

SELECT A FAN OR BLOWER

The instructions that follow are to assist you in completing the information required when making a fan or blower selection.

If you need additional assistance, please contact our local **Cincinnati Fan** sales engineer for your area.

To locate the **Cincinnati Fan** sales engineer for your area, go to: www.cincinnatifan.com/rep-lookup.htm

Individual product catalogs and our Engineering Data catalog can found at: www.cincinnatifan.com/product-catalogs.htm

Thank you for choosing Cincinnati Fan

Steps	How To Properly Select a Fan or Blower Explanation									
Choose fan type Centrifugal blower Axial flow fan	A centrifugal blower <i>wheel</i> draws air into the inlet of the blower housing, through the wheel, and discharges it at 90° out through the discharge of the blower housing. An axial fan uses a <i>propeller</i> to draw the air into the fan and discharges the air in the same axial direction. A centrifugal blower housing has a "scroll" whereas a axial fan is an "in-line duct type" fan or a "wall" fan. <i>Do not use an axial flow fan to convey material.</i> There is a variation of axial flow duct fan that uses a blower wheel instead of a propeller. It is referred to as a Tubular Centrifugal. <i>We do not make any tubular centrifugal fans at Cincinnati Fan.</i>									
2. Total airflow ACFM	Airflow is rated in cubic feet of air per minute (CFM) or in metric equivalent, it is rated in cubic meters per hour (M³/Hr). To convert M³ /Hr to CFM multiply your M³ /Hr x .58858 If you will be conveying material, make sure you have enough CFM for the duct, pipe or hose size so the material will maintain the required velocity to carry it completely through the system and not settle in the duct, pipe or hose. See STEP 2 on page 4.									
3. Static Pressure in. SPWG	Static Pressure is the resistance to airflow (friction) caused by the air moving through a pipe, duct, hose, filter, hood slots, air control dampers or louvers. Static pressure is rated in inches of water gauge (SPWG) or in metric equivalent, it is rated in Pascal's (Pa). This should include the pressure drop through all of the ductwork on the inlet and outlet of the fan or blower plus the pressure drop through any filters, control dampers, louvers and other system components that restrict airflow. 1 Pa = .004 inches SPWG NOTE: If the static pressure on the inlet side of a blower will exceed 15" SPWG, a correction for suction pressure (called Rarefication) should be made. See Static Pressure Corrections For Suction Pressure in STEP 3 on page 4.									

Please contact our sales office for your area if you are not comfortable with making the corrections in the following steps. They will be more than happy to assist you. http://www.cincinnatifan.com/rep-lookup.htm

4. Density @ Standard Conditions	Standard air is based on a temperature of 70° F., 29.92" barometric pressure and .075 pounds per cubic foot. Density changes resulting from temperature and/or barometric pressure variations, such as higher altitudes, must be corrected to standard conditions before selecting a fan or blower based on standard performance data. If your density is in kilograms per cubic meter (kg/m³), make the following correction: 1 kg/m³ = .0624 lb/ft³
5. Air Temperature ° F° F <i>to</i> ° F	The temperature of the air going <i>through the fan or blower</i> will affect the performance of the fan or blower. Temperature should be shown in degrees Fahrenheit (\mathbf{F}). Make the following correction for degrees Centigrade (C). $^{\circ}\mathbf{F} = 1.8 \text{ x }^{\circ}\mathbf{C} + 32$ If the air temperature will vary, what are the minimum and maximum temperatures in degrees F?
6. Altitude Feet above sea level	The altitude the fan or blower will be operating at will also affect the performance of the fan or blower. The altitude should be given in feet above sea level.

Continue onto next page for Steps 7, 8 and 9 regarding Fan or Blower Construction.

Special Conditions That May Affect A Fan Or Blower Construction 7. Material Handling Will you be conveying any material through the fan or blower or will it be clean air? ☐ YES ☐ NO Clean air? (If YES, move on to Step 8 below). TYFS TNO Dirty air? (Only a fan or blower with a Radial type wheel should be used) If dirty air, the four models below come with radial type wheels: Model PB Cast Aluminum Blowers at: www.cincinnatifan.com/centrifugal-pb.htm Model PBS Fabricated Steel Blowers at: www.cincinnatifan.com/centrifugal-pbs.htm Model SPB Die Formed Steel Blowers at: www.cincinnatifan.com/centrifugal-spb.htm Model RBE Radial Blade Exhauster at: www.cincinnatifan.com/centrifugal-rbe.htm \square G □Р If dirty, is material granular (G) or powdery (P)? (A Shrouded or Non-Shrouded Radial wheel can be used) ☐ YES ☐ NO If dirty, is material long and stringy like paper trim or fibers? (Use only a Non-Shrouded Radial wheel) ☐ YES ☐ NO For any material, will the material be wet or moist? ☐ YES ☐ NO For any material, will the material be dry? lbs./cu ft. If conveying material, what is the weight of the material in *pounds per cubic foot*? lbs./hr. If conveying material, how many pounds will you be conveying in *pounds per hour?* 8. Ambient Temperature The ambient temperature is the temperature of the air *outside the fan or blower*. This can affect the operation of the motor and the fan bearings and/or belts for any belt driven fans or blowers. _° F. _° F *to* ____° F If the outside air temperature will vary, what are the minimum and maximum temperatures in degrees F? 9. Safety Conditions Is there anything going through the fan or blower *or* outside the fan or blower that is explosive and/or flammable? ☐ YES ☐ NO Will the <u>airstream</u> of the fan or blower be explosive or flammable? ☐ YES ☐ NO Will the area outside the fan or blower be explosive or flammable? Class: _____ If you checked YES for either of the above, what Class and Groups of Explosion Proof (EXP) motor will you require? Groups: _____ If you checked YES for either of the above, what AMCA Type spark resistant construction will you AMCA Type:

WARNING

require? (AMCA Type A, B or C?)

All fans and blowers have rotating parts and pinch points. Severe personal injury can result if operated without OSHA required guards. Stay away from rotating equipment unless it is disconnected or properly locked out from it's power source. Read all operating instructions prior to installing, inspecting, moving, performing maintenance or operating any fan or blower equipment.

STEP 2. Total Airflow (CFM):

Selecting the proper airflow (CFM) for your system can be very critical. If you will be exhausting contaminated air such as engine exhaust fumes, not having enough CFM can lead to asphyxiation and even an explosion. If you will be conveying material such as wood chips, too low a CFM will allow the chips to settle somewhere in the system thus clogging the duct, pipe or hose. That leads to down time to disassemble the ducting to clean it out. Too much CFM can cause a blow out in the system. The correct CFM must take the material conveying velocity into consideration for the material you are wanting to move to another location.

SCFM and ACFM (SCFM and ACFM are not interchangeable)

SCFM stands for Standard Cubic Feet per Minute. It is the <u>total</u> CFM at standard density conditions. These are the CFM values typically listed in fan manufacturers catalogs.

ACFM stands for Actual Cubic Feet per Minute. It is the mass flow rate divided by the density of the air or gas being moved. Since fans and blowers handle the same volume of air at any density, the ACFM value should be used when selecting a fan or blower.

The total airflow (SCFM) should also meet or exceed the minimum CFM required by any regulating authorities for the application. This sometimes only requires you to meet the minimum CFM as recommended by a "standards" organization.

If you are not sure how much CFM will be required for your specific application, do not hesitate to contact our **Cincinnati Fan** sales engineer for your area. They will be very happy to assist you in making the correct sizing recommendation for your system. You can locate our local sales office for your area by going to:

www.cincinnatifan.com/rep-lookup.htm

STEP 3. Static Pressure (SP):

The **Total Static Pressure** for your system must include the static pressure of the total airflow (CFM) moving through the entire system. This should include the static pressure of the CFM going through ducting, piping, hose, filters, hood slots, airflow control dampers and louvers. To select the correct static pressure through smooth wall pipe or duct you will need to refer to pages 11 and 12 in the: **Cincinnati Fan Engineering Data catalog.**

It will show you the friction loss <u>per 100 feet</u> of duct or pipe for the total CFM for your system. Now, add the additional static pressure loss for any dampers, filters, etc. for the **Total Static Pressure**.

Static Pressure Correction For Suction Pressure:

When a large amount of static pressure is on the inlet of a blower, it requires additional suction to move the air. That is because it is easier to blow air than it is to suck air. This is called *Rarefication*. If you have more than 15" SP on the blower inlet, you need to correct I for suction pressure per the chart below. If you also have to make corrections for altitude and/or temperature, make them first and then correct for Rarefication.

Other Static Pressure Estimating Factors:

- 1. For flexible hose, use 2-3 times the pressure drop for smooth wall duct or pipe.
- Each 90° elbow is equal to 10 feet of straight duct or pipe.Example:

125 feet of straight pipe + 2: 90° elbows = 145 feet of straight pipe

The Cincinnati Fan Engineering Data catalog will also provide you with very helpful recommendations for material conveying, air changes required for good ventilation, velocities for exhaust hoods, and guidelines for good duct installations.

STATIC PRESSURE CORRECTIONS FOR SUCTION PRESSURE

Based on standard air at 70° F, 29.92" Hg Barometric Pressure, .075 lbs. Per cubic feet density.

Suction	Corrected	Suction	Corrected
Pressure	Static	Pressure	Static
in Inches W.G.	Pressure	in Inches W.G.	Pressure
16	16.6	33	35.9
17	17.7	34	37.1
18	18.8	35	38.5
19	20.1	36	39.5
20	21.1	37	40.8
21	22.2	38	41.9
22	23.3	39	43.0
23	24.3	40	44.4
24	25.5	41	45.9
25	26.8	42	46.8
26	27.8	43	48.1
27	28.9	44	49.3
28	30.1	45	50.3
29	31.6	46	51.9
30	32.4	47	53.4
31	33.7	48	54.4
32	34.7	49	55.7

Suction	Corrected	Suction	Corrected				
Pressure	Static	Pressure	Static				
in Inches W.G.	Pressure	in Inches W.G.	Pressure				
50	57.0	67	79.7				
51	57.9	68	82.3				
52	60.0	69	83.5				
53	61.2	70	84.7				
54	62.3	71	85.9				
55	63.5	72	87.1				
56	64.6	73	88.3				
57	65.8	74	91.0				
58	68.0	75	92.3				
59	69.1	76	93.5				
60	70.3	77	94.7				
61	71.5	78	95.9				
62	72.7	79	98.8				
63	75.0	80	100.0				
64	76.2	81	101.2				
65	77.4	82	102.6				
66	78.5	83	104.3				

NOTE:

- 1. With 45" of suction pressure on the blower inlet and no discharge pressure on the blower discharge, youtotal static pressure = 50.3" Total SPWG.
- 2. With 45" of suction pressure on the blower inlet and 12" of discharge pressure on the discharge, yourtotal static pressure = 50.3"+12" = 62.3" Total SPWG.
- 3. With 0" of suction pressure on the blower inlet and 12" of discharge pressure on the blower discharge, yourtotal static pressure = 12" Total SPWG. There is no correction required for discharge pressure.

STEP 4. Corrections For Altitude and Temperature:

Fan performance tables are developed using standard air which is 70° F., 29.92" barometric pressure (at sea level) and .075 lbs. per cubic foot. Density changes resulting from temperature and/or barometric pressure variations (at higher altitudes) must be corrected to standard conditions before selecting a fan or blower based on standard performance data. Temperature and/or altitude conversion factors are used in making the corrections to standard conditions. *Example:*

For this example, we will be selecting a Model PB, cast aluminum pressure blower. You need to select a blower to deliver 1500 CFM at 7" SP at 250° F, and at 6500 feet altitude.

- STEP 1. From the table below, the conversion factor for 250° and 6500 ft. altitude is 1.71.
- STEP 2. The correct static pressure is: 1.71 x 7" SP = 11.97" SP at standard conditions. Round off to 12" SP.
- STEP 3. Check the Model PB blower catalog for 1500 CFM at 12" SP. We select a direct driven model PB-15A with an 8" inlet and a 16½" x 4¾" BC wheel. The BHP at standard conditions is 4.99.
- STEP 4. We need to correct the BHP for the lighter air:
 4.99 ÷ 1.71 = 2.92 BHP at 250° and 6500 ft..
 A 3 HP motor will suffice at 250° and 6500 ft., but not at standard conditions. Special motor insulation may be required above 3500 feet altitude.

NOTE: If you will be starting the blower at standard room temperature, you need to run the calculations for 6500 feet altitude but at both 70° F. and at 250° F. to determine the minimum HP motor you will need at 70° F. Failure to complete both calculations could result in a non-warranty motor failure.

Safe Operating Speeds:

When a blower or fan will be moving air at temperatures substantially above 70° F, the safe operating speed of the blower wheel or fan propeller must be taken into consideration. Most metals become characteristically weaker at higher temperatures. There are maximum operating temperatures listed in suppliers catalogs for various blowers and fan types. The wheel or propeller speeds shown are the maximum for that blower or fan construction.

Bearings:

The weakest part of a fan or blower is the bearing system, whether in a pillow block design on belt driven fans or located within the motor on direct driven fans. Temperatures above the fans maximum operating range can break down the lubricant in the bearings and cause bearing failure. The location of the bearings on a fan or blower must be considered when moving high temperature air. Fans with bearings located in the air stream have lower temperature limitations. Fans or blowers with bearings outside the air stream have higher temperature limitations. Tube axial fans can handle higher temperatures when there is a bearing-belt tube installed in the air stream to isolate and protect the bearings. With the addition of a shaft cooler wheel (heat slinger), a blowers maximum temperature limit can be extended. The heat slinger absorbs heat from the blower shaft while circulating air over the inboard bearing to keep it cool.

Motors:

Standard motors are typically rated up to 40° C (104° F) and up to 3300 feet altitude. As operating temperatures and/or altitudes are increased, special winding insulation and/or special high temperature bearing grease may be required. Consult our Cincinnati Fan sales engineer for your area to ensure the motor you specify will operate correctly for your specific application.

NOTE: Temperatures below 15° F or above 250° F may require special low temperature or high temperature grease.

TEMPERATURE & ALTITUDE CONVERSION FACTORS

Air Temp.	Altitude In Feet Above Sea Level																					
Deg. F.	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	10000	11000	12000
-50°	.77	.79	.80	.81	.83	.85	.86	.88	.89	.91	.92	.94	.96	.98	1.00	1.02	1.04	1.06	1.08	1.12	1.16	1.21
-25°	.82	.84	.85	.87	.89	.91	.92	.94	.95	.97	.98	1.01	1.03	1.05	1.07	1.09	1.11	1.13	1.15	1.20	1.24	1.29
0°	.87	.89	.91	.92	.94	.96	.98	.99	1.01	1.03	1.05	1.06	1.09	1.10	1.13	1.15	1.17	1.19	1.22	1.26	1.31	1.37
40°	.94	.96	.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.19	1.21	1.23	1.26	1.28	1.30	1.32	1.36	1.41	1.47
70°	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.18	1.20	1.22	1.25	1.27	1.30	1.32	1.35	1.37	1.40	1.45	1.51	1.57
80°	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.19	1.21	1.23	1.26	1.28	1.30	1.33	1.36	1.38	1.41	1.43	1.48	1.56	1.61
100°	1.06	1.08	1.10	1.12	1.14	1.16	1.19	1.21	1.23	1.25	1.28	1.30	1.33	1.35	1.38	1.41	1.43	1.46	1.48	1.54	1.60	1.66
120°	1.09	1.12	1.14	1.16	1.18	1.20	1.23	1.25	1.28	1.30	1.32	1.35	1.38	1.40	1.43	1.46	1.48	1.51	1.53	1.58	1.66	1.72
140°	1.13	1.15	1.18	1.20	1.22	1.25	1.27	1.29	1.32	1.34	1.37	1.40	1.42	1.45	1.48	1.51	1.54	1.57	1.58	1.65	1.72	1.78
160°	1.17	1.19	1.22	1.24	1.26	1.29	1.31	1.34	1.36	1.39	1.42	1.44	1.47	1.50	1.53	1.56	1.59	1.62	1.64	1.70	1.78	1.84
180°	1.21	1.23	1.26	1.28	1.30	1.33	1.36	1.38	1.41	1.43	1.46	1.49	1.52	1.55	1.58	1.61	1.64	1.67	1.70	1.75	1.84	1.90
200°	1.25	1.27	1.29	1.32	1.34	1.37	1.40	1.42	1.45	1.48	1.51	1.54	1.57	1.60	1.63	1.66	1.69	1.72	1.75	1.81	1.89	1.96
250°	1.34	1.36	1.39	1.42	1.45	1.47	1.50	1.53	1.56	1.59	1.62	1.65	1.68	1.71	1.74	1.78	1.82	1.85	1.88	1.94	2.02	2.10
300°	1.43	1.46	1.49	1.52	1.55	1.58	1.61	1.64	1.67	1.70	1.74	1.77	1.80	1.84	1.87	1.91	1.94	1.98	2.00	2.08	2.16	2.25
350°	1.53	1.56	1.59	1.62	1.65	1.68	1.72	1.75	1.78	1.81	1.85	1.88	1.92	1.96	2.00	2.04	2.07	2.11	2.14	2.22	2.31	2.40
400°	1.62	1.65	1.69	1.72	1.75	1.79	1.82	1.85	1.89	1.93	1.96	2.00	2.04	2.08	2.12	2.16	2.20	2.25	2.27	2.35	2.47	2.55
450°	1.72	1.75	1.79	1.82	1.86	1.89	1.93	1.96	2.00	2.04	2.08	2.12	2.16	2.20	2.24	2.29	2.33	2.38	2.41	2.50	2.61	2.70
500°	1.81	1.85	1.88	1.92	1.96	1.99	2.03	2.07	2.11	2.15	2.19	2.23	2.28	2.32	2.36	2.41	2.46	2.51	2.54	2.62	2.75	2.85
550°	1.91	1.94	1.98	2.02	2.06	2.10	2.14	2.18	2.22	2.26	2.30	2.35	2.40	2.44	2.49	2.54	2.58	2.63	2.68	2.77	2.90	3.00
600°	2.00	2.04	2.08	2.12	2.16	2.20	2.24	2.29	2.33	2.38	2.42	2.47	2.50	2.56	2.61	2.66	2.71	2.77	2.80	2.90	3.04	3.14
650°	2.10	2.14	2.18	2.22	2.26	2.31	2.35	2.40	2.44	2.49	2.54	2.58	2.63	2.68	2.74	2.79	2.84	2.90	2.94	3.04	3.19	3.30
700°	2.19	2.23	2.27	2.32	2.36	2.41	2.46	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.86	2.91	2.97	3.03	3.06	3.18	3.33	3.44
750°	2.28	2.33	2.37	2.42	2.47	2.51	2.56	2.61	2.66	2.71	2.76	2.81	2.87	2.92	2.98	3.04	3.10	3.16	3.19	3.31	3.47	3.59
800°	2.38	2.43	2.48	2.53	2.57	2.62	2.67	2.72	2.76	2.81	2.86	2.92	2.98	3.04	3.10	3.16	3.22	3.28	3.33	3.45	3.60	3.74