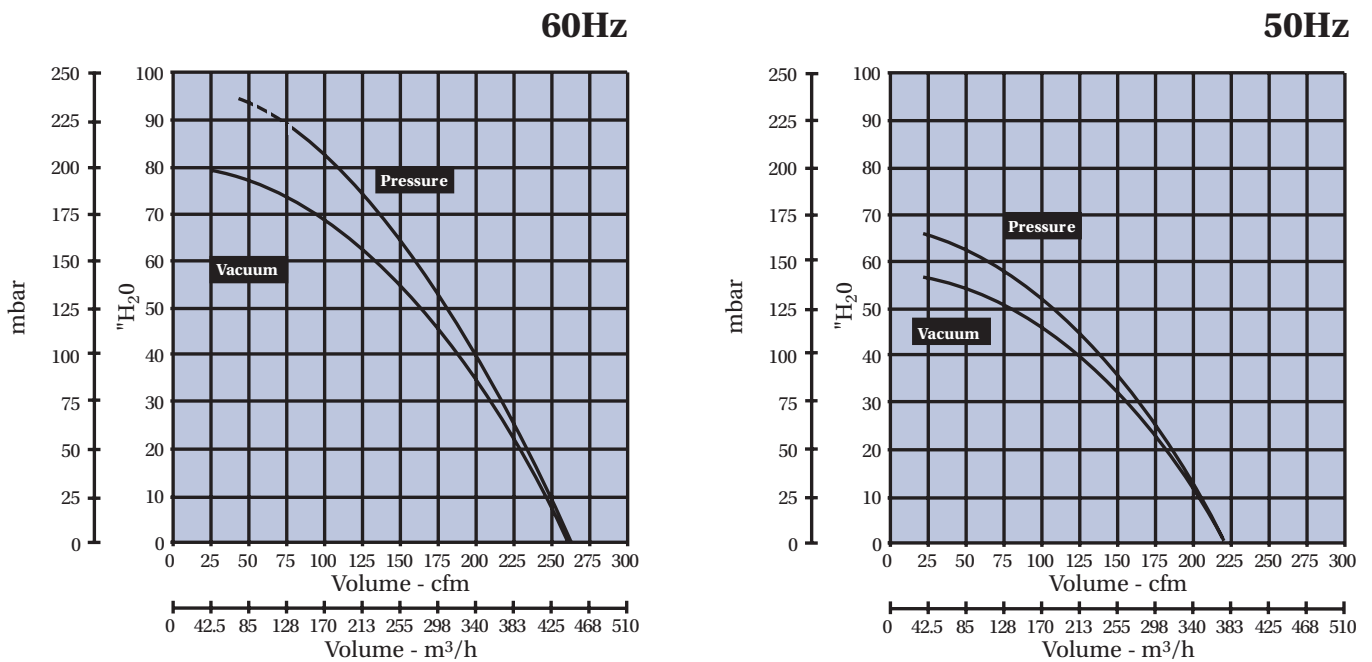
## Single Phase or Three Phase TEFC Motor

### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum			Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar	hp						Volts	Amperes
VB037S	60	262	445.2	88	219.2	79	196.8	5	230, 1Ø	20.8	119	3450	74dba@60Hz	165	74.9
	50	218	370.4	66.5	165.7	57	142	4.2	220, 1Ø	19	113	2850		165	74.9
VB037	60	262	445.2	88	219.2	79	196.8	5	200-230/460,3Ø	13-11.6/5.8	81.7-94/47	3450	76dba@60Hz	150	68.1
	50	218	370.4	66.5	165.7	57	142	4.2	190/380-415,3Ø	12/6-5.6	92/46-42	2850		150	68.1

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 311°F/155°C.

### PERFORMANCE



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.

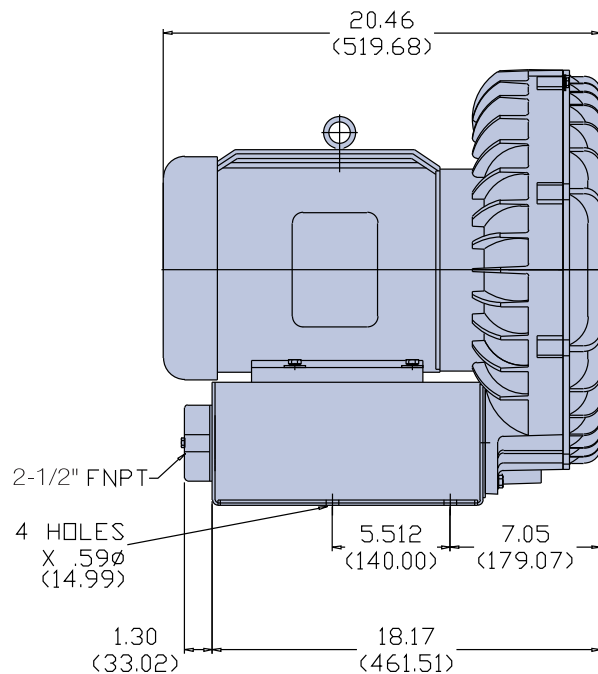
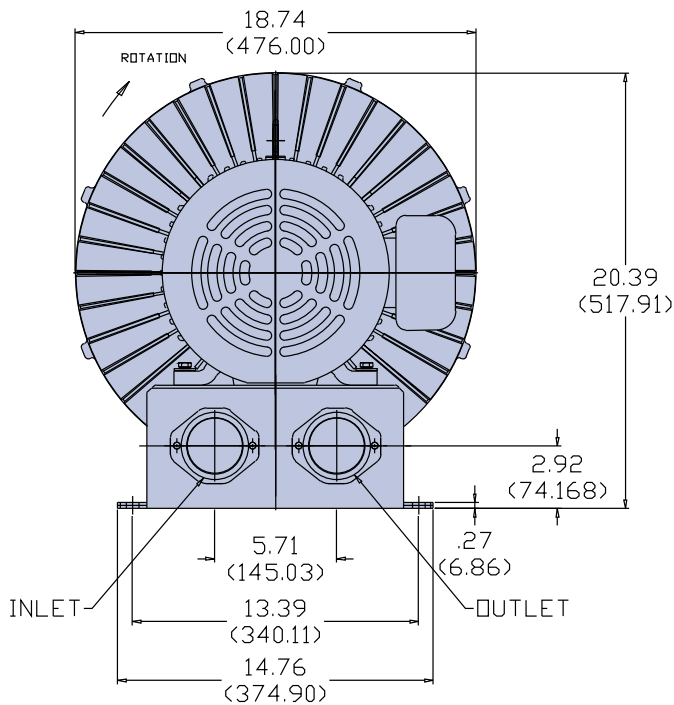
## VB055 Three Phase TEFC Motor

- Flow to 370 cfm
- 7½ hp
- NEMA Class F Insulation
- CE, UL Listed, CSA Certified Motor



### DIMENSIONS

Inches  
(Millimeters)



# VB055

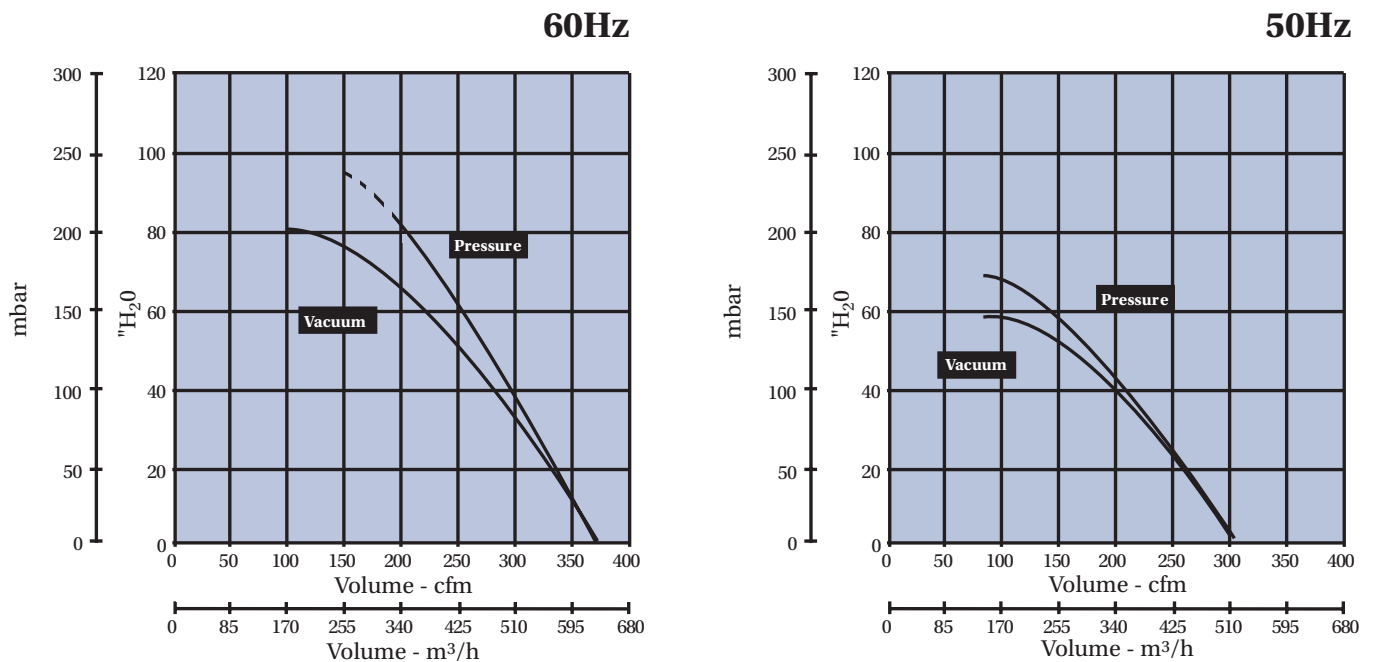
## Three Phase TEFC Motor

### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum		Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level	Weight		
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar						hp	Volts	Amperes
VB055	60	370	628.7	78	194.3	81	201.8	7.5	200-230/460,3Ø	20.8-19/9.5	125.2-144/72	3480	82dba@60Hz	250	113.5
	50	307	521.7	68	169.4	58	144.5	6.25	190/380-415,3Ø	19.2/9.6-9.4	138/69 63.2	2880		250	113.5

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 311°F/155°C.

### PERFORMANCE



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.

## VB075

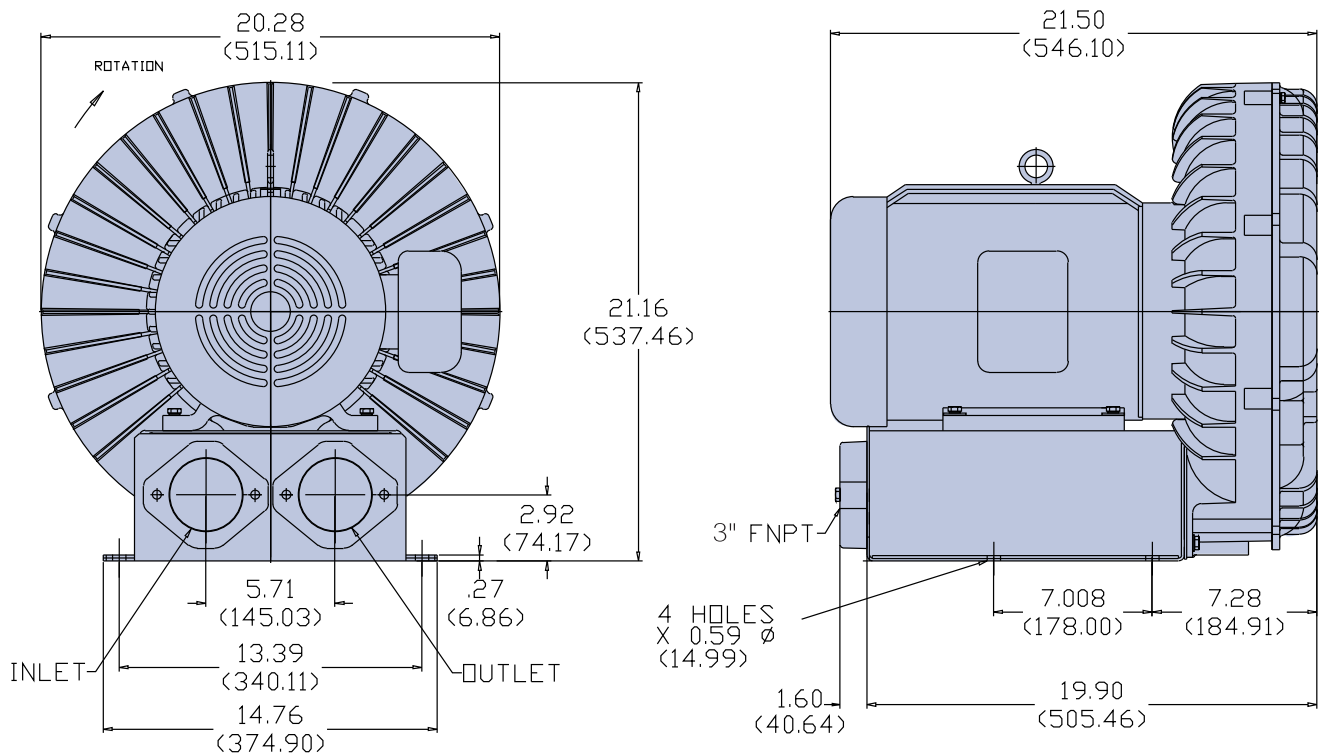
### Three Phase TEFC Motor

- Flow to 495 cfm
- 10 hp
- NEMA Class F Insulation
- CE, UL Listed, CSA Certified Motor



### DIMENSIONS

Inches  
(Millimeters)



# VB075

## Three Phase TEFC Motor

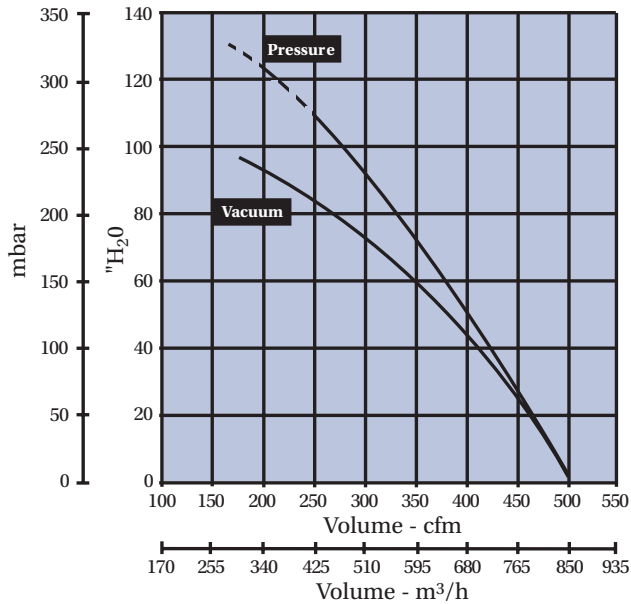
### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum		hp	Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level	Weight	
		cfm	m <sup>3</sup> /h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar							lb	kg
VB075	60	495	841.1	106	264	98	244.1	10	200-230/460,3Ø	27.5-27.2/13.6	197.6-227.2/113.6	3450	81dba@60Hz	265	120.3
	50	412	700	87	216.7	72	179.4	8.3	190/380-415,3Ø	27/13.5-14.5	218/109-99.8	2850		265	120.3

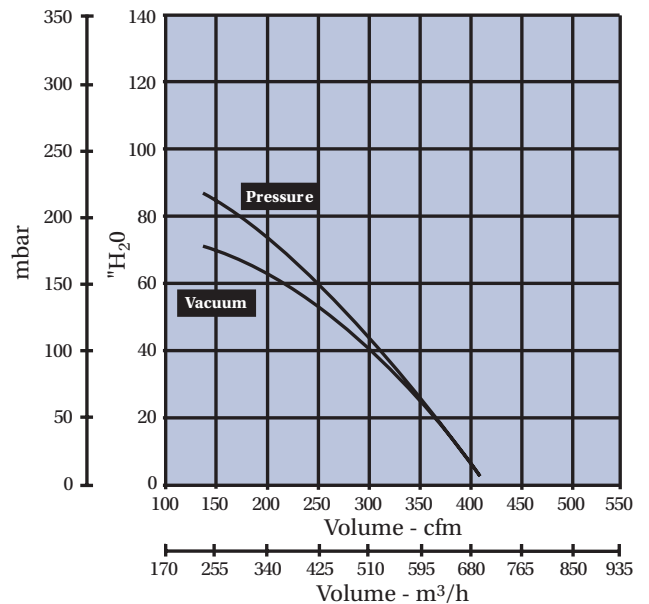
Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 311°F/155°C.

### PERFORMANCE

**60Hz**



**50Hz**



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.

# VB110

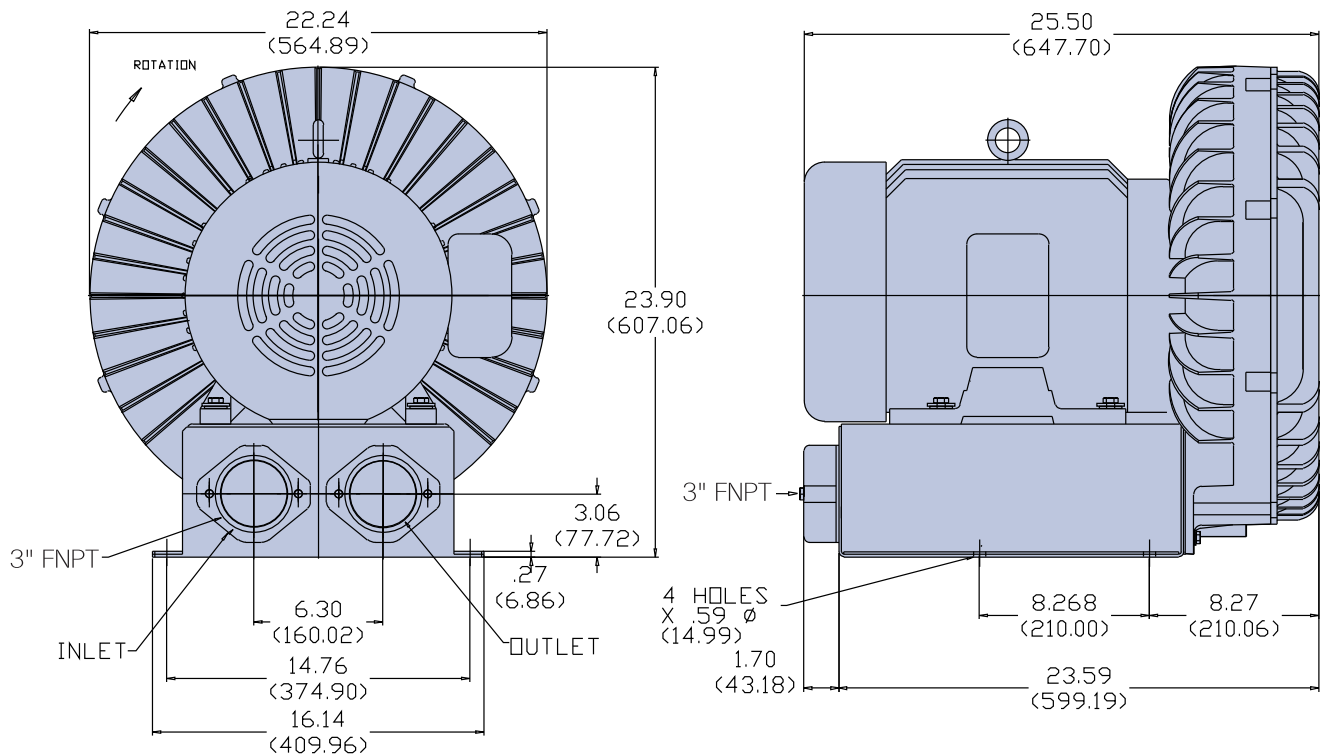
## Three Phase TEFC Motor

- Flow to 645 cfm
- 15 hp
- NEMA Class F Insulation
- CE, UL Listed, CSA Certified Motor



### DIMENSIONS

Inches  
(Millimeters)



# VB110

## Three Phase TEFC Motor

### SPECIFICATIONS

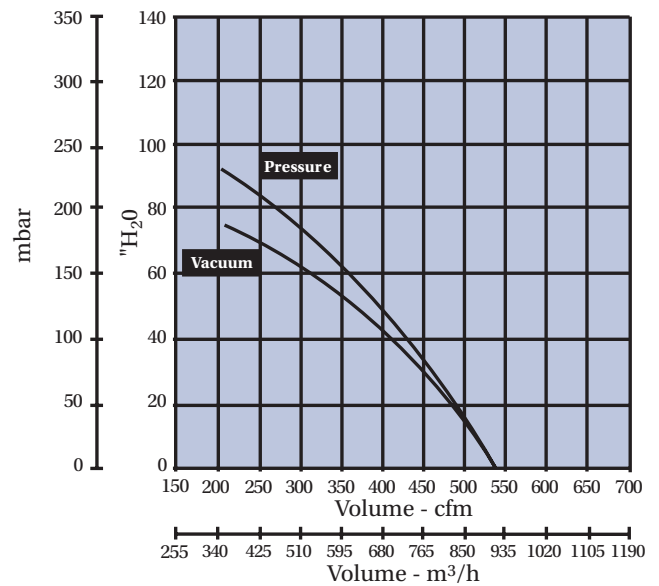
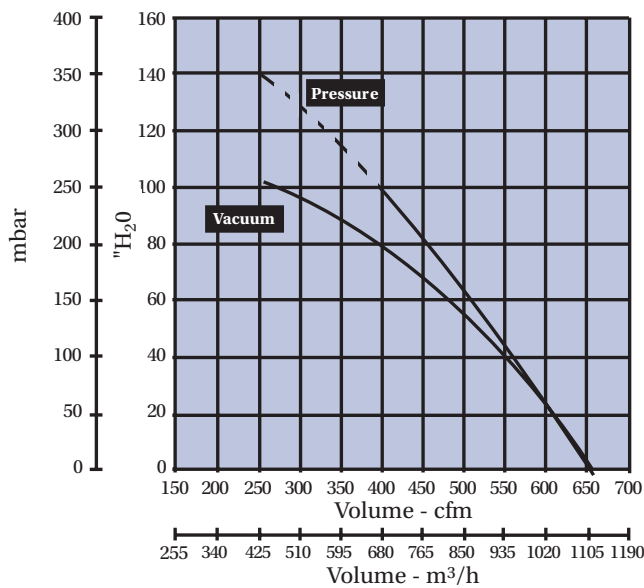
Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum			Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar	hp						lb	kg
VB110	60	645	1096	102	254.1	104	259.1	15	200-230/460,3Ø	38.5-35/17.5	250.4-288/144	3490	80dba@60Hz	370	168
	50	538	914.2	94	234.2	76	189.3	12.5	190/380-415,3Ø	35.2/17.6-16.6	276/138-126.4	2880		370	168

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 311°F/155°C.

### PERFORMANCE

**60Hz**

**50Hz**



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.

# VB007SXP, VB007XP

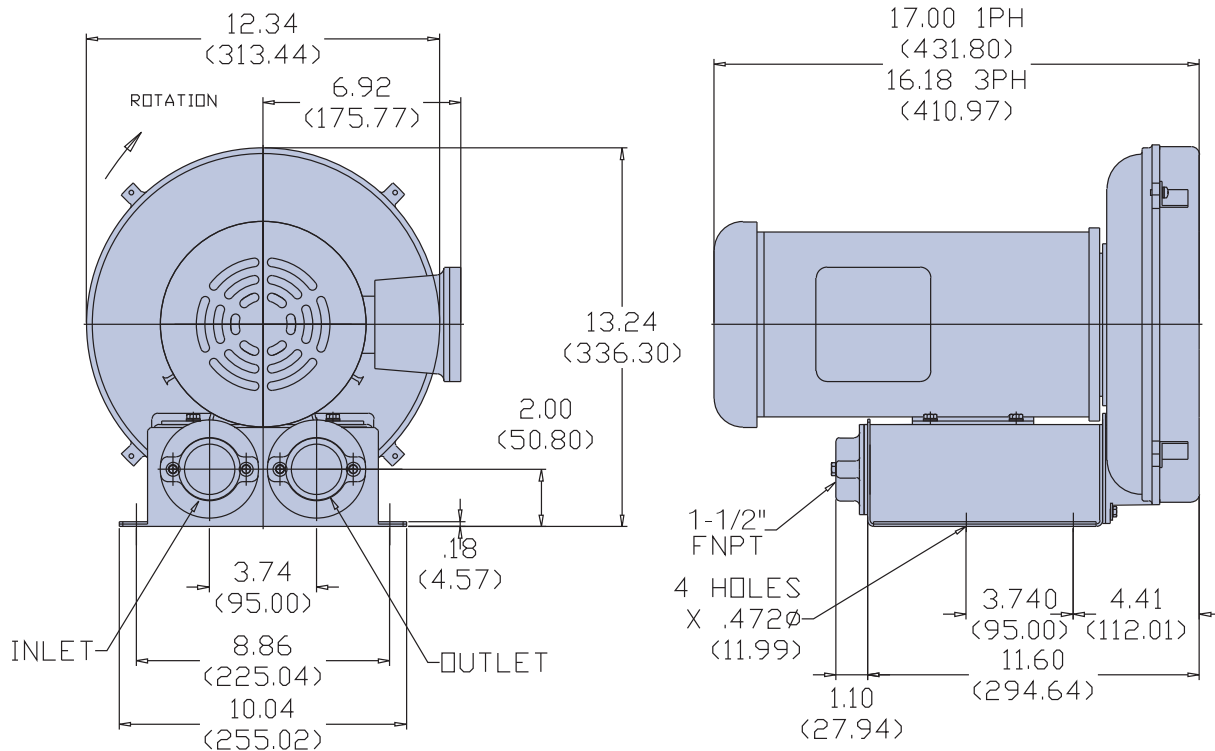
## Single Phase or Three Phase Explosion-Proof Motor

- Flow to 107 cfm
- 1½ hp
- NEMA Class B Insulation  
Pilot duty thermal protection  
Class I, Group D; Div 1  
Class II, Groups F and G
- Sealed Bearings
- UL Listed, CSA Certified Motor
- Viton® Shaft Seal
- High temperature anaerobic sealant



### DIMENSIONS

Inches  
(Millimeters)



# VB007SXP, VB007XP

## Single Phase or Three Phase Explosion-Proof Motor

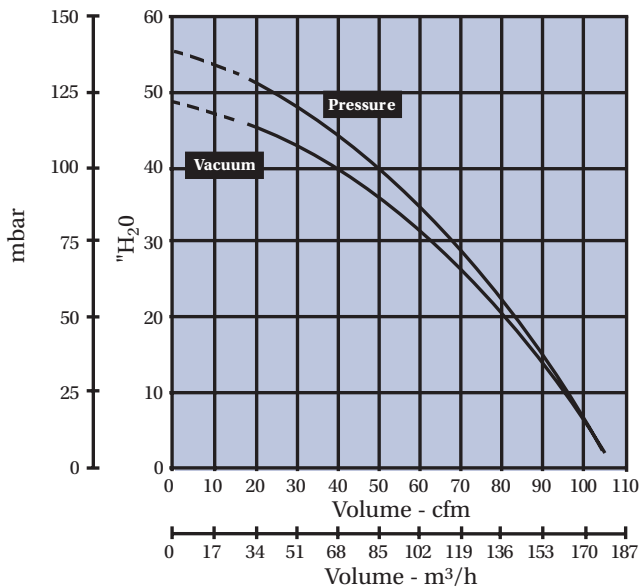
### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum		hp	Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level @ 1.5m	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar							lb	kg
VB007SXP	60	107	181.8	51	127	45	112.1	1.5	115/208-230,1Ø	15/7.9-7.5	87.4/48-43.7	3450	70dba@60Hz	78	35
VB007XP	60	107	181.8	51	127	45	112.1	1.5	200-230/460,3Ø	5.1-4.6/2.3	25.5-22.2/11	3450	64dba@60Hz	67	30.4

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 266°F/130°C.

### PERFORMANCE

#### 60Hz



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information. Consult applicable federal, state and local codes regarding proper selection and use of explosion-proof motors.



# VB019SXP, VB019XP

## Single Phase or Three Phase Explosion-Proof Motor

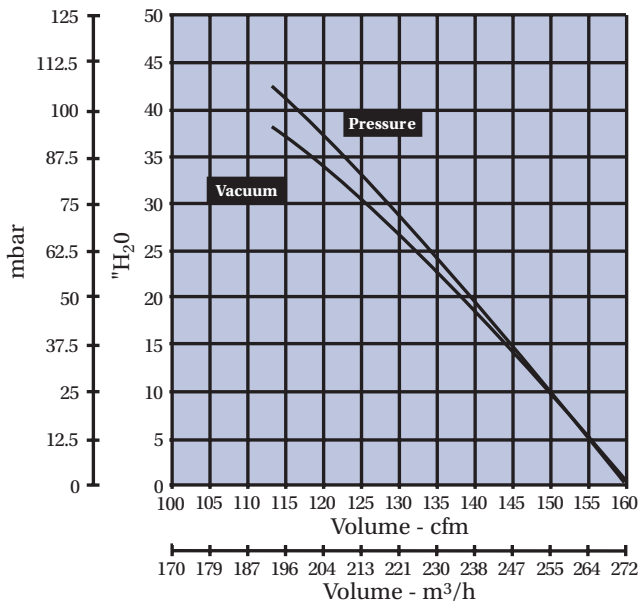
### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum		hp	Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar							lb	kg
VB019SXP	60	160	271.9	42.5	105.9	38.5	95.9	2	115/208-230,1Ø	21/11-10.5	165/74.6-82.5	3450	70dba@60Hz	114	51.8
VB019XP	60	160	271.9	42.5	105.9	38.5	95.9	2	200-230/460,3Ø	5.7-5.4/2.7	30.4-35/17.5	3450	73dba@60Hz	85	38.6

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 266°F/130°C.

### PERFORMANCE

#### 60Hz



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.  
Consult applicable federal, state and local codes regarding proper selection and use of explosion-proof motors.



# VB030XP

## Three Phase Explosion-Proof Motor

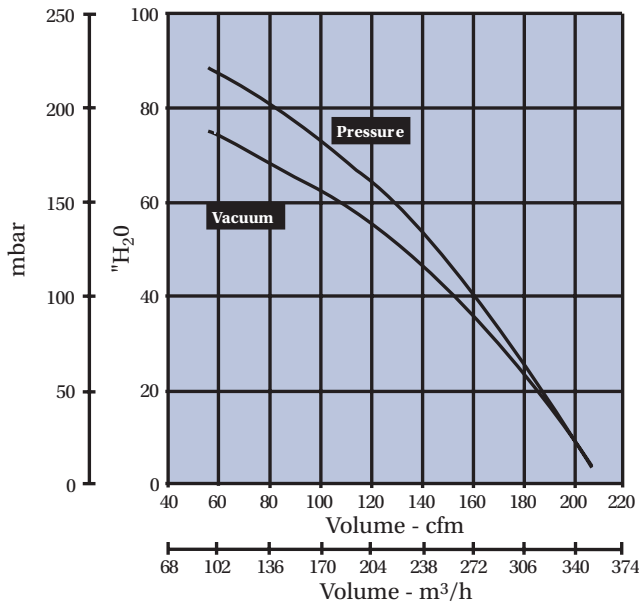
### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum		hp	Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar							lb	kg
VB030XP	60	210	356.8	87	216.7	72	179.4	4	200-230/460, 3Ø	10.6-10.2/5.1	101.3-112/56	3450	73dba@60Hz	160	72.6

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 266°F/130°C.

### PERFORMANCE

#### 60Hz



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.  
Consult applicable federal, state and local codes regarding proper selection and use of explosion-proof motors.



# VB037XP

## Three Phase Explosion-Proof Motor

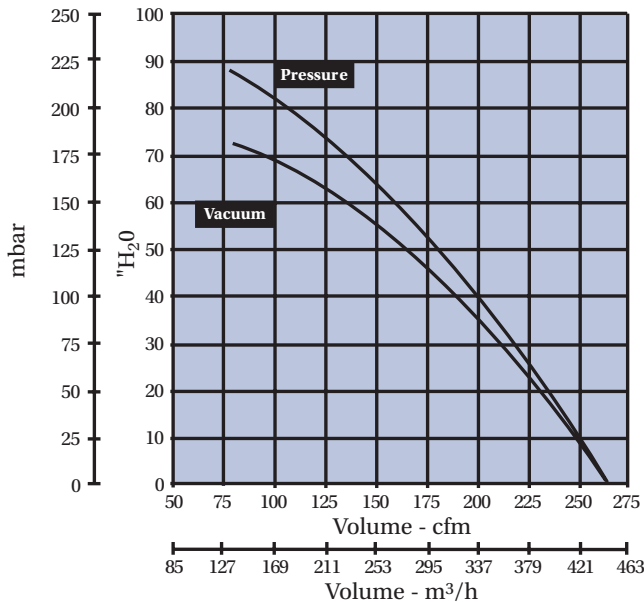
### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum		hp	Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level	Weight	
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar							lb	kg
VB037XP	60	262	445.2	88	219.2	72	179.4	5	200-230/460, 3Ø	13-12/6	92.2-106/53	3500	79dba@60Hz	203	92.2

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 266°F/130°C.

### PERFORMANCE

#### 60Hz



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.  
Consult applicable federal, state and local codes regarding proper selection and use of explosion-proof motors.

# VB055XP

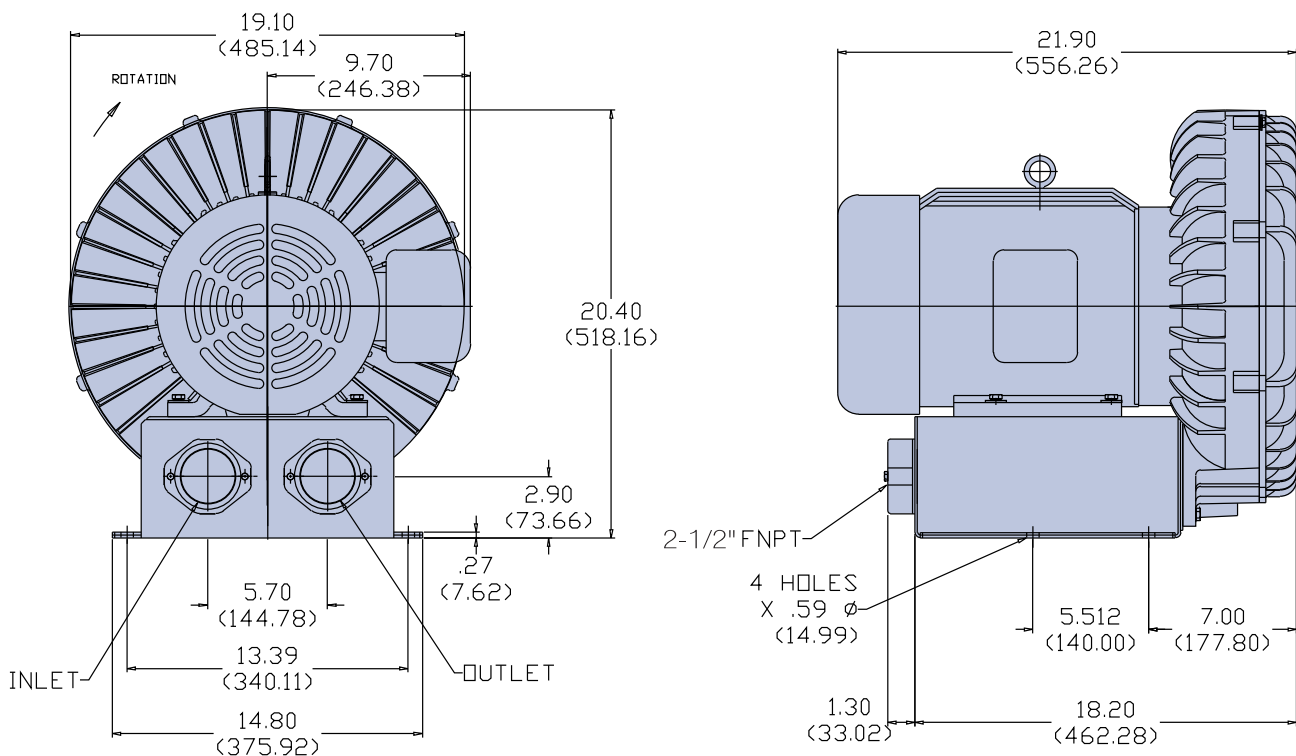
## Three Phase Explosion-Proof Motor

- Flow to 370 cfm
- 7½ hp
- NEMA Class B Insulation  
Pilot duty thermal protection  
Class I, Group D; Div 1  
Class II, Groups F and G
- Sealed Bearings
- UL Listed, CSA Certified Motor
- Viton® Shaft Seal
- High temperature anaerobic sealant



### DIMENSIONS

Inches  
(Millimeters)



# VB055XP

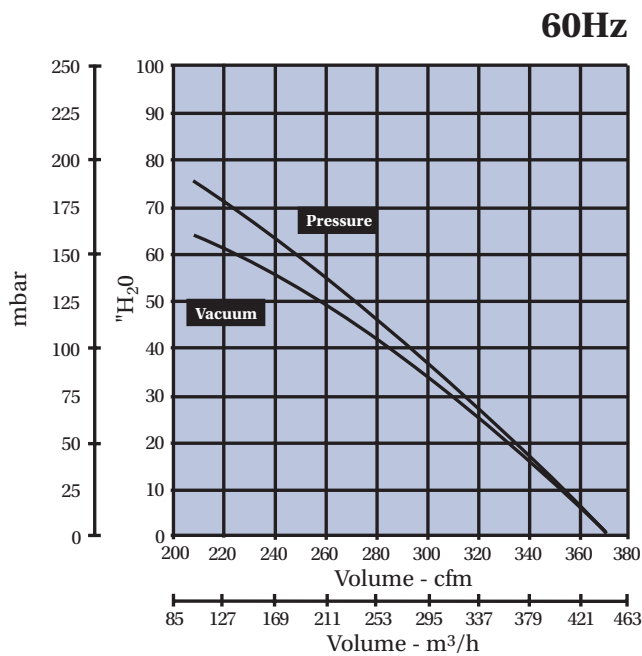
## Three Phase Explosion-Proof Motor

### SPECIFICATIONS

Model No.	Freq	Maximum Volume		Maximum Operating Pressure		Maximum Operating Vacuum		Standard Voltage	FLA Current	Locked Rotor Current	Speed	Estimated Acoustical Noise Level	Weight		
		cfm	m <sup>3</sup> h	"H <sub>2</sub> O	mbar	"H <sub>2</sub> O	mbar						hp	Volts	Amperes
VB055XP	60	370	628.7	76	189.3	64	159.4	7.5	200-230/460, 3Ø	20.7-18.6/9.3	154.3-177.4/88.7	3450	82dba@60Hz	297	134.8

Maximum Ambient Temperature: 104°F/40°C. Maximum Internal Motor Temperature: 266°F/130°C.

### PERFORMANCE



Note: Dimensions, specifications and performance data are subject to change without notice. Contact factory for latest information.  
Consult applicable federal, state and local codes regarding proper selection and use of explosion-proof motors.

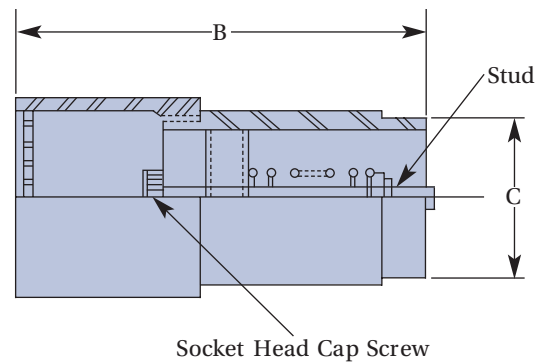
## Blower Accessories Relief Valves

Spencer relief valves are designed to protect Vortex blowers from overheating in a blocked-off mode during vacuum or pressure operation. Follow the instructions furnished with each valve for adjustment procedures; avoid settings that involve blower operation beyond full load amperage of the motor as indicated on nameplate. No relief valve is required for the smallest Vortex blowers—Models VB001 and VB002 in vacuum service, Model VB001 in pressure service.



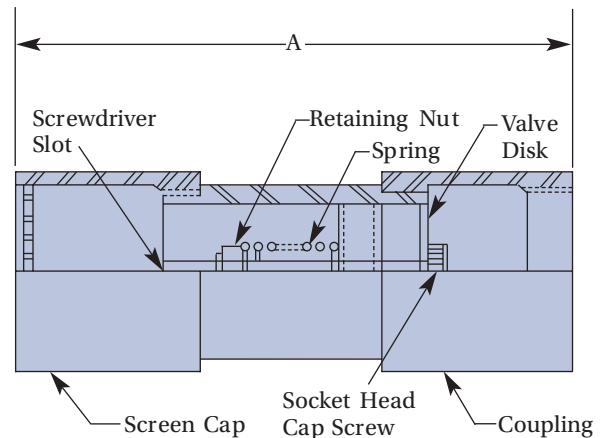
### Pressure Relief Valves

Blower Model	Part No.	*Max. Press. "H <sub>2</sub> O		MPT Pipe Size, in.
		60 Hz	50Hz	
VB002	VLV90320	40	27	1½
VB003	VLV90320	44	30	1½
VB004	VLV90320	43	30	1½
VB007	VLV90314	51	35	1½
VB019	VLV90314	76	52	1½
VB030	VLV90316	94	63	2
VB037	VLV90316	88	66	2
VB055	VLV90316	78	68	2
VB075	VLV90321	106	87	2½
VB110	VLV90321	102	94	2½



### Vacuum Relief Valves

Blower Model	Part No.	*Max. Vac. "H <sub>2</sub> O		FPT Pipe Size, in.
		60 Hz	50Hz	
VB003	VLV90315	40	28	1½
VB004	VLV90313	40	28	1½
VB007	VLV90313	45	32	1½
VB019	VLV90313	64	46	1½
VB030	VLV90317	76	57	2
VB037	VLV90317	79	57	2
VB055	VLV90317	81	58	2
VB075	VLV90318	98	72	2½
VB110	VLV90318	104	76	2½



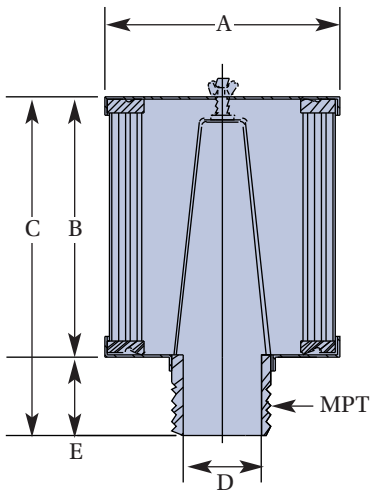
\*Adjustment required.

Blower Models	Dimensions, inches		
	A	B	C (NPT)
VB002, 003, 004, 007, 019	6¼	4 <sup>11</sup> / <sub>16</sub>	1½
VB030, 037, 055	6¼	4 <sup>11</sup> / <sub>16</sub>	2
VB075, 110	9¾	6¾	2½

# Blower Accessories Inlet Filters and Accessory Arrangements

## Inlet Filters

Inlet filters have a single connection and are typically used in pressure applications to prevent dust, abrasive particles and contaminants from entering the blower. The filter elements are made with pleated paper impregnated with thermoset resin; replacement elements are available. Filtration efficiency is >99% per SAE Fine Dust Test (10 micron particles).

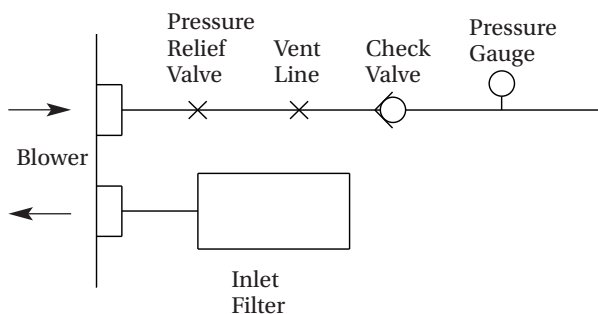


Blower Model	Inlet Filter Part No.	Replacement Filter Element Part No.	Dimensions, inches				
			A	B	C	D	E
VB001	FIL90164	ELE90043	4 <sup>5</sup> / <sub>8</sub>	4 <sup>7</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>8</sub>	1" tube	1 <sup>1</sup> / <sub>2</sub>
VB002	FIL90160	ELE90043	4 <sup>5</sup> / <sub>8</sub>	4 <sup>7</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub> "	1 <sup>1</sup> / <sub>2</sub>
VB003	FIL90160	ELE90043	4 <sup>5</sup> / <sub>8</sub>	4 <sup>7</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub> "	1 <sup>1</sup> / <sub>2</sub>
VB004	FIL90160	ELE90043	4 <sup>5</sup> / <sub>8</sub>	4 <sup>7</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>2</sub>
VB007	FIL90154	ELE90043	4 <sup>5</sup> / <sub>8</sub>	4 <sup>7</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>
VB019	FIL90154	ELE90043	4 <sup>5</sup> / <sub>8</sub>	4 <sup>7</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>
VB030	FIL90161	ELE90045	6	4 <sup>7</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>8</sub>	2	2
VB037	FIL90161	ELE90045	6	4 <sup>7</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>8</sub>	2	2
VB055	FIL90162	ELE90045	6	4 <sup>7</sup> / <sub>8</sub>	7 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>2</sub>
VB075	FIL90166	ELE90044	6	9 <sup>5</sup> / <sub>8</sub>	12 <sup>5</sup> / <sub>8</sub>	3	3
VB110	FIL90166	ELE90044	6	9 <sup>5</sup> / <sub>8</sub>	12 <sup>5</sup> / <sub>8</sub>	3	3

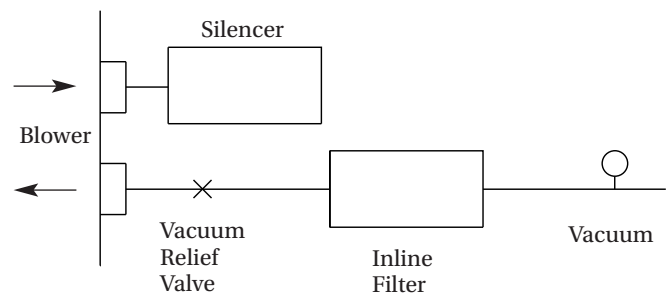
## Blower Accessory Arrangements

These diagrams show the recommended location and sequence of placement for Vortex blower accessories, differentiated between pressure and vacuum applications.

### Pressure



### Vacuum

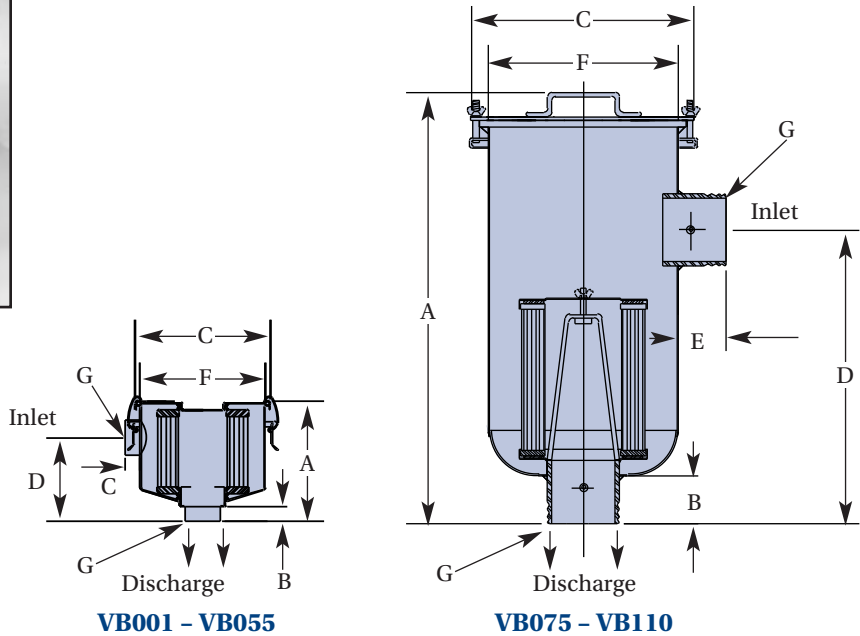


# Blower Accessories

## Inline filters



Inline filters have two connections and are typically used in vacuum applications to keep dust and abrasive particles from entering the blower through the connected piping. Filtration efficiency is >99% per SAE Fine Dust Test (10 micron particles). The pleated paper filter elements are replaceable. These filters have a low pressure drop and use a positive sealing O-ring system.



Blower Model	Inline Filter Part No.	Replacement Filter Element Part No.	Dimensions, inches							
			A	B	C	D	E	F	G	
VB001	FIL90174	ELE90059	6½	¾	7 <sup>5</sup> / <sub>16</sub>	4½	¾	6 <sup>13</sup> / <sub>16</sub>	1	FPT
VB002	FIL90174	ELE90059	6½	¾	7 <sup>5</sup> / <sub>16</sub>	4½	¾	6 <sup>13</sup> / <sub>16</sub>	1	FPT
VB003	FIL90175	ELE90059	6½	¾	7 <sup>5</sup> / <sub>16</sub>	4½	¾	6 <sup>13</sup> / <sub>16</sub>	1¼	FPT
VB004	FIL90175	ELE90059	6½	¾	7 <sup>5</sup> / <sub>16</sub>	4½	¾	6 <sup>13</sup> / <sub>16</sub>	1¼	FPT
VB007	FIL90176	ELE90059	6½	¾	7 <sup>5</sup> / <sub>16</sub>	4½	¾	6 <sup>13</sup> / <sub>16</sub>	1½	FPT
VB019	FIL90176	ELE90059	6½	¾	7 <sup>5</sup> / <sub>16</sub>	4½	¾	6 <sup>13</sup> / <sub>16</sub>	1½	FPT
VB030	FIL90177	ELE90067	10¼	¾	8¾	5	¾	7 <sup>5</sup> / <sub>8</sub>	2	FPT
VB037	FIL90177	ELE90067	10¼	¾	8¾	5	¾	7 <sup>5</sup> / <sub>8</sub>	2	FPT
VB055	FIL90178	ELE90067	10½	1	8¾	5½	1¼	7 <sup>5</sup> / <sub>8</sub>	2½	FPT
VB075	FIL90179	ELE90068	27 <sup>5</sup> / <sub>8</sub>	3	14	18½	3	12	3	MPT
VB110	FIL90179	ELE90068	27 <sup>5</sup> / <sub>8</sub>	3	14	18½	3	12	3	MPT

# Blower Accessories Filter/Silencers And Silencers

## Inlet Filter/Silencers

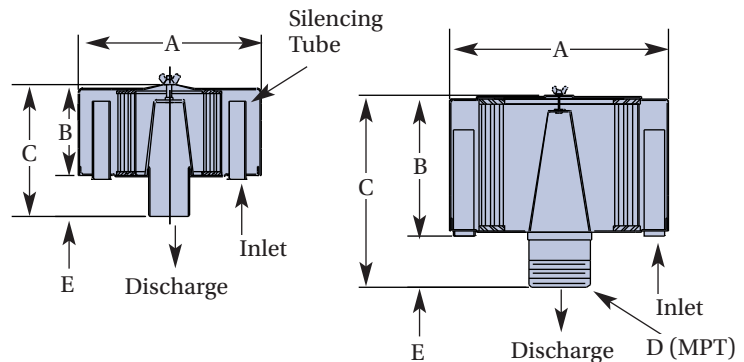
These filter/silencers combine filtration and sound absorption in one compact assembly. They have a single connection and are typically used in pressure applications. The filter elements are made with pleated paper impregnated with thermoset resin; replacement elements are available. Filtration efficiency is >99% per SAE Fine Dust Test (10 micron particles).



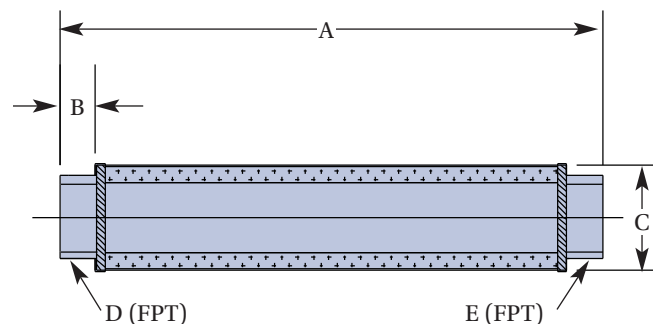
Blower Model	Inlet Filter/Sil. Part No.	Replacement Filter Element Part No.	Dimensions, inches				
			A	B	C	D	E
VB004	FSL90058	ELE90043	6.00	4.78	6.625	1¼	1.63
VB007	FSL90054	ELE90043	6.00	4.78	6.625	1½	1.63
VB019	FSL90054	ELE90043	6.00	4.78	6.625	1½	1.63
VB030	FSL90055	ELE90045	10.31	4.78	6.66	2	1.87
VB037	FSL90055	ELE90045	10.31	4.78	6.66	2	1.87
VB055	FSL90057	ELE90045	10.31	4.78	7.28	2½	2.5
VB075	FSL90056	ELE90044	10.31	10.0	12.5	3	2.5
VB110	FSL90056	ELE90044	10.31	10.0	12.5	3	2.5

## Tubular Silencers

These silencers are open-ended for connection at either or both ends. In pressure applications, they are typically used between the blower inlet and an inlet filter. In vacuum applications, they are attached to the blower discharge. The sound absorbent material is held in place by galvanized expanded metal.



Blower Model	Part No.	Dimensions, inches				
		A	B	C	D	E
VB004	SIL90124	12	.70	2.6	1¼	1¼
VB007	SIL90125	12	.70	3.1	1½	1½
VB019	SIL90125	12	.70	3.1	1½	1½
VB030	SIL90126	15¾	.70	3.63	2	2
VB037	SIL90126	15¾	.70	3.63	2	2
VB055	SIL90128	21	1.25	4.63	2½	2½
VB075	SIL90127	26	1.69	5	3	3
VB110	SIL90127	26	1.69	5	3	3



## Blower Accessories

### Gauges and Vortex Vacuum Separator

#### Pressure and Vacuum Gauges

These gauges monitor line pressure in either pressure or vacuum applications. The range is 0–200" H<sub>2</sub>O, pressure or vacuum. The dial is 2½" diameter, brass fitting is ¼" NPT.

Pressure Gauge Part No. GAG90026

Vacuum Gauge Part No. GAG90032



#### Vortex Vacuum Separator

The Vortex Vacuum separator is used with a Vortex blower to create a compact, cost-effective central vacuum system for one to three operators. This combination offers a continuous-duty system with low maintenance and high filtration efficiency.

The separator has a permanent, two-layer filter fabric suspended above a dirt can. During vacuum operation, the fabric assumes a domed shape. When the vacuum producer is shut off, the weighted fabric inverts and sheds its accumulated dirt. This simple self-cleaning technique is a Spencer exclusive.

The separator weighs 21 lb and is furnished with brackets for wall mounting.

Separator Part No. SEP90298

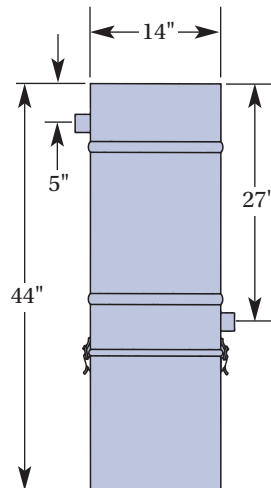


#### Filter Section

- Double filter fabric: cotton sateen liner with Dacron® cover. Part No. BVA90183
- Rugged steel construction.
- Filtration efficiency: 98.9% at 2 micron particle size.
- 2" OD tube inlet.
- Baked high-gloss enamel exterior finish.

#### Dirt Can

- Eight-gallon dirt/debris collection.
- Baked epoxy phenolic paint interior finish.
- Baked high-gloss enamel exterior finish.



## Related Products

### FastVac® Vacuum Cleaning Unit

The Spencer FastVac system is a solution to the need for a compact, cost-effective, one or two operator central vacuum system. This heavy-duty, industrially rated vacuum system is ideal for a variety of general cleaning applications. The system provides continuous-duty and quiet operation, combined with low maintenance and high filtration efficiency. It is designed for use with 15' x 1.5" diameter hose, with a maximum system length of 65 feet, at sea level conditions.

FastVac units are equipped with a Vortex® regenerative vacuum producer, two-stage separator with a cartridge filter and quick-release dirt can. The system is interconnected and mounted on a steel floor stand, ready for installation. Mobile units and optional HEPA filters are available.



Stationary Model - Shown with optional HEPA filter



Mobile Model - Shown with optional HEPA filter and hoses and tools

## Related Products Monitoring and Control Systems

Spencer makes 100% of its electrical control systems in-house. These systems can monitor and adjust blower and/or process variables at any desired level of sophistication. If a blower or process cannot be maintained within established parameters, the control system can further provide alarm and shutdown functions.

### Process automation features

To support process automation, Spencer can provide Vortex blowers with Programmable Logic Controllers and operator interface terminals.

Under PLC direction, multiple blowers can be cycled on and off or sequenced in any pattern to equalize loading or respond to process demands.

### Supervisory control and data acquisition (SCADA) systems for factory automation

Spencer blower installations can be tied into SCADA systems for central control of an entire plant. Besides supplying the central system with blower status information, the Spencer control panel can interface with existing central alarm systems. Blower set points can be established and on/off commands issued remotely, for fast response to process conditions.

### UL/CUL Listed control panels

UL Listed Spencer control panels for the U.S. market are built in accordance with UL 508A standards for industrial control panels for general use. For Canada, Spencer panels comply with the requirements of CSA Standard for Industrial Control Equipment C22.2 No. 14-M91 and bear the CUL label.

### Control system engineering and design assistance

Spencer engineers are available as a planning resource to help design new control systems that will accommodate all your desired functions.



*Simple to complex control panels are designed and built by Spencer's System Design & Control Engineering Department.*



*In-house assembly of control panel with PLC and operator interface terminal.*

## Engineering Section

### Mercury Column Values

At 70°F in equivalent inches of water, ounces and pounds per square inch.

"Hg	"Water	Ounces	psi	"Hg	"Water	Ounces	psi	"Hg	"Water	Ounces	psi	"Hg	"Water	Ounces	psi
0.1	1.36	.785		4.9	66.64	38.489		9.8	133.28	76.979		15.0	204.00	117.825	
0.2	2.72	1.571		5.0	68.00	39.275		9.9	134.64	77.764		15.1	205.36	118.610	
0.3	4.08	2.356		5.102	69.36	40.060	2½	10.0	136.00	78.550		15.2	206.72	119.396	
0.4	5.44	3.142		5.2	70.72	40.846		10.1	137.36	79.335		15.305	208.08	120.181	7½
0.5	6.80	3.927		5.3	72.08	41.631		10.204	138.72	80.121	5	15.4	209.44	120.967	
0.509	6.92	4.000	¼	5.4	73.44	42.417		10.3	140.08	80.906		15.5	210.80	121.752	
0.6	8.16	4.713		5.5	74.80	43.202		10.4	141.44	81.692		15.6	212.16	122.538	
0.7	9.52	5.498		5.602	76.16	43.988	2¾	10.5	142.80	82.477		15.7	213.52	123.323	
0.8	10.88	6.284		5.7	77.52	44.773		10.6	144.16	83.263		15.805	214.88	124.109	7¾
0.9	12.24	7.069		5.8	78.88	45.559		10.704	145.52	84.048	5¼	15.9	216.24	124.894	
1.0	13.60	7.855		5.9	80.24	46.344		10.8	146.88	84.834		16.0	217.60	125.680	
1.018	13.84	8.000	½	6.0	81.60	47.130		10.9	148.24	85.619		16.1	218.96	126.465	
1.1	14.96	8.640		6.1	82.96	47.915		11.0	149.60	86.405		16.2	220.32	127.251	
1.2	16.32	9.426		6.108	83.04	48.000	3	11.1	150.96	87.190		16.306	221.68	128.036	8
1.3	17.68	10.211		6.2	84.32	48.701		11.204	152.32	87.976	5½	16.4	223.04	128.822	
1.4	19.04	10.997		6.3	85.68	49.486		11.3	153.68	88.761		16.5	224.40	129.608	
1.5	20.40	11.782		6.4	87.04	50.272		11.4	155.04	89.547		16.6	225.76	130.394	
1.527	20.76	12.000	¾	6.5	88.40	51.057		11.5	156.40	90.332		16.7	227.12	131.180	
1.6	21.76	12.568		6.6	89.76	51.843		11.6	157.76	91.118		16.8	228.48	131.966	
1.7	23.12	13.353		6.617	89.96	52.000	3¼	11.704	159.12	91.903	5¾	16.906	229.84	132.752	8¼
1.8	24.48	14.139		6.7	91.12	52.628		11.8	160.48	92.689		17.0	231.20	133.538	
1.9	25.84	14.924		6.8	92.48	53.414		11.9	161.84	93.474		17.1	232.56	134.324	
2.0	27.20	15.710		6.9	93.84	54.199		12.0	163.20	94.260		17.2	233.92	135.110	
2.036	27.68	16.000	1	7.0	95.20	54.985		12.1	164.56	95.045		17.3	235.28	135.896	
2.1	28.56	16.495		7.1	96.56	55.770		12.2	165.92	95.831		17.406	236.64	136.682	8½
2.2	29.92	17.281		7.126	96.88	56.000	3½	12.216	166.08	96.000	6	17.5	238.00	137.468	
2.3	31.28	18.066		7.2	97.92	56.556		12.3	167.28	96.616		17.6	239.36	138.254	
2.4	32.64	18.852		7.3	99.28	57.341		12.4	168.64	97.402		17.7	240.72	139.040	
2.5	34.00	19.637		7.4	100.64	58.127		12.5	170.00	98.187		17.8	242.08	139.826	
2.545	34.60	20.000	1¼	7.5	102.00	58.912		12.6	171.36	98.973		17.906	243.44	140.612	8¾
2.6	35.36	20.423		7.6	103.36	59.698		12.7	172.72	99.758		18.0	244.80	141.398	
2.7	36.72	21.208		7.635	103.80	60.000	3¾	12.725	173.00	100.000	6¼	18.1	246.16	142.184	
2.8	38.08	21.994		7.7	104.72	60.483		12.8	174.08	100.544		18.2	247.52	142.970	
2.9	39.44	22.779		7.8	106.08	61.269		12.9	175.44	101.329		18.3	248.88	143.756	
3.0	40.80	23.565		7.9	107.44	62.054		13.0	176.80	102.115		18.324	249.12	144.000	9
3.054	41.52	24.000	1½	8.0	108.80	62.840		13.1	178.16	102.900		18.4	250.24	144.542	
3.1	42.16	24.350		8.1	110.16	63.625		13.2	179.52	103.686		18.5	251.60	145.328	
3.2	43.52	25.136		8.144	110.72	64.000	4	13.234	179.92	104.000	6½	18.6	252.96	146.114	
3.3	44.88	25.921		8.2	111.52	64.411		13.3	180.88	104.471		18.7	254.32	146.900	
3.4	46.24	26.707		8.3	112.88	65.196		13.4	182.24	105.257		18.8	255.68	147.686	
3.5	47.60	27.492		8.4	114.24	65.982		13.5	183.60	106.042		18.906	257.04	148.472	9¼
3.563	48.44	28.000	1¾	8.5	115.60	66.767		13.6	184.96	106.828		19.0	258.40	149.258	
3.6	48.96	28.278		8.6	116.96	67.553		13.7	186.32	107.613		19.1	259.76	150.044	
3.7	50.32	29.063		8.653	117.64	68.000	4¼	13.743	186.84	108.000	6¾	19.2	261.12	150.830	
3.8	51.68	29.849		8.7	118.32	68.338		13.8	187.68	108.399		19.3	262.48	151.616	
3.9	53.04	30.634		8.8	119.68	69.124		13.9	189.04	109.184		19.407	263.84	152.402	9½
4.0	54.40	31.420		8.9	121.04	69.909		14.0	190.40	109.970		19.5	265.20	153.188	
4.072	55.36	32.000	2	9.0	122.40	70.695		14.1	191.76	110.755		19.6	266.56	153.974	
4.1	55.76	32.205		9.1	123.76	71.480		14.2	193.12	111.541		19.7	267.92	154.760	
4.2	57.12	32.991		9.162	124.56	72.000	4½	14.252	193.76	112.000	7	19.8	269.28	155.546	
4.3	58.48	33.776		9.2	125.12	72.266		14.3	194.48	112.326		19.907	270.64	156.332	9¾
4.4	59.84	34.562		9.3	126.48	73.051		14.4	195.84	113.112		20.0	272.00	157.118	
4.5	61.20	35.347		9.4	127.84	73.837		14.5	197.20	113.897		20.1	273.36	157.904	
4.581	62.28	36.000	2¼	9.5	129.20	74.622		14.6	198.56	114.683		20.2	274.72	158.690	
4.6	62.56	36.133		9.6	130.56	75.408		14.7	199.92	115.468		20.3	276.08	159.476	
4.7	63.92	36.918		9.671	131.48	76.000	4¾	14.805	201.28	116.254	7¼	20.363	276.84	160.000	10
4.8	65.28	37.704		9.7	131.92	76.193		14.9	202.64	117.039					

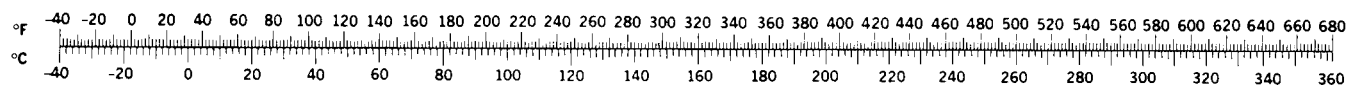
Example:

To find how many inches of mercury is equal to 3 psi, locate 3 under the psi column and read 6.108 under the inches of mercury column. A reading of 6.0 inches

on the other hand is somewhat less than 3 psi, but more than 2¾ psi.

$$\begin{aligned} ^\circ\text{F} &= \frac{9}{5}\text{C} + 32 & \text{Absolute: Rankin (R)} & \quad \text{R} = \text{F} + 460 \\ ^\circ\text{C} &= \frac{5}{9}(\text{F} - 32) & \text{Absolute: Kelvin (K)} & \quad \text{K} = \text{C} + 273 \end{aligned}$$

### Temperature Equivalents

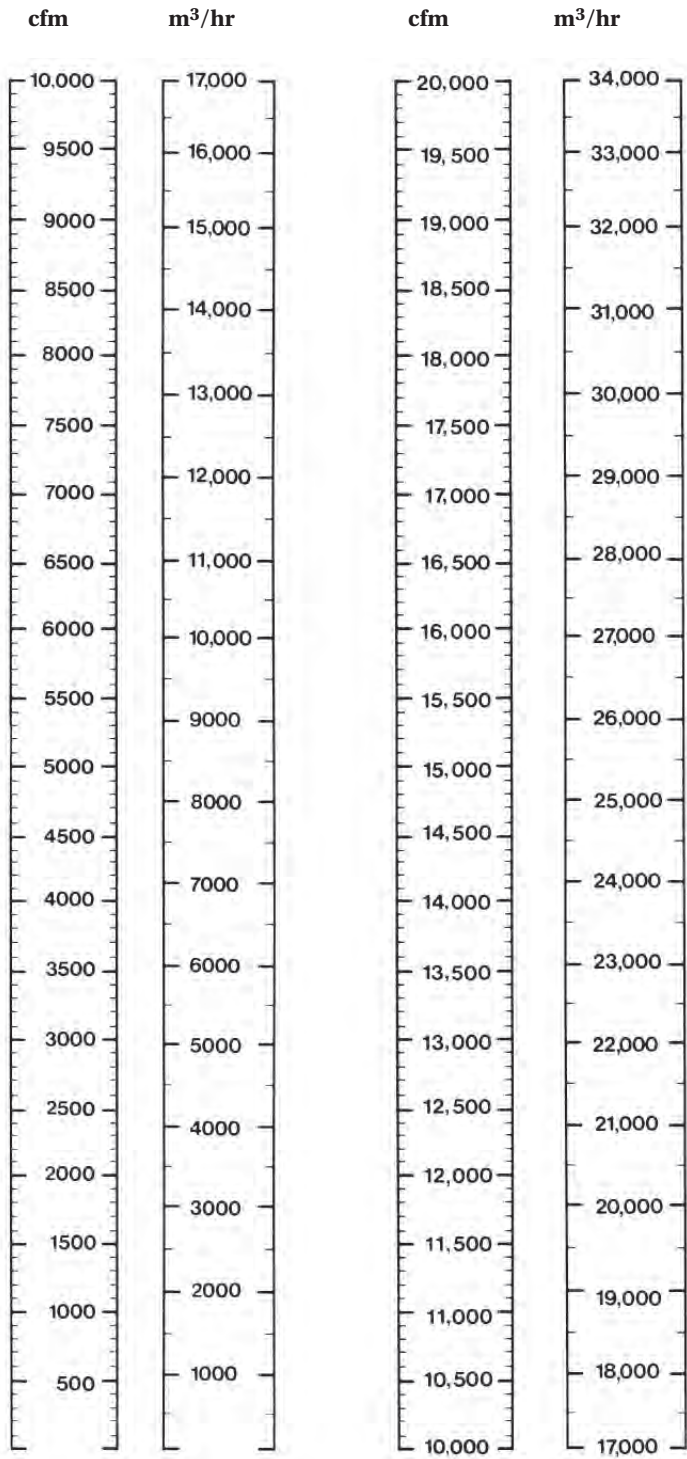


# Engineering Section

## Conversion Factors

### Volume Equivalents

Multiply	By	To Obtain
lb/in. <sup>2</sup> (psi)	2.036	"Hg
lb/in. <sup>2</sup> (psi)	27.684	"H <sub>2</sub> O
lb/in. <sup>2</sup> (psi)	5.17	cm Hg
lb/in. <sup>2</sup> (psi)	70.317	cm H <sub>2</sub> O
lb/in. <sup>2</sup> (psi)	0.0703	kg/cm <sup>2</sup>
lb/in. <sup>2</sup> (psi)	703.09	kg/m <sup>2</sup>
lb/in. <sup>2</sup> (psi)	6.84	kilo-pascals
oz/in. <sup>2</sup>	1.732	"H <sub>2</sub> O
oz/in. <sup>2</sup>	0.127	"Hg
oz/in. <sup>2</sup>	0.323	cm Hg
oz/in. <sup>2</sup>	4.394	cm H <sub>2</sub> O
"H <sub>2</sub> O	0.0735	"Hg
"H <sub>2</sub> O	0.576	oz/in. <sup>2</sup>
"H <sub>2</sub> O	0.036	lb/in. <sup>2</sup>
"H <sub>2</sub> O	2.5	cm H <sub>2</sub> O
mm H <sub>2</sub> O	1.0	kg/m <sup>2</sup>
mm Hg	7.855	oz/in. <sup>2</sup>
mm Hg	0.491	lb/in. <sup>2</sup>
mm Hg	13.58	"H <sub>2</sub> O
mm Hg	2.54	cm Hg
mm Hg	345.3	kg/m <sup>2</sup>
gal H <sub>2</sub> O	8.33	lb
gal	0.1337	ft <sup>3</sup>
ft <sup>3</sup>	7.48	gal
ft <sup>3</sup>	0.0283	m <sup>3</sup>
horsepower	746.0	watts
kilowatts	1.341	horsepower
m <sup>3</sup> /min	35.3	cfm
cfm	1.6992	m <sup>3</sup> /hr

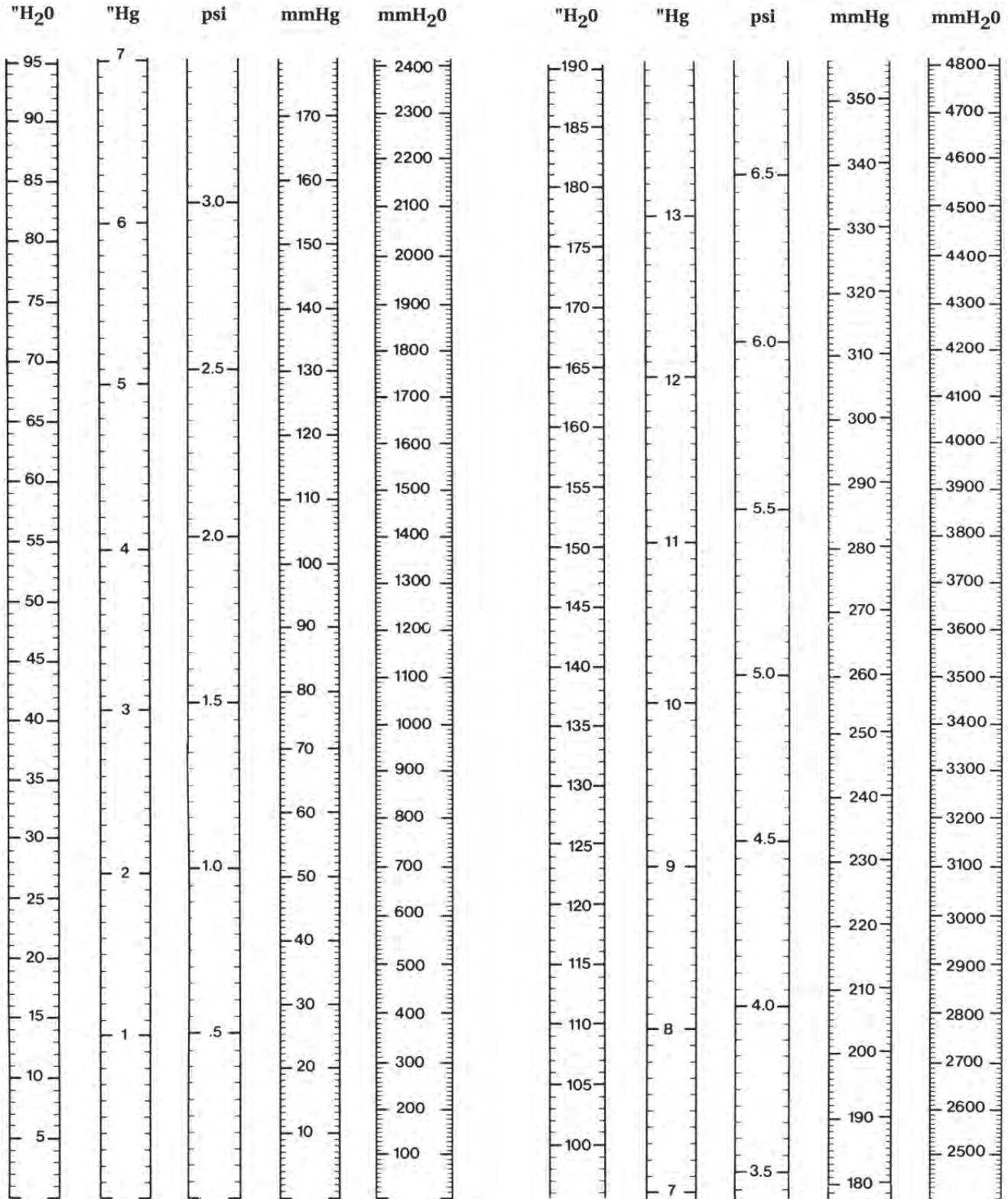


### Absolute Pressure At Altitudes Above Sea Level Based on U.S. Standard Atmosphere

Altitude Feet	Pressure "Hg	Pressure psi	Altitude Feet	Pressure "Hg	Pressure psi
0	29.92	14.70	6,500	23.53	11.56
500	29.38	14.43	7,000	23.09	11.34
600	29.28	14.38	7,500	22.65	11.12
700	29.18	14.33	8,000	22.22	10.90
800	29.07	14.28	8,500	21.80	10.70
900	28.97	14.23	9,000	21.38	10.50
1,000	28.86	14.18	9,500	20.98	10.30
1,500	28.33	13.90	10,000	20.58	10.10
2,000	27.82	13.67	10,500	20.18	9.91
2,500	27.31	13.41	11,000	19.70	9.73
3,000	26.81	13.19	11,500	19.40	9.53
3,500	26.32	12.92	12,000	19.03	9.35
4,000	25.84	12.70	12,500	18.65	9.15
4,500	25.36	12.45	13,000	18.29	8.97
5,000	24.89	12.23	13,500	17.93	8.81
5,500	24.43	12.00	14,000	17.57	8.63
6,000	23.98	11.77	14,500	17.22	8.46
			15,000	16.88	8.28

# Engineering Section Conversion Factors

## Pressure Equivalents

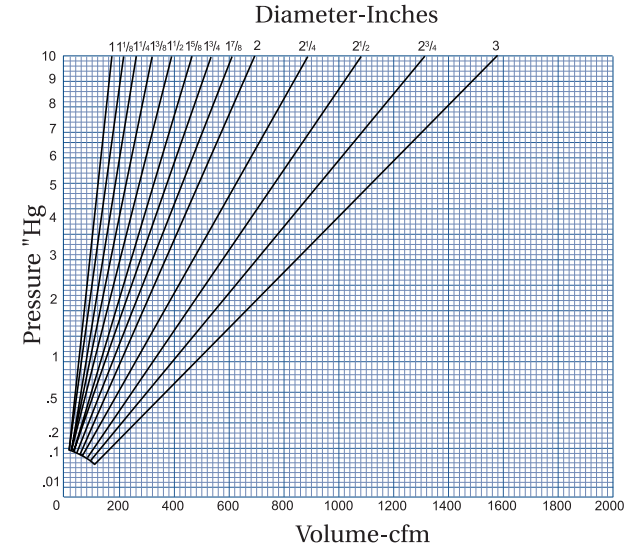
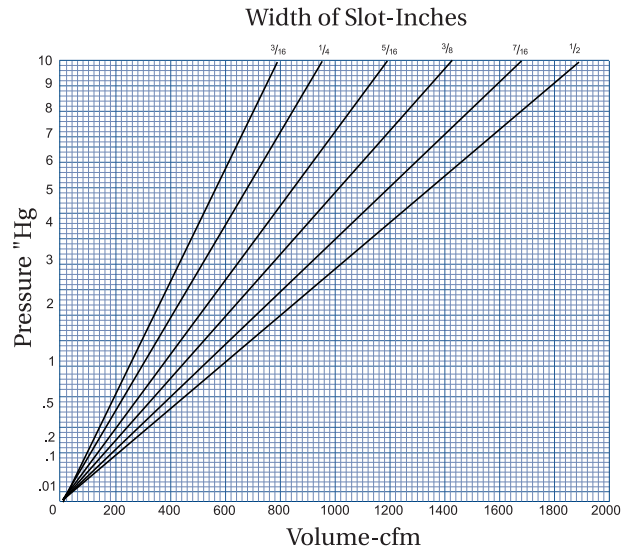
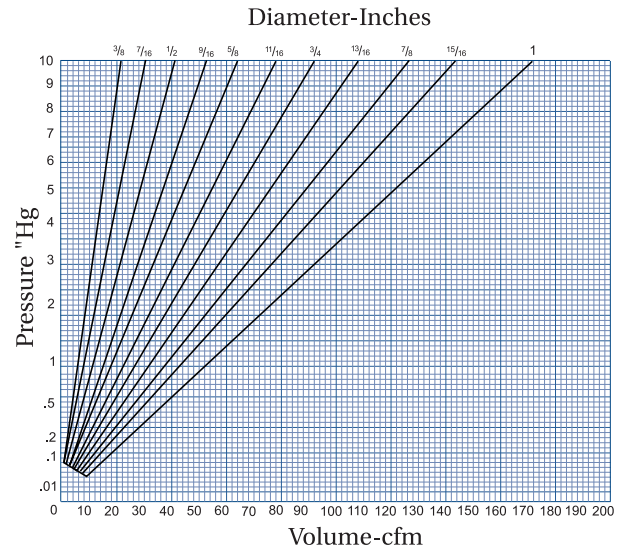
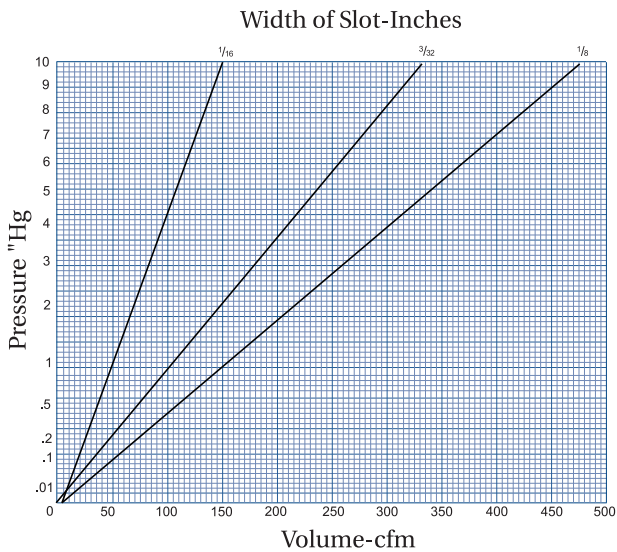
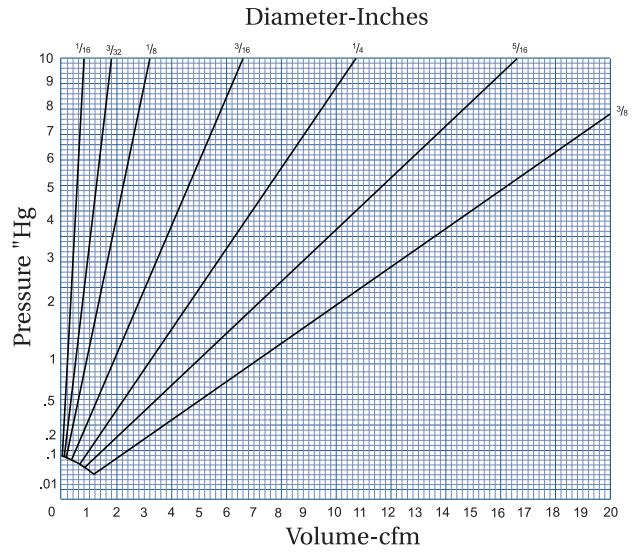


# Engineering Section

## Orifice Capacity

The graphs at the right indicate the amount of air which will pass through various sized, round, sharp-edged orifices in 1/8 inch steel plate at a given pressure.

The graphs below reflect flow through slots. Volume is given in cfm per linear foot.



# Engineering Section Friction Loss

This chart may be used to compute friction losses in a piping system. For example, determine the friction loss incurred when 70 cfm flows through a 2" pipe, 50' long.

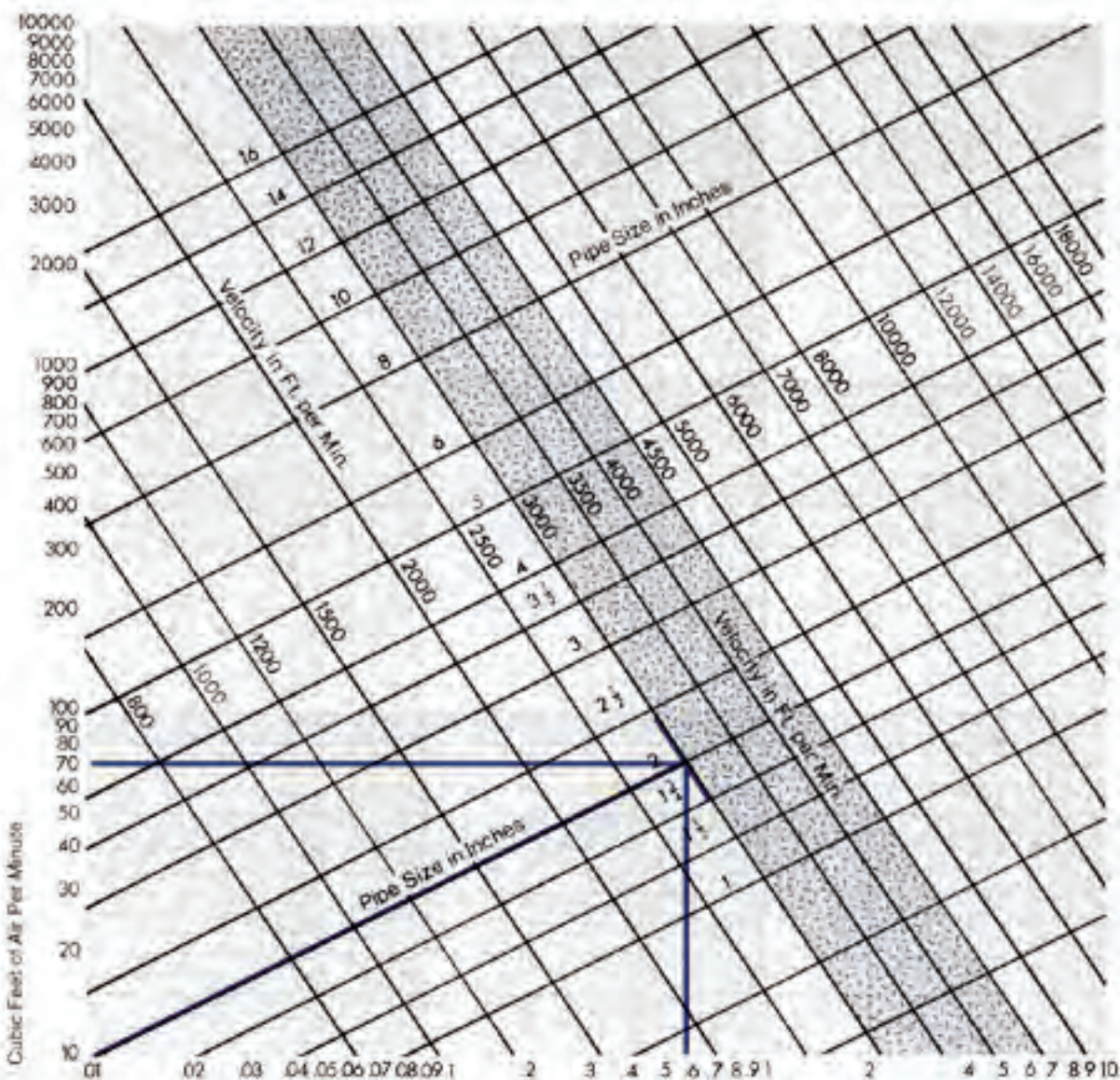
Step 1: Intersect 70 cfm and the sloping line for 2" pipe as shown.

Step 2: Drop a vertical from this point of intersection and read the loss/100' of line, in this case, .60Hg/100'.

Step 3: Multiply the loss/100' of line by the length of run/100'. The loss for 50', then, is

$$.60 \left( \frac{\text{length of run}}{100'} \right) = .60 \left( \frac{50'}{100'} \right) = 0.30" \text{ Hg.}$$

Also: Velocity in the line may be read from the negatively sloping lines on the graph. Here, to get 70 cfm through a 2" line, the air must travel at a velocity of approximately 3000 fpm.



Friction loss in "Hg per 100 ft of line with inlet air at 70°F and 14.7 psia.



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