



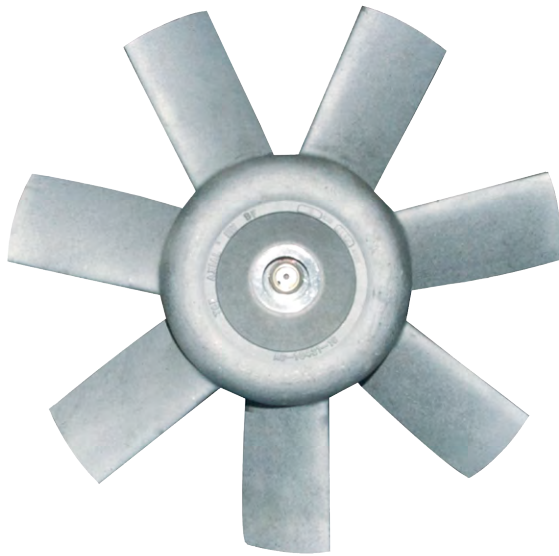
INDUSTRIAL PROCESS AND  
COMMERCIAL VENTILATION SYSTEMS

# AXIFAN® VANEAXIAL FANS

MODEL TCVA



# VANEAXIAL FANS



AXIFAN Cast Aluminum Wheel

## Model TCVA

The heart of the TCVA AXIFAN® fan lies in its wheel. Cast of high strength aluminum alloy, the one-piece TCVA AXIFAN® wheel has been developed to maximize the highest efficiency possible. Attention to detail in blade and hub design have created what is felt to be the most efficient and reliable axial fan on the market today. With the wide range of hub-to-tip ratios available, there is a TCVA AXIFAN® to meet any air movement requirements.

### Hub-To-Tip Ratio

The multitude of TCVA AXIFAN® wheels evolves from nine basic castings. Each casting is machined and cut to the proper diameter. By cutting the same model casting to one of several different diameters, different hub-to-tip ratios are created. Since each hub ratio has slightly different pressure/efficiency characteristics, the freedom of having several wheels (different hub ratios) for a set diameter provides the opportunity to maximize efficiency at the required point of rating.

### Housing

TCVA AXIFAN® housings are one-piece, heavy-gauge, hot-rolled steel construction. Flanges on both the inlet and outlet are integrally rolled and punched for attachment to ductwork or accessories as necessary. The sheet seam is continuously welded and ground smooth to assure efficient airflow through the housing. On Arrangement 4 direct drive units neither the wheel nor the motor protrudes beyond the housing, allowing for an easy mount into existing ductwork.

### Guide Vanes

The fan housing is fitted with aerodynamically designed stationary straightening guide vanes on the air discharge side of the wheel. The guide vanes are welded to both the inner cylinder and the fan housing interior and function to aid in the elimination of swirl and turbulence downstream of the fan thereby recovering rotational energy losses, improving efficiency and static pressure capability, and reducing fan noise generation.

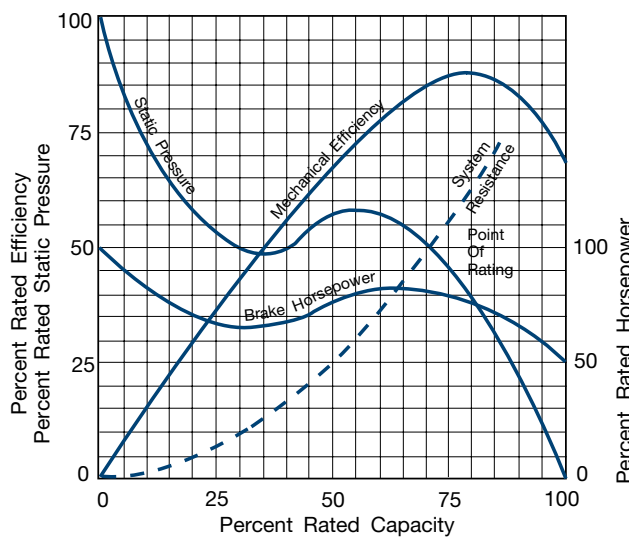
### Sizes

12" to 60" inch wheel diameters

### Performance

Airflow to 103,000 CFM  
Static pressure to 7" w.g.

### Typical Performance/System Curve For Direct Drive TCVA AXIFAN®



Twin City Fan & Blower certifies that the model TCVA AXIFANS® shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.



Model TCVA is available with the UL/cUL 705 listing for electrical, File No. E158680.

## Arrangement 9 Belt Driven

For applications that require the motor to be out of the airstream or the versatility of a belt driven fan, the Arrangement 9 TCVA AXIFAN® is the perfect choice. Driven through either a fixed or adjustable V-belt drive system, the exact point of rating can be achieved. Any future change in rating can be accomplished through a simple sheave change. Good for operation up to 200°F as standard, the Arrangement 9 TCVA AXIFAN® can be customized to handle even the most severe of conditions. Performance tables for belt driven TCVA AXIFAN® units are located on pages 10 through 18. Selection examples are found on page 8.

### Shaft and Bearings/Inner Cylinder

Shafts for belt driven TCVA AXIFAN® units are ground and polished steel construction machined to a suitable diameter to allow the rotating assembly to operate well below the first critical speed.

Bearings are flange mounted ball or roller type selected for a minimum average life of 200,000 hours. Bearing life is determined in accordance with standards set forth by AFBMA (Anti-Friction Bearing Manufacturers Association). All bearings are provided with extended lubrication lines terminating at the housing exterior.

The complete shaft and bearing assembly is mounted within the inner cylinder, safely isolating these components from the high velocity airstream.

### Belt Fairing

The V-belt drive assembly is extended through a two-piece belt fairing. The belt fairing is an aerodynamically designed tube, welded continuously to both the inner cylinder (bearing housing) and the fan housing, thus protecting the V-belts from the direct blast of the airstream.

### Motor

Motors for TCVA AXIFAN® Arrangement 9 fans are standard foot-mounted NEMA design. All of the various enclosures (open drip-proof, totally enclosed, explosion proof, etc.) can be accommodated through the use of an adjustable motor base. This motor mounting platform pivots at several locations to offer infinite adjustment for belt tension.

## Arrangement 4 Direct Drive

Where space constraints require the use of a complete "in line" fan or the desire is for a simple, dependable fan with minimum maintenance requirements, the direct drive Arrangement 4 TCVA AXIFAN® is the logical choice. Constructed with the fan wheel mounted directly on the motor shaft, this fan provides premium efficiency with minimal obstructions in the airstream. Performance tables for direct drive TCVA AXIFAN® units are located on pages 19 and 20.



TCVA Arr. 9



TCVA Arr. 4

### Motor

Motors for TCVA AXIFAN® direct drive fans are foot-mounted, NEMA standard, totally enclosed fan cooled (TEFC), continuous duty, ball bearing type with Class "F" insulation and of cast iron construction when commercially available. Motors which are equipped with grease lubricated bearings have extended lube lines to the housing exterior. For ease of wiring the motor, wiring connections are extended to an external conduit box mounted on the fan exterior. The fan housing exterior has a duplicate motor nameplate mounted adjacent to the fan nameplate.



Inlet Bell



Inlet/Outlet Cones



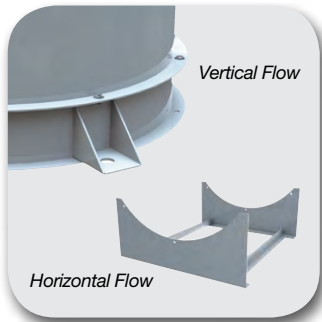
Companion Flanges



Variable Inlet Vanes



Sound Attenuation



Support Legs



Suspension Clips



Vibration Isolation

## Inlet Bell

For systems with no ductwork on the fan inlet, it is advantageous to install an inlet bell to avoid inlet losses. The inlet bell is a toroidal shape to provide a smooth entrance to the fan. Inlet bells are flanged, drilled, and bolted to the fan's flanged inlet.

## Inlet/Outlet Cones

Transition pieces, called cones, can be provided for both the inlet and outlet. Cones are flanged on both ends and drilled to match the fan's flange. Cones are available with an access door if required.

Outlet cones can be utilized to provide static pressure regain, transforming velocity pressure losses into static pressure. A greater discussion of this is provided on page 7.

## Companion Flanges

For ease of installation to adjacent ductwork, companion flanges can be provided. Flanges are rolled angle rings, drilled to match the fan's inlet or outlet flange.

## Variable Inlet Vanes

For frequent or continuous volume control, variable inlet vanes can be provided. Variable inlet vanes are available for each specific fan size and are bolted to the fan's flanged inlet. The vane action during dampening works to spin the air in the direction of the wheel rotation thus resulting in lower power consumption. The vane operator mechanism is outside of the airstream and is controlled by a single lever.

Variable inlet vanes can be set up for manual or automatic operation. The variable inlet vane's inlet is flanged and drilled to accept ductwork or an inlet bell as the system requires.

## Sound Attenuation

For applications requiring quiet operation, custom built attenuation packages can be provided on the fan inlet or outlet. Attenuators are aerodynamically and acoustically matched to the specific system requirements and are designed to significantly reduce noise while adding only minor resistance to airflow.

## Support Legs

**Horizontal Flow** — For horizontal flow with floor mounting, support legs are welded to the fan flange with bolt holes aligned for connection of ductwork.

**Vertical Flow** — For vertical flow with either floor or ceiling mounting, support legs are welded to the fan housing for four-point support.

## Suspension Clips

For horizontal flow with ceiling mounting, clips of formed angle are welded to the fan housing for suspension via tie rods to the ceiling support structure.

## Vibration Isolation

All TCVA AXIFAN® fans can be provided with spring or rubber-in-shear isolators as an option. Spring isolators are standard 1-inch in deflection and can be provided for floor mount or ceiling (hung) orientation. It should be noted that use of a loosely fitting flex connector on the fan inlet must be avoided as inlet obstructions and loss of rating may occur.

## Belt Guard

Available for Arrangement 9 belt driven fans, the belt guard encloses the motor sheave and V-belts. The guard is easily removable for inspection and maintenance.

## Weather Cover

For outdoor installations with Arrangement 9 belt driven fans, the weather cover completely encloses the motor and V-belt drive from the elements. Provided with slots for ventilation, the cover is easily removable for inspection and maintenance. Weather covers are available for either horizontal or vertical flow fans.

## Screening

Safety screening can be provided for installation to the fan inlet, fan outlet, cone or bell.

## Clamshell Construction

Clamshell construction provides complete accessibility to the internal components of the fan. A further description is available on page 6.

## Shaft Seal

To limit the air entering the inner cylinder and avoid contact of airstream contaminants with the bearing and V-belt drive, a shaft seal can be provided. The shaft seal consists of a non-asbestos rubbing ring at the wheel end of the inner cylinder held in place by a cover plate. Please note that a shaft seal does not make the inner cylinder gas-tight.

## Housing Door

**General Observation** — For inspection and maintenance of the internal section (V-belt drive area) of TCVA AXIFAN® units a general observation access door can be provided. Doors are 5" x 5" for fans sizes 12" to 18" and 8" x 8" for all others. Doors are gasketed, single skinned and bolted in place to the housing exterior. As standard, doors are located adjacent to the motor base (for belt driven fans) or adjacent to the motor conduit box (for direct drive).

**Wheel Area** — Similar in size and attachment to the general observation access door, a wheel area access door is also available. Wheel area doors differ from general observation doors in that they are double skinned to maintain a flush surface to the housing interior, thus eliminating the pressure losses resulting from a single skinned door in this critical pressure developing area.

## Spark-Resistant Construction

Belt driven TCVA AXIFAN® units are available with spark-resistant construction. Various grades of spark resistance are as dictated by AMCA, Types A, B, and C.

## Discharge Cap

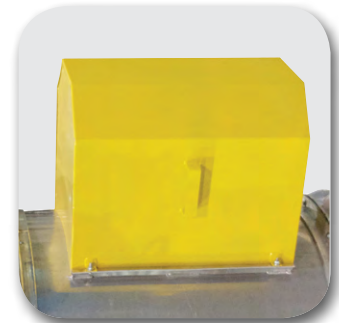
All TCVA AXIFAN® units can be provided with a discharge cap for rooftop mounting. Discharge caps are designed for vertical discharge with a backdraft damper to seal out the weather when the fan is shut off. See minimum CFM requirements on page 9.

## Curb Cap

TCVA AXIFAN® units can be supplied with a base (curb cap), to attach to the fan flange for curb mounting. The combination of a curb cap and discharge cap creates an upblast style, power roof ventilator (see page 6 for further explanation).



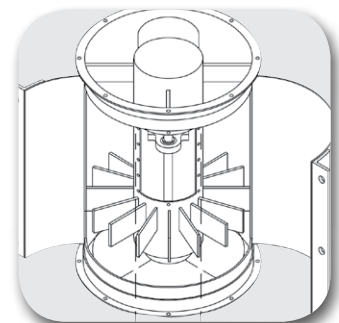
Belt Guard



Weather Cover



Screening



Clamshell Construction



Shaft Seal



Housing Door



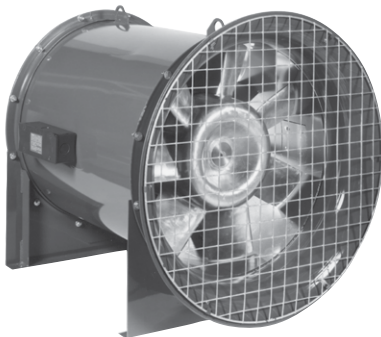
Discharge Cap



Curb Cap



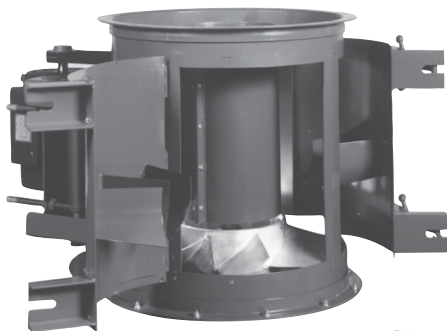
Ventilation



Industrial Process



Upblast Style Power  
Roof Ventilator



Clamshell

## Ventilation

Whether duct mounted or provided with an inlet bell for open inlets, the TCVA AXIFAN® is the logical choice for almost any ventilating system. Available as either a supply or return fan, the magnitude of fan/wheel combinations to choose from insures the user of a high efficient, economical, quiet, long-running fan.

## Industrial Process

Designed for rugged industrial service, the TCVA AXIFAN® is an ideal component for most industrial air systems. The heavy duty housing construction and large diameter shaft/bearing combinations can handle the toughest of airstreams.

## Upblast Style Power Roof Ventilator

Fitted with a discharge cap, curb cap, and a weather cover, the TCVA AXIFAN® makes an ideal upblast style power roof ventilator. The broad band high efficiency range makes this fan ideal for installation both with and without ductwork attached.

## Clamshell

For tough industrial systems requiring frequent cleaning and maintenance with a minimal degree of downtime, the clamshell construction TCVA AXIFAN® is the right fan for the job. Manufactured with two large doors running the full length of the fan housing and opening 180°, the clamshell fan unit provides complete accessibility to the shaft, bearings, V-belt drive and wheel assembly, all without removal of any ductwork.



## The Fan Rating

A fan's point of rating is the intersection of the independent system resistance curve and the fan's characteristic performance curve (refer to page 2 for a typical performance/system curve).

The resistance of the system is determined from the airflow requirements and the ductwork elements through which this airflow must pass. This ductwork creates resistance to flow and is measured in terms of pressure.

The total resistance for a system is the sum of the "total system resistances" at the specified flow rate (CFM) for each of the elements found in the system. This value is the total pressure for which a fan is selected.

## The Total Pressure Concept

Fans are utilized to develop the total pressure required to produce the specified flow rate within a system. Total pressure can be separated into the components of static pressure (analogous to the potential energy of the airstream) and velocity pressure (analogous to the kinetic energy of the airstream) at any point within the system; where total pressure is equal to the sum of the static pressure and velocity pressure (refer to formulas on page 8).

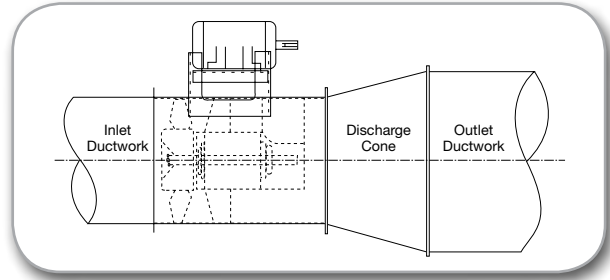
It is a common industry practice to specify a system resistance in terms of static pressure. This system static pressure value is obtained by subtracting the velocity pressure from the system total pressure.

This velocity pressure is calculated based on the velocity of the specified airflow at the designated cross-sectional area.

TCVA AXIFAN® ratings are established from tests with the data corrected to the cross-sectional area of the fan outlet. It is important to note that to maintain accuracy the specified system static pressure should be calculated at the same cross-sectional area as that of the fan outlet.

If the system does not have a cross-sectional area the same as the fan outlet, the true static pressure capability of the fan will be greater or less than the cataloged rating. This is due to a portion of the velocity pressure being converted to (or from) static pressure, with the total pressure remaining constant.

Due to industry preferences, TCVA AXIFAN® ratings are displayed in this catalog in static pressure (at the fan outlet area) only. In order to properly rate axial flow fans on a static pressure basis, the system cross-sectional area must be considered and the total pressure concept should be used.



## Use of an Outlet Cone

As displayed above, fan outlet cones can be utilized to transition an axial fan to ductwork with a diameter larger than that of the fan. A cone of this type allows for the same quantity of air (CFM) to efficiently reduce the velocity of the airstream at the fan outlet to that of the cone outlet, thus converting or regaining much of the velocity pressure to static pressure. This velocity pressure is said to be static pressure regained. The advantage of using an outlet cone is that a system that requires 1.5" of static pressure to overcome the duct friction losses may be able to use a fan supplying 1.25" static pressure at the fan outlet with the additional 0.25" being produced by the static pressure regain.

When a cone is used, the static pressure regain is defined as the increase in static pressure developed from the conversion of velocity pressure at the cone outlet minus the velocity pressure at the fan outlet.

$$SP \text{ regain (ideal)} = VP \text{ fan} - VP \text{ cone}$$

Although several quick rules of thumb are available to estimate this amount, upon final selection the actual SP regain for the specific fan size must be calculated and deducted from the rated static pressure.

The same principles can be used to adapt a fan outlet to any cone diameter larger or smaller. Given the same principles, additional velocity pressure can be imparted to a system by using a smaller diameter cone.

Please note that this simplified explanation does not take into account any inherent ductwork or energy conversion losses. It should be further noted that static pressure regain calculations are approximate and are not part of the AMCA certified ratings program.

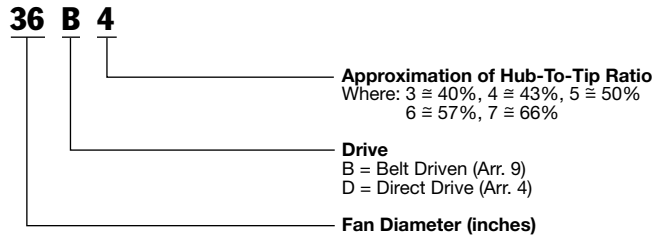
The cone dimensions shown below are for the Twin City Fan & Blower standard cones which are the equivalent of the next fan size larger with an angle of divergence of 10 degrees. To aid in the calculation of SP regain this chart displays inside dimensions and outlet areas for TCVA AXIFAN® units and the Twin City Fan & Blower standard cone.

Outlet Cone Dimensions

FAN SIZE	12	15	18	21	24	28	32	36	42	48	54	60
FAN I.D. (in.)	12.16	15.16	18.16	21.19	24.19	28.25	32.25	36.25	42.38	48.38	54.38	60.38
CONE I.D. (in.)	15.16	18.16	21.19	24.19	28.25	32.25	36.25	42.38	48.38	54.38	60.38	66.44
FAN AREA (ft <sup>2</sup> )	0.807	1.253	1.799	2.448	3.191	4.353	5.672	7.166	9.793	12.76	16.12	19.87
CONE AREA (ft <sup>2</sup> )	1.253	1.799	2.448	3.191	4.353	5.672	7.166	9.793	12.76	16.12	19.87	24.08

## Model Nomenclature

TCVA AXIFAN® model numbers are represented as follows. Refer to page 2 for an explanation of hub-to-tip ratios.



## Useful Formulas

Total Pressure (TP) =  
Static Pressure (SP) + Velocity Pressure (VP)

$$\text{Velocity (Vel.)} = \frac{\text{CFM}}{\text{Area in ft}^2}$$

$$\text{Velocity Pressure (VP)} = \left( \frac{\text{Vel.}}{1096.7} \right)^2 \times \text{Density in lb/ft}^3$$

$$\text{Efficiency} = \frac{\text{CFM} \times \text{Pressure (in. w.g.)}}{6356 \times \text{Brake Horsepower}}$$

Where total (or mechanical) efficiency is calculated using total pressure and static efficiency is calculated using static pressure.

## Performance Tables

Performance tables in this catalog are based on standard air density which is defined by AMCA as that of dry air at 70°F and sea level pressure (29.92 inches of mercury). This is equal to a density value of 0.075 lb/ft<sup>3</sup>.

When required performance is at other than standard conditions, the values must be converted to equivalent standard values before the fan can be selected from the performance tables, and then reconverted back to the actual conditions after the specific selection is made. The table of temperature and altitude density ratios on page 9 should be used for this purpose with example 2 below displaying this procedure.

## Sample Selections

The following examples illustrate conditions that may be encountered with TCVA AXIFAN® units. For additional performance corrections refer to the Twin City Fan & Blower Fan Selector Program.

**Example 1:** Select the most efficient Arr. 9 TCVA AXIFAN® for 10,000 CFM @ 1.5" SP at standard conditions (0.075 lb/ft<sup>3</sup> density). The performance tables direct us to the 32" fan size. Turning to page 15 for specifics on the 32" fan size we find there are four different hub-to-tip ratios to choose from: 32B4, 32B5, 32B6, 32B7. We compare each performance of the four hub-to-tip ratios to determine the most efficient (lowest horsepower) selection. Consequently, our fan selection is 32B6 @ 1047 RPM @ 3.56 BHP. The static efficiency is 66.2%.

**Example 2:** Select an Arr. 9 TCVA AXIFAN® for 10,000 CFM @ 1.5" @ 150°F and 10,000 ft elevation. Using the "Temperature & Altitude Density Ratio" chart on page 9, we find a factor of 0.598. Divide the operating static pressure by this factor (1.5 ÷ 0.598) = 2.5" SP equivalent static at standard air and density. The performance tables direct us to the 28" fan size. Turning to page 14 for specifics we find four hub-to-tip ratios. Comparing each we select the 28B6 as the most efficient selection at 1542 RPM and 5.92 BHP.

This is the brake horsepower required at standard air density (often referred to as cold, or starting horsepower). However, actual BHP at the operating conditions of 150°F and 10,000 ft altitude will be 5.92 x 0.598 = 3.54.

Selection: 28B6 @ 1542 RPM @ 3.54 BHP.

**Example 3:** If the operating density is known, this same air density ratio can be calculated by:  
Operating density ÷ 0.075 = Factor

This factor is then used as in Example 2.

**Example 4:** Select the most economic Arr. 9 TCVA AXIFAN® for 10,000 CFM @ 1.5" SP at standard conditions (0.075 lb/ft<sup>3</sup> density). In evaluating first cost it should be noted that fan versus fan, the smaller the hub ratio the less the cost of a fan. For example, a Model 36B4 is less expensive than a 36B5, a 36B5 is less expensive than a 36B6, and so on. With this in mind, we start with our premium efficient selection (32B6) and compare with the smallest hub ratio for each diameter smaller.

Fan Size	RPM	BHP
32B6	1047	3.56
28B4	1519	3.72
24B4	2045	4.33
21B4	2859	5.36

An educated review can now be made based on first cost (including cone cost if applicable), power consumption, space allotment, tip speed, outlet velocity, and of course, total pressure considerations.



Temperature & Altitude Density Ratios

AIR TEMP. °F	ALTITUDE IN FEET ABOVE SEA LEVEL												
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	15000	20000
	BAROMETRIC PRESSURE IN INCHES OF MERCURY												
	29.92	28.86	27.82	26.82	25.84	24.90	23.98	23.09	22.22	21.39	20.58	16.89	13.75
70	1.000	0.964	0.930	0.896	0.864	0.832	0.801	0.772	0.743	0.714	0.688	0.564	0.460
100	0.946	0.912	0.880	0.848	0.818	0.787	0.758	0.730	0.703	0.676	0.651	0.534	0.435
150	0.869	0.838	0.808	0.770	0.751	0.723	0.696	0.670	0.646	0.620	0.598	0.490	0.400
200	0.803	0.774	0.747	0.720	0.694	0.668	0.643	0.200	0.596	0.573	0.552	0.453	0.369
250	0.747	0.720	0.694	0.669	0.645	0.622	0.598	0.576	0.555	0.533	0.514	0.421	0.344

Bare Fan Weights (lb)

FAN SIZE	ARR. 9
12B6	61
12B7	79
15B5	79
15B6	98
15B7	121
18B4	93
18B5	112
18B6	135
18B7	158
21B4	128
21B5	150
21B6	173
21B7	224
24B4	195
24B5	218
24B6	269
24B7	335
28B4	254
28B5	305
28B6	370
28B7	444

FAN SIZE	ARR. 9
32B4	346
32B5	412
32B6	485
32B7	646
36B4	461
36B5	534
36B6	695
36B7	875
42B4	728
42B5	889
42B6	1068
48B4	1007
48B5	1186
54B3	1092
54B4	1272
60B3	1357

FAN SIZE	ARR. 4
12D7	65
15D6	86
15D7	97
18D5	103
18D6	115
18D7	130
21D4	133
21D5	137
21D6	149
21D7	176
24D4	173
24D5	193
24D6	215
24D7	261
28D4	227
28D5	260
28D6	300
28D7	347

FAN SIZE	ARR. 4
32D4	298
32D5	343
32D6	391
32D7	493
36D4	391
36D5	438
36D6	541
36D7	670
42D4	619
42D5	722
42D6	851
48D4	841
48D5	970
54D3	930
54D4	1056
60D3	1132

Housing Gauges

SIZE	HOUSING GAUGE
12	14
15	12
18	12
21	12
24	10
28	10
32	10
36	10
42	7
48	7
54	7
60	7

Accessory Weights (lb)

FAN SIZE	BELT GUARD	WEATHER COVER	INLET/ OUTLET SCREEN	INLET BELL	INLET/ OUTLET CONE	COMPANION FLANGE	SUPPORT LEGS		VARIABLE INLET VANES	DIS-CHARGE CAP	CURB CAP
							HORIZ. FLOW	VERT. FLOW			
12	4	7	3	8	9	5	10	10	42	30	15
15	6	11	3	10	11	8	12	10	45	40	16
18	8	18	4	12	16	10	12	10	60	55	17
21	10	21	5	13	21	11	20	10	62	65	23
24	11	23	7	20	30	13	24	17	68	78	26
28	12	26	8	22	40	15	32	17	71	98	34
32	14	32	10	25	54	17	47	17	80	120	45
36	16	34	11	52	82	19	58	17	89	165	51
42	18	40	13	62	100	25	83	19	98	230	64
48	21	45	18	70	114	33	97	19	107	288	72
54	25	56	24	76	128	37	126	26	116	384	82
60	30	68	33	86	139	41	265	26	134	400	133

Motor Weights (lb)

FRAME	48	56	143T	145T	182T	184T	213T	215T	254T
ODP	7	11	33	44	71	82	124	144	185
TE	9	14	40	53	85	98	149	173	222

FRAME	256T	284T	286T	324T	326T	364T	365T	404T	405T
ODP	214	266	310	404	452	620	680	869	938
TE	257	319	372	485	542	744	816	1043	1126

Discharge Cap Limits

SIZE	MINIMUM CFM TO OPEN		MAXIMUM CFM
	STAINLESS	ALUMINUM	
12	1390	1065	2450
15	1885	1440	3320
18	3130	2395	5525
21	4190	3205	7390
24	5455	4170	9625
28	8520	6515	15035
32	9779	7480	17506
36	12525	9580	22100
42	16850	12885	29730
48	21950	16765	38690
54	27670	21160	48825
60	34880	26050	60140























TCVA | Size 32D4, D5, D6, D7 Wheel Dia.: 32" Outlet Area: 5.672 ft² Tip Speed: 8.38 x RPM Fan Efficiency Grade: FEG90 (32D4), FEG90 (32D5), FEG85 (32D6), FEG85 (32D7)

Table with columns: PROP, RPM, 0.25" SP, 0.5" SP, 0.75" SP, 1" SP, 1.25" SP, 1.5" SP, 2" SP, 2.5" SP, 3" SP, 4" SP, 5" SP. Rows include sizes 32D4, 32D5, 32D6, and 32D7.

TCVA | Size 36D4, D5, D6, D7 Wheel Dia.: 36" Outlet Area: 7.166 ft² Tip Speed: 9.42 x RPM Fan Efficiency Grade: FEG90 (36D4), FEG90 (36D5), FEG85 (36D6), FEG80 (36D7)

Table with columns: PROP, RPM, 0.25" SP, 0.5" SP, 0.75" SP, 1" SP, 1.25" SP, 1.5" SP, 2" SP, 2.5" SP, 3" SP, 4" SP, 5" SP. Rows include sizes 36D4, 36D5, 36D6, and 36D7.

TCVA | Size 42D4, D5, D6 Wheel Dia.: 42" Outlet Area: 9.793 ft² Tip Speed: 11.00 x RPM Fan Efficiency Grade: FEG85 (42D4), FEG90 (42D5), FEG85 (42D6)

Table with columns: PROP, RPM, 0.25" SP, 0.5" SP, 0.75" SP, 1" SP, 1.25" SP, 1.5" SP, 2" SP, 2.5" SP, 3" SP, 4" SP, 5" SP. Rows include sizes 42D4, 42D5, and 42D6.

TCVA | Size 48D4, D5 Wheel Dia.: 48" Outlet Area: 12.76 ft² Tip Speed: 12.57 x RPM Fan Efficiency Grade: FEG90 (48D4), FEG90 (48D5)

Table with columns: PROP, RPM, 0.25" SP, 0.5" SP, 0.75" SP, 1" SP, 1.25" SP, 1.5" SP, 2" SP, 2.5" SP, 3" SP, 4" SP, 5" SP. Rows include sizes 48D4 and 48D5.

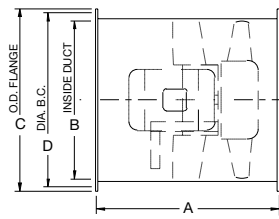
TCVA | Size 54D3, D4 Wheel Dia.: 54" Outlet Area: 16.12 ft² Tip Speed: 14.14 x RPM Fan Efficiency Grade: FEG85 (54D3), FEG90 (54D4)

Table with columns: PROP, RPM, 0.25" SP, 0.5" SP, 0.75" SP, 1" SP, 1.25" SP, 1.5" SP, 2" SP, 2.5" SP, 3" SP, 4" SP, 5" SP. Rows include sizes 54D3 and 54D4.

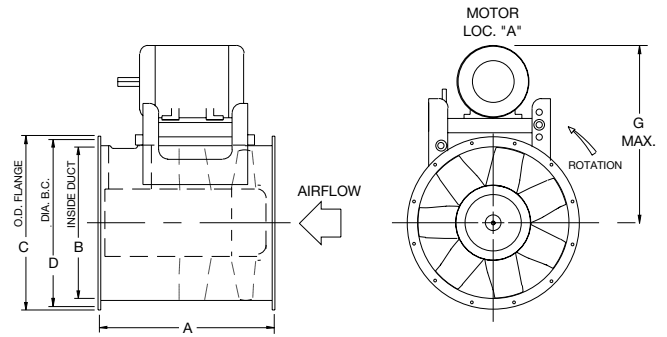
TCVA | Size 60D3 Wheel Dia.: 60" Outlet Area: 19.88 ft² Tip Speed: 15.71 x RPM Fan Efficiency Grade: FEG85

Table with columns: PROP, RPM, 0.25" SP, 0.5" SP, 0.75" SP, 1" SP, 1.25" SP, 1.5" SP, 2" SP, 2.5" SP, 3" SP, 4" SP, 5" SP. Row includes size 60D3.

Performance certified is for installation Type B: Free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories).



**ARR. 4 - HORIZONTAL**



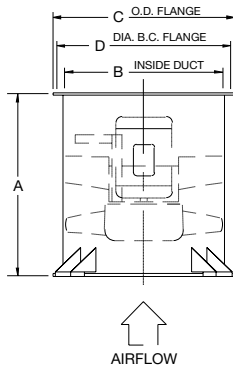
**ARR. 9 - HORIZONTAL**

**HORIZONTAL DISCHARGES**

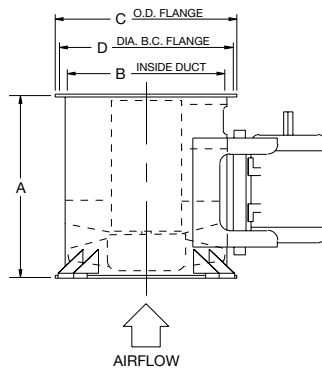
**HOR** = Horizontal - No Clips or Legs

**HCH** = Horizontal Ceiling Hung with Suspension Clips

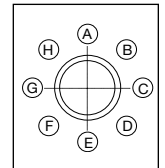
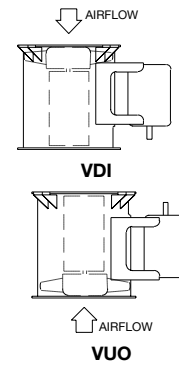
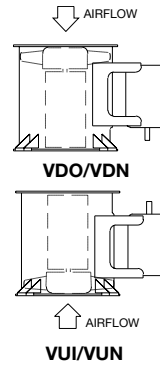
**HBM** = Horizontal Base Mounted with Support Legs



**ARR. 4 - VERTICAL**



**ARR. 9 - VERTICAL**



**HORIZONTAL MOTOR LOCATIONS (VIEWED FROM FAN OUTLET)**

**VERTICAL DISCHARGES**

**VDO** = Vertical Down Floor Mounted With Legs  
**VDN** = Vertical Down Discharge Without Legs  
**VDI** = Vertical Down Ceiling Hung With Legs

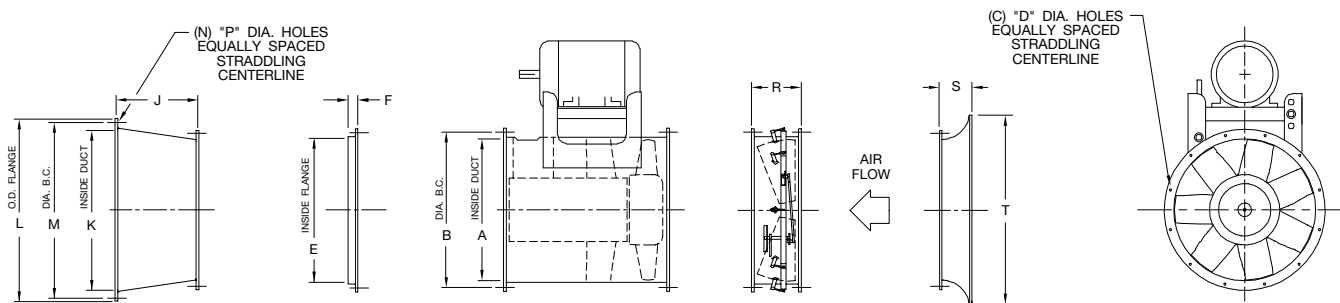
**VUI** = Vertical Up Floor Mounted With Legs  
**VUN** = Vertical Up Discharge Without Legs  
**VUO** = Vertical Up Ceiling Hung With Legs

FAN SIZE	A				B	C	D	G (MAX.)	MAXIMUM MOTOR FRAME									
	ARR. 9 HUB RATIO		ARR. 4 HUB RATIO						ARR. 9 - HUB RATIO				ARR. 4 - HUB RATIO					
	3-5	6-7	3-5	6-7					3	4	5	6	7	3	4	5	6	7
<b>12</b>	NA	24.50	NA	24.50	12.16	15.16	13.88	19.25	NA	NA	NA	184T	184T	NA	NA	NA	NA	145T
<b>15</b>	22.00	27.00	NA	27.00	15.16	18.16	16.88	20.50	NA	NA	215T	215T	215T	215T	NA	NA	NA	145T
<b>18</b>	24.50	28.00	24.50	28.00	18.16	21.16	19.88	27.50	NA	215T	215T	215T	215T	NA	NA	145T	184T	215T
<b>21</b>	27.00	32.00	27.00	32.00	21.19	24.19	22.88	31.75	NA	256T	256T	256T	256T	NA	145T	184T	215T	215T
<b>24</b>	28.00	36.25	28.00	36.25	24.19	27.19	25.88	34.50	NA	256T	256T	256T	256T	NA	184T	215T	215T	256T
<b>28</b>	32.00	40.25	32.00	40.25	28.25	31.25	30.00	38.25	NA	286T	286T	286T	286T	NA	215T	215T	256T	286T
<b>32</b>	36.25	47.00	36.25	47.00	32.25	35.25	34.00	41.00	NA	286T	286T	286T	286T	NA	215T	256T	286T	365T
<b>36</b>	40.25	53.25	40.25	53.25	36.25	39.25	38.00	45.25	NA	326T	326T	326T	326T	NA	256T	286T	365T	405T
<b>42</b>	47.00	53.25	47.00	53.25	42.38	46.38	44.63	49.50	NA	326T	326T	326T	NA	286T	365T	405T	NA	NA
<b>48</b>	53.25	NA	53.25	NA	48.38	52.38	50.63	53.25	NA	326T	326T	NA	NA	NA	365T	405T	NA	NA
<b>54</b>	53.25	NA	53.25	NA	54.38	58.38	56.63	59.00	365T	365T	NA	NA	NA	365T	405T	NA	NA	NA
<b>60</b>	53.25	NA	53.25	NA	60.38	64.38	63.38	60.25	365T	NA	NA	NA	NA	405T	NA	NA	NA	NA

AC13790A AC13791B  
 AC13446B AC13595B

DIMENSIONS ARE NOT TO BE USED FOR CONSTRUCTION. CERTIFIED DRAWINGS AVAILABLE UPON REQUEST.

# DIMENSIONAL DATA



**CONE**

**COMPANION FLANGE**

**VARIABLE INLET VANE**

**INLET BELL**

FAN SIZE	COMPANION FLANGE		CONE							VARIABLE INLET VANE	INLET BELL		FAN AREA (FT <sup>2</sup> )	CONE AREA (FT <sup>2</sup> )
	D	E	F	J	K	L	M	N	P		R	S		
12	0.56	12.16	1.50	8.50	15.16	18.44	16.88	8	0.56	5.50	2.52	15.19	0.81	1.25
15	0.56	15.16	1.50	8.50	18.16	21.44	19.88	8	0.56	6.50	3.12	19.77	1.25	1.80
18	0.56	18.16	1.50	8.50	21.19	24.50	22.88	8	0.56	7.50	3.71	23.72	1.80	2.45
21	0.56	21.19	1.50	8.50	24.19	27.50	25.88	12	0.56	8.75	4.31	27.67	2.45	3.19
24	0.56	24.19	1.50	11.50	28.25	31.56	30.00	12	0.56	10.00	4.96	31.63	3.19	4.35
28	0.56	28.25	1.50	11.50	32.25	35.56	34.00	12	0.56	11.50	5.75	36.90	4.35	5.67
32	0.56	32.25	1.50	11.50	36.25	39.56	38.00	12	0.56	13.00	6.54	42.17	5.67	7.17
36	0.56	36.25	1.50	17.00	42.38	46.81	44.63	16	0.69	10.00	7.39	47.44	7.17	9.80
42	0.69	42.38	2.00	17.00	48.38	52.81	50.63	16	0.69	11.75	8.59	55.34	9.80	12.77
48	0.69	48.38	2.00	17.00	54.38	58.69	56.63	16	0.69	13.25	9.76	63.25	12.77	16.13
54	0.69	54.38	2.00	17.00	60.38	64.94	63.38	20	0.69	14.75	10.98	71.16	16.13	19.88
60	0.69	60.38	3.00	17.00	66.44	70.94	69.38	24	0.69	16.25	12.20	79.06	19.88	24.08

AC13716M

AC17824A

AC13577B

DIMENSIONS ARE NOT TO BE USED FOR CONSTRUCTION. CERTIFIED DRAWINGS AVAILABLE UPON REQUEST.



Fans shall be Model TCVA AXIFAN® Vaneaxial Fans as manufactured by Twin City Fan & Blower, Minneapolis, Minnesota. Fans shall be Arrangement 9, V-belt driven with the wheel mounted on a separate shaft and bearings supported completely within an enclosed tube isolated from the high velocity airstream or Arrangement 4, with the propeller mounted directly on the motor shaft and with the propeller and motor assembly enclosed entirely within the fan casing.

**PERFORMANCE** — Performance ratings shall conform to AMCA Standard 205 (fan efficiency grade) and 211 (air performance). Fans shall be tested in accordance with ANSI/AMCA Standard 210 (air performance) and 300 (sound performance) in an AMCA accredited laboratory. Fans shall be licensed to bear the AMCA certified ratings seal for air and fan efficiency grade (FEG).

Model TCVA shall be available UL 705 listed. Fans shall bear a permanently attached nameplate displaying model and serial number of the unit for future identification.

**HOUSING** — Fan housings shall be welded of 14-gauge ASTM A-569 hot rolled steel on size 12, 12-gauge hot rolled steel on sizes 15 through 21, 10-gauge hot rolled steel on sizes 24 through 36, and 7-gauge hot rolled steel on sizes 42 through 60. Inlet and outlet flanges are standard.

**GUIDE VANES** — Fan housings shall be fitted with aerodynamically designed stationary straightening guide vanes on the air discharge side of the wheel. The guide vanes shall be welded to both the inner cylinder and the fan housing interior and function to aid in the elimination of swirl and turbulence downstream thereby recovering rotational energy losses, improving efficiency and static pressure capability, and reducing fan noise generation.

**WHEEL** — The fan wheel shall be a solid one-piece sand casting of A356 - T6 Aluminum and shall contain seven blades and an integral center hub. The wheel shall have blades of airfoil shape designed with a variable hub ratio system to allow the selected fan to operate at the highest efficiency possible. Wheels shall be machined to the proper diameter so that blade tip clearance shall be within tolerance necessary to insure certified fan performance. The wheel shall be secured to the fan/motor shaft with a Trantorque® or taperlock bushing.

**SHAFT (ARR. 9)** — Shafts shall be AISI 1040 or 1045 hot rolled steel, accurately turned, ground, polished, and ring gauged for accuracy. Shafts shall be sized for the first critical speed of at least 1.43 times the maximum speed.

**BEARINGS (ARR. 9)** — Bearings shall be heavy duty, grease lubricated, anti-friction ball or roller, self-aligning, pillow block type and selected for a minimum average bearing life (AFBMA L-50) in excess of 200,000 hours at the maximum fan RPM. All bearings are provided with pre-filled factory extended lubrication lines terminating at the housing exterior.

**DRIVE (ARR. 9)** — The fan shall be equipped with a (fixed/adjustable) pitch V-belt drive selected to operate the fan at the correct operational RPM. The V-belt drive shall consist of cast iron sheaves and anti-static conducting belts and shall be selected with a (1.2/1.5) safety factor based upon the required brake horsepower of the fan.

The complete fan shaft and bearing assembly is mounted within a steel fabricated inner cylinder. The V-belt drive assembly is extended through a two-piece belt fairing. The belt fairing shall be an aerodynamically shaped tube designed to maximize fan efficiency. The belt fairing is welded continuously to both the inner cylinder that houses the fan shaft and bearings and the fan housing.

**MOTOR** — Motors for Arrangement 9 fans shall be manufactured in accordance with current applicable standards of IEEE and NEMA and, where applicable, shall meet current EPACT standards. Motors shall be foot-mounted, NEMA standard (ODP, TEFC, Explosion-Proof), continuous duty, ball bearing type with class (B, F) insulation and of cast iron construction when commercially available.

Motors for Arrangement 4 fans shall be foot-mounted, NEMA standard, totally enclosed fan cooled (TEFC), continuous duty, ball bearing type with class “F” insulation and of cast iron construction when commercially available. For ease in wiring the motor, wiring connections shall be extended to an exterior conduit box located on the exterior of the fan housing. A duplicate motor nameplate shall be mounted on the exterior of the fan adjacent to the fan nameplate. External grease fittings with pre-filled factory extended grease leads shall be supplied for lubrication of the motor bearings on all motors that provide grease fittings.

**FINISH** — The entire fan assembly, excluding the shaft, shall be thoroughly degreased and deburred before application of a rust-preventative primer. After the fan is completely assembled, a finish coat of paint shall be applied to the entire assembly. The fan shaft shall be coated with a petroleum-based rust protectant. Aluminum components shall be unpainted.

**FACTORY RUN TEST** — All fans with motors and drives mounted by Twin City Fan & Blower shall be completely assembled and test run as a unit at the specified operating speed prior to shipment. Each wheel shall be statically and dynamically balanced in accordance with ANSI/AMCA 204-96 “Balance Quality and Vibration Levels for Fans” to Fan Application Category BV-3, Balance Quality Grade G6.3. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings. Records shall be maintained and a written copy shall be available upon request.

**GUARANTEE** — The manufacturer shall guarantee the workmanship and materials for its TCVA AXIFAN® vaneaxial fans at least one (1) year from startup or eighteen (18) months from shipment, whichever occurs first.

# INDUSTRIAL PROCESS AND COMMERCIAL VENTILATION SYSTEMS

CENTRIFUGAL FANS | UTILITY SETS | PLENUM & PLUG FANS | INLINE CENTRIFUGAL FANS  
MIXED FLOW FANS | TUBEAXIAL & VANEAXIAL FANS | PROPELLER WALL FANS | PROPELLER ROOF VENTILATORS  
CENTRIFUGAL ROOF & WALL EXHAUSTERS | CEILING VENTILATORS | GRAVITY VENTILATORS | DUCT BLOWERS  
RADIAL BLADED FANS | RADIAL TIP FANS | HIGH EFFICIENCY INDUSTRIAL FANS | PRESSURE BLOWERS  
LABORATORY EXHAUST FANS | FILTERED SUPPLY FANS | MANCOOLERS | FIBERGLASS FANS | CUSTOM FANS



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