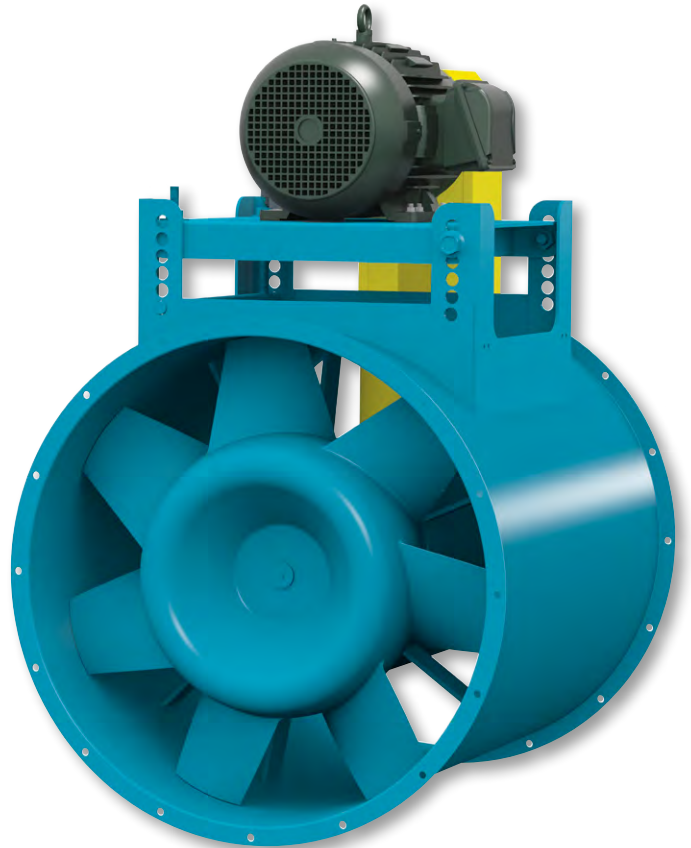




INDUSTRIAL PROCESS AND
COMMERCIAL VENTILATION SYSTEMS

AXIFAN® VANEAXIAL & TUBEAXIAL FANS

TCVS/TCTS | TCVSSH/TCTSSH



VANEAXIAL & TUBEAXIAL FANS



Models

TCVS | TCTS | TCSSH | TCTSSH



TCVS

Models TCVS and TCTS are available with the UL/cUL 705 listing for electrical, File No. E158680.



Models TCSSH and TCTSSH are UL/cUL listed for Smoke Control Systems as standard, File No. MH-29313, 500°F for 4 hours and 1000°F for 15 minutes.

Guide Vanes

TCVS vaneaxial fans are fitted with straightening guide vanes. The vanes are aerodynamically placed within the housing on the discharge side of the wheel. Vanes are stationary and welded to both the inner and outer cylinders. The straightening effect of the vanes aids in minimizing turbulence downstream from the fan thereby recovering rotative energy imparted to the air by the wheel.

AXIFAN® Steel Wheel

AXIFAN® steel wheels are manufactured with a spun steel hub. Steel blades are welded to the hub and can be attached at precise angles ranging from 30° to 50°. This ability to customize blade angles provides the highest efficiency for a given performance.

For applications requiring extensive corrosion resistance or operation at higher temperatures than standard, the Arrangement 9 TCVS/TCTS AXIFAN® is the perfect choice. Standard construction is good for operation to 200°F; fans can be customized to handle up to 300°F. Steel construction is standard, all stainless steel construction is available. Driven by either a fixed or adjustable V-belt drive system, the exact point of rating can be achieved. A future change in rating can be accomplished through a simple sheave change.

TCSSH/TCTSSH (Smoke & Heat Removal)

Specifically designed for smoke control applications. UL/cUL listed for smoke control systems for 500°F for 4 hours or 1000°F for 15 minutes.

Housing

Fan housings are constructed of continuously welded, heavy gauge steel for strength and rigidity. Flanges on both the inlet and outlet are integrally rolled and punched for attachment to ductwork or accessories.

Shafts

Fan shafts are ground and polished 1045 steel sized to allow the rotating assembly to operate a minimum of 43% below the first critical speed.

Bearings

Cast iron, re-greasable flange mounted ball or roller type bearings have a minimum L-10 life of 40,000 hours. This is equivalent to an average life of 200,000 hours. Extended lubrication lines terminate at the housing exterior.

Drive Isolated from Airstream

The shaft and bearing assembly is mounted within the inner cylinder to isolate these components from the high velocity airstream. The V-belt drive assembly is extended through a two-piece belt fairing. The belt fairing is an aerodynamically designed tube, designed to maximize fan efficiency, minimize air blockage, and reduce noise generation.

Hub-to-Tip Ratio

AXIFAN® wheels are manufactured from one of four hub sizes. Hubs are machined and cut to the specified diameter for a job. Blades are die-formed stamped steel and custom cut to their specified size. Fabricating wheels from custom sized blades and hubs allows the creation of wheels with an infinite range of hub-to-tip ratios. Since each hub-to-tip ratio has a slightly different pressure/efficiency characteristic, the freedom of having several wheels with different hub-to-tip ratios for a set diameter allows maximum efficiency at the required point of rating. For additional hub-to-tip ratios refer to the Twin City Fan & Blower Fan Selector Program.

Motors

A variety of single- and three-phase motors is available in open drip-proof (ODP), explosion-proof (EXP), and totally enclosed fan cooled (TEFC) enclosures. An adjustable mounting platform pivots to allow infinite belt tension adjustment.

Inlet Bell

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

Inlet/Outlet Cone

A round-to-round transition bolted to the inlet or discharge flange of the fan housing provides a smooth connection of the fan to larger or smaller ductwork. Cones are flanged on both ends and drilled to mate with the fan's flange. Cones are available with an access door if required. Outlet cones can be utilized to affect performance and transform velocity pressure into static pressure.

Companion Flanges

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

Variable Inlet Vane

For frequent or continuous volume control a variable inlet vane can be provided. The vane action during dampening works to spin the air in the direction of the wheel rotation, thus resulting in lower power consumption.

Variable inlet vanes are available for each specific fan size and are bolted to the fan's flanged inlet. The variable inlet vane's inlet is flanged and drilled to accept ductwork or an inlet bell as the system requires. The vane mechanism is outside of the airstream and is controlled by a single vane lever. Variable inlet vanes can be set up for manual or automatic operation.

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. See page 13 for a description of how to identify the location of the legs.

Suspension Clips

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

Vibration Isolation

All AXIFAN® fans can be provided with spring or rubber-in-shear isolators as an option. Spring isolators are standard 1" in deflection and can be provided for floor mount or ceiling (hung) orientation. Use of isolators requires flexible duct connectors on attached ductwork. Avoid flexible connectors, which can collapse on the inlet side of the fan.



Inlet Bell



Inlet/Outlet Cone



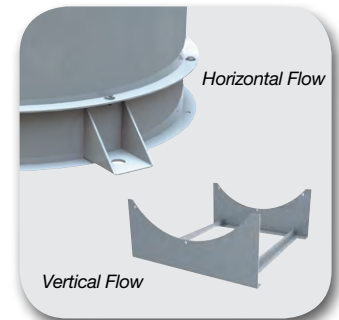
Companion Flanges



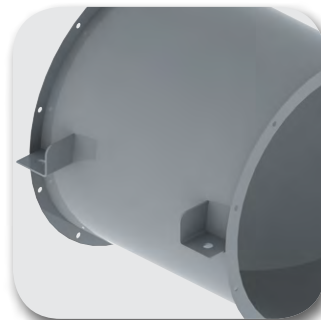
Variable Inlet Vane



Sound Attenuation



Support Legs



Suspension Clips



Vibration Isolation

ACCESSORIES



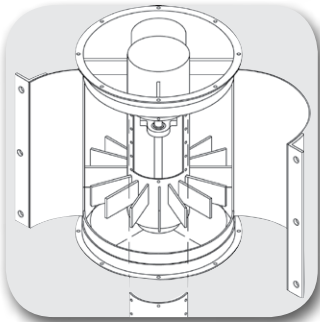
Belt Guard



Weather Cover



Screening



Clamshell Construction



Housing Door



Shaft Seal



Discharge Cap



Curb Cap

Belt Guard

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, 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 in the fan inlet, fan outlet, cone, or bell.

Clamshell Construction

Clamshell construction provides complete accessibility to the internal components of the fan.

Housing Doors

General Observation Door

For inspection and maintenance of the internal section (V-belt drive area) of 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.

Wheel Area Door

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.

Shaft Seal

To limit air entering the inner cylinder and avoid contact of airstream contaminants with the bearings 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.

High Temperature Construction

AXIFAN® units can be customized to handle up to 300°F continuous in the airstream.

Discharge Cap

AXIFAN® units can be provided with a discharge cap for rooftop mounting. Discharge caps are designed for vertical discharge with two backdraft dampers to seal out the weather when the fan is shut off. See page 6 for minimum flow (CFM) requirements.

Curb Cap

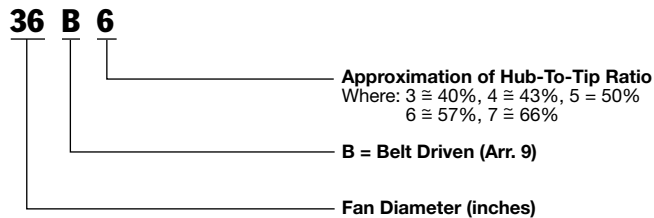
AXIFAN® units can be supplied with a base (curb cap), attached to the fan's flange for curb mounting. The combination of a curb cap and discharge cap creates an upblast-style power roof ventilator.

UL/cUL 705 Listing

Models TCVS and TCTS are available with the UL/cUL 705 listing for electrical when supplied with specific motors. The models TCVSSH and TCTSSH are provided standard with the UL/cUL listing for Smoke Control Systems.

Model Nomenclature

TCVS/TCTS AXIFAN® Arrangement 9 model numbers are represented as follows. Refer to the “Hub-To-Tip Ratio” section on page 2 for an explanation of hub-to-tip ratios.



Useful Formulas

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

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

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

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.

Sample Selections

The following examples illustrate conditions that may be encountered with Arrangement 9 TCVS/TCTS AXIFAN® fans. For additional performance corrections refer to the Twin City Fan & Blower Fan Selector Program.

Example 1: Make the most efficient selection for an Arrangement 9 TCVS AXIFAN® at 10,000 CFM and 1.5" SP at standard conditions (0.075 lb/ft³ density). By looking through the TCVS tables for fans that meet this performance we find:

Fan Size	RPM	BHP	Blade Angle
21B6	2024	5.94	48°
24B5	1684	4.36	41°
28B6	1210	3.90	39°
30B4	1494	3.66	33°

Comparing these fans, we find that the 30B4 is the most efficient (lowest horsepower) selection.

Example 2: Make the optimum selection for an Arrangement 9 TCTS AXIFAN® at 11,000 CFM and 1.5" SP at 150°F and 10,000 feet elevation. Using the “Temperature and Altitude Density Ratios” table on page 6, we establish a factor of 0.598. Dividing the operating SP by this factor (1.5 ÷ 0.598) = 2.5" equivalent SP at standard air and density. By looking through the TCTS tables for fans that meet a performance of 11,000 CFM at 2.5" SP, we find:

Fan Size	RPM	BHP	Blade Angle
21B6	2771	11.38	40°
24B5	2303	8.53	35°
28B6	1733	8.43	32°
30B4	2010	7.06	30°

Comparing these fans, we find that the 30B4 is the most efficient (lowest horsepower) selection. The horsepower shown above (often referred to as “cold” or “starting” horsepower) is the horsepower required at standard air density (0.075 lb/ft³). However, the actual BHP at the operating conditions of 150°F and 10,000 feet elevation will be 7.06 x 5.98 = 4.22 BHP.

Example 3: Select a TCVS fan, without a cone, for 10,000 CFM at 1.5" SP and a maximum outlet velocity of 2400 FPM at standard conditions (0.075 lb/ft³). Start by calculating the area required for 2400 FPM.

$$\text{Area} = \text{CFM} \div \text{OV} = 10,000 \div 2400 = 4.17 \text{ ft}^2$$

Using the cone and outlet dimensions from the table on page 14, we see that the outlet area for a 28" fan matches 4.17 ft² the closest without going under. Turning to page 8 for the 28B6 fan size and looking up 10,000 CFM @ 1.5" SP yields the following interpolated selection:

28B6 TCVS @ 1210 RPM @ 3.90 BHP @ 39° blade angle

Example 4: Using the same criteria as Example 3, 10,000 CFM at 1.5" SP and a maximum outlet velocity of 2400 FPM at standard conditions (0.075 lb/ft³), select a fan with a coned outlet.

Taking the next smaller fan size, 24B5, from the table on page 14 find the outlet area to be 3.19 ft².

$$\begin{aligned} \text{Velocity @ fan} &= 10,000 \div 3.192 = 3135 \text{ FPM} \\ \text{VP}_{\text{fan}} &= (3135 \div 1096.7)^2 \times 0.075 = 0.61" \text{ w.g.} \\ \text{VP}_{\text{cone}} &= (2400 \div 1096.7)^2 \times 0.075 = 0.36" \text{ w.g.} \\ \text{SP}_{\text{regain}^*} &= \text{VP}_{\text{fan}} - \text{VP}_{\text{cone}} = 0.61 - 0.36 = 0.25" \text{ w.g.} \end{aligned}$$

Turning to the table for a 24B5 TCVS on page 8 and looking up 10,000 CFM at 1.25" SP (1.5"-0.25"), through interpolation we find:

24B5 TCVS @ 1578 RPM @ 3.88 BHP @ 43° blade angle

We could continue in this method to the next smaller fan size, 21B6 (assuming the same cone to 2400 FPM). In this case, our static pressure including regain is 0.82" SP, which yields the following:

21B6 TCVS @ 1835 RPM @ 4.67 BHP @ 50° blade angle

An educated review would then determine the premium selection based on considerations of first cost vs. power consumption vs. space allotment, etc.

Please note that this explanation does not take into consideration any inherent ductwork or energy conversion losses. This exact SP_{regain} amount should be factored by a predetermined percentage based on the actual cone geometry.

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	15000
	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	0.671	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	0.620	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
300	0.697	0.672	0.648	0.624	0.604	0.580	0.558	0.538	0.518	0.498	0.480	0.393	0.321

Bare Fan Weights (lb)

FAN SIZE	12B7	15B6	18B5	21B6	24B5	28B6	30B4	32B5	36B6	42B3	48B4	54B3
TCVS	76	95	109	170	215	251	318	409	692	655	1004	1089
TCTS	74	92	106	165	208	243	308	397	671	630	974	1054

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
30	13	29	9	24	48	16	40	17	76	110	40
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

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
ODP	214	266	310	404	452	620	680
TE	257	319	372	485	542	744	816

Housing Gauges

FAN SIZE	HOUSING GAUGE
12	14
15	12
18	12
21	12
24	10
28	10
30	10
32	10
36	10
42	7
48	7
54	7

Minimum CFM to Open Discharge Cap

FAN SIZE	STAINLESS	ALUMINUM
12	1051	721
15	1707	1171
18	2532	1737
21	3527	3035
24	4693	4039
28	6574	5658
30	7605	6545
32	8712	7498
36	11158	9603
42	15891	13677
48	20904	17991
54	26613	22905

Performance Charts

The Arrangement 9 performance charts in this catalog are based on standard air density which is defined by AMCA as that of dry air of 70°F and sea level pressure (29.92 inches of mercury). This is equal to a density value of 0.075 lbs./cu.ft.

When required performance is at other than standard conditions, the values must be converted to equivalent standard values before entering the tables, and then

reconverted back to the actual conditions after the specific selection is made. The chart of temperature and altitude corrections above should be used for this purpose with Example #2 on page 5 displaying this procedure.



TCVS 12B7

Wheel Dia.: 12"

Outlet Area: 0.807 ft²

Tip Speed: 3.14 x RPM

CFM	OV	0.25" SP			0.50" SP			0.75" SP			1" SP			1.25" SP			1.50" SP			2" SP			2.50" SP			3" SP			3.50" SP			4" SP				
		RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG		
600	744	1133	0.06	39	1534	0.11	30																													
800	992	1291	0.10	44	1590	0.15	37	1971	0.23	30	2103	0.27	30																							
1000	1240	1410	0.16	50	1718	0.22	42	1944	0.29	38	2192	0.36	34	2497	0.46	30	2603	0.52	30																	
1200	1488	1638	0.24	50	1856	0.32	46	2074	0.40	42	2267	0.47	39	2470	0.55	33	2706	0.65	33	3067	0.85	30	3244	0.98	30											
1400	1736	1873	0.37	50	1978	0.43	50	2223	0.53	45	2412	0.62	42	2568	0.71	38	2731	0.79	38	3144	1.02	33	3511	1.27	30	3662	1.43	30	3815	1.59	30					
1600	1984	2112	0.53	50	2204	0.60	50	2298	0.67	50	2583	0.81	44	2739	0.91	41	2856	1.00	41	3180	1.21	37	3490	1.45	34	3942	1.80	30	4075	1.99	30					
1800	2232	2355	0.73	50	2436	0.81	50	2518	0.89	50	2836	0.99	49	2862	1.14	43	3016	1.25	43	3283	1.47	40	3517	1.70	38	3809	1.95	35	4176	2.31	32	4482 2.65 30				
2000	2480	2599	0.99	50	2672	1.07	50	2746	1.15	50	2820	1.25	50	2972	1.38	45	3168	1.54	45	3435	1.80	42	3656	2.04	40	3887	2.29	38	4123	2.55	36	4384	2.87	34		
2200	2728	2845	1.29	50	2911	1.38	50	2978	1.47	50	3045	1.57	50	3113	1.68	49	3223	1.81	49	3578	2.16	44	3798	2.43	42	4016	2.70	40	4248	2.99	38	4419	3.26	37		
2400	2976	3093	1.67	50	3153	1.76	50	3214	1.86	50	3275	1.96	50	3337	2.07	50	3399	2.18	50	3712	2.55	46	3984	2.89	43	4148	3.17	42	4366	3.47	40	4533 3.76 39				
2600	3224	3341	2.10	50	3396	2.20	50	3452	2.30	50	3509	2.41	50	3565	2.52	50	3623	2.65	50	3738	2.90	50	4110	3.37	45	4330	3.71	43	4490 4.01 42							
2800	3472	3590	2.61	50	3641	2.71	50	3693	2.82	50	3745	2.94	50	3797	3.05	50	3850	3.18	50	3957	3.44	50	4171	3.82	48	4447	4.27	45								
3000	3720	3839	3.19	50	3887	3.30	50	3935	3.42	50	3984	3.54	50	4032	3.66	50	4082	3.79	50	4180	4.06	50	4281	4.36	50	4554 4.84 47										
3400	4216	4339	4.61	50	4423	4.73	50	4466 4.99 50	4509 5.13 50	4552 5.27 50																										

Regular type face = Class I, max. RPM 4455

Bold type face = Class II, max. RPM 5729

TCVS 15B6

Wheel Dia.: 15"

Outlet Area: 1.254 ft²

Tip Speed: 3.93 x RPM

CFM	OV	0.25" SP			0.50" SP			0.75" SP			1" SP			1.25" SP			1.50" SP			2" SP			2.50" SP			3" SP			3.50" SP			4" SP				
		RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG		
1200	957	902	0.08	41																																
1400	1116	941	0.10	44	1231	0.18	37																													
1600	1276	995	0.13	46	1271	0.21	39	1485	0.30	36																										
2000	1595	1129	0.20	48	1323	0.30	45	1551	0.40	40	1726	0.51	38	1893	0.62	36																				
2400	1914	1280	0.30	49	1444	0.41	47	1622	0.53	44	1804	0.65	41	1964	0.78	39	2123	0.91	37																	
2800	2233	1433	0.43	50	1586	0.56	48	1716	0.69	47	1883	0.83	44	2035	0.97	42	2184	1.12	40	2462	1.42	37	2702	1.72	35											
3200	2552	1606	0.61	50	1730	0.75	49	1851	0.89	48	1989	1.04	46	2106	1.20	45	2251	1.36	43	2543	1.70	39	2742	2.04	38	2969	2.39	36	3210	2.76	34					
3600	2871	1783	0.83	50	1874	0.98	50	2012	1.14	48	2123	1.30	47	2210	1.48	47	2319	1.65	46	2595	2.01	42	2814	2.39	40	3038	2.78	38	3218	3.17	37	3394	3.56	36		
4000	3190	1962	1.10	50	2043	1.26	50	2152	1.43	49	2259	1.62	48	2364	1.80	47	2442	1.99	47	2647	2.38	45	2892	2.79	42	3103	3.20	40	3280	3.63	39	3451	4.07	38		
4400	3509	2143	1.43	50	2217	1.60	50	2291	1.78	50	2394	1.98	49	2496	2.18	48	2597	2.39	47	2766	2.80	46	2968	3.24	44	3175	3.69	42	3380	4.14	40	3551 4.61 39				
4800	3828	2325	1.82	50	2392	2.01	50	2460	2.20	50	2561	2.41	49	2660	2.63	48	2726	2.84	48	2889	3.29	47	3048	3.75	46	3244	4.23	44	3446	4.72	42	3608 5.22 41				
5200	4147	2508	2.28	50	2579	2.48	50	2633	2.69	50	2696	2.90	50	2793	3.14	49	2890	3.37	48	3166	4.34	47	3318	4.84	46	3509	5.35	44	3667 5.89 43							
5600	4466	2691	2.82	50	2749	3.03	50	2807	3.25	50	2866	3.48	50	2924	3.71	50	3019	3.96	49	3171	4.47	48	3320	4.99	47	3432	5.53	47	3578 6.07 46	3766 6.62 44						
6000	4785	2875	3.43	50	2930	3.66	50	2984	3.89	50	3038	4.13	50	3092	4.37	50	3147	4.63	50	3335	5.18	48	3441	5.72	48	3585 6.29 47	3726 6.85 46	3829 7.44 46								

Regular type face = Class I, max. RPM 3540

Bold type face = Class II, max. RPM 4552

TCVS 18B5

Wheel Dia.: 18"

Outlet Area: 1.799 ft²

Tip Speed: 4.71 x RPM

CFM	OV	0.25" SP			0.50" SP			0.75" SP			1" SP			1.25" SP			1.50" SP			2" SP			2.50" SP			3" SP			3.50" SP			4" SP			
		RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	
1600	889	840	0.10	35																															
2000	1112	876	0.13	39	1175	0.24	33																												
2400	1334	928	0.18	42	1201	0.30	36	1428	0.44	33																									
2800	1556	979	0.24	45	1233	0.37	39	1462	0.52	35	1655	0.68	33	1894	0.86	30																			
3200	1779	1047	0.31	47	1285	0.46	41	1483	0.63	38	1681	0.80	35	1866	0.98	33	2020	1.17	32																
3600	2001	1113	0.40	49	1340	0.56	43	1523	0.74	40	1718	0.93	37	1884	1.12	35	2025	1.32	34																
4000	2223	1191	0.51	50	1393	0.69	45	1593	0.88																										

TCVS 24B5

Wheel Dia.: 24"

Outlet Area: 3.192 ft²

Tip Speed: 6.28 x RPM

CFM	OV	0.25" SP			0.50" SP			0.75" SP			1" SP			1.25" SP			1.50" SP			2" SP			2.50" SP			3" SP			3.50" SP			4" SP						
		RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG				
3500	1096	652	0.23	39	876	0.43	33																															
4000	1253	679	0.29	41	889	0.50	35	1069	0.73	32																												
5000	1566	736	0.43	45	927	0.67	39	1099	0.94	35	1243	1.22	33	1422	1.53	30																						
6000	1880	806	0.62	48	980	0.89	42	1141	1.20	38	1271	1.52	36	1402	1.85	34	1511	2.19	33																			
7000	2193	882	0.87	50	1034	1.18	45	1184	1.52	41	1304	1.87	39	1426	2.24	37	1547	2.62	35	1752	3.42	33	2006	4.30	30													
8000	2506	982	1.18	50	1106	1.55	47	1247	1.91	43	1359	2.30	41	1474	2.70	39	1593	3.12	37	1778	3.98	35	1975	4.90	33	2139	5.85	32										
9000	2820	1084	1.58	50	1175	1.98	49	1308	2.39	45	1417	2.81	43	1525	3.24	41	1611	3.68	40	1817	4.63	37	1994	5.61	35	2143	6.61	34	2294	7.65	33							
10000	3133	1189	2.07	50	1257	2.50	50	1374	2.96	47	1472	3.41	45	1578	3.88	43	1684	4.36	41	1853	5.36	39	2026	6.43	37	2198	7.50	35	2342	8.63	34	2486	9.77	33				
11000	3446	1294	2.66	50	1357	3.13	50	1437	3.63	49	1552	4.13	46	1653	4.63	44	1733	5.14	43	1892	6.20	41	2055	7.32	39	2224	8.50	37	2356	9.68	36	2485	10.86	35				
12000	3759	1401	3.36	50	1459	3.87	50	1516	4.40	50	1611	4.94	48	1706	5.49	46	1805	6.03	44	1961	7.17	42	2116	8.33	40	2283	9.58	38	2413	10.85	37	2541	12.13	36				
13000	4073	1509	4.18	50	1562	4.72	50	1615	5.29	50	1688	5.87	49	1783	6.47	47	1854	7.05	46	2030	8.25	43	2183	9.49	41	2304	10.76	40	2430	12.10	39	2596	13.49	37				
14000	4386	1617	5.13	50	1666	5.71	50	1715	6.31	50	1764	6.93	50	1836	7.57	49	1929	8.20	47	2068	9.47	45	2218	10.80	43	2368	12.13	41	2485	13.50	40	2608	14.96	39				
15000	4699	1726	6.23	50	1772	6.84	50	1817	7.47	50	1863	8.12	50	1909	8.50	50	2003	9.48	48	2140	10.84	46	2282	12.22	44	2431	13.62	42	2545	15.07	41	2659	16.54	40				
16000	5013	1835	7.47	50	1878	8.12	50	1921	8.79	50	1964	9.48	50	2007	10.19	50	2050	10.91	50	2211	12.35	47	2346	13.81	45	2494	15.30	43	2606	16.81	42	2718	18.36	41				

Regular type face = Class I, max. RPM 2220

Bold type face = Class II, max. RPM 2855

TCVS 28B6

Wheel Dia.: 28"

Outlet Area: 4.353 ft²

Tip Speed: 7.33 x RPM

CFM	OV	0.25" SP			0.50" SP			0.75" SP			1" SP			1.25" SP			1.50" SP			2" SP			2.50" SP			3" SP			3.50" SP			4" SP							
		RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG					
4500	1034	504	0.30	41	676	0.55	34																																
5000	1149	514	0.36	44	674	0.62	37																																
6000	1378	557	0.49	46	702	0.79	40	830	1.12	36																													
7000	1608	611	0.67	47	731	1.00	43	852	1.36	39	963	1.74	36	1063	2.13	34																							
8000	1838	658	0.89	49	768	1.25	45	885	1.65	41	979	2.07	39	1071	2.50	37	1162	2.93	35	1352	4.40	34	1508	6.10	34														
9000	2068	711	1.15	50	819	1.56	46	908	1.99	44	1009	2.44	41	1098	2.92	39	1187	3.40	37	1348	4.98	37	1508	6.10	34														
10000	2297	775	1.48	50	870	1.92	47	953	2.38	45	1027	2.88	44	1124	3.38	41	1210	3.90	39	1348	4.98	37	1508	6.10	34														
11000	2527	840	1.88	50	922	2.36	48	1001	2.85	46	1069	3.37	45	1152	3.92	43	1234	4.47	41	1386	5.64	38	1518	6.82	36	1655	8.06	34											
12000	2757	905	2.34	50	973	2.85	49	1051	3.39	47	1115	3.94	46	1178	4.51	45	1259	5.11	43	1403	6.33	40	1533	7.63	38	1660	8.92	36	1794	10.28	34								
14000	3216	1039	3.52	50	1087	4.09	50	1148	4.70	49	1222	5.33	47	1281	5.97	46	1339	6.62	45	1462	8.01	43	1601	9.40	40	1704	10.90	39	1803	12.40	38	1925	13.91	36					
16000	3676	1175	5.06	50	1216	5.69	50	1258	6.37	50	1315	7.07	49	1372	7.80	48	1443	8.52	46	1537	10.01	45	1634	11.60	44	1770	13.19	41	1863	14.82	40	1958	16.53	39					
18000	4135	1312	7.02	50	1349	7.72	50	1386	8.46	50	1423	9.23	50	1477	10.01	49	1531	10.82	48	1638	12.47	46	1724	14.12	45	1815	15.90	44	1906	17.74	43	2017	19.52	41					
20000	4595	1450	9.45	50	1483	10.22	50	1516	11.01	50	1549	11.83	50	1583	12.70	50	1636	13.60	49	1740	15.38	47	1823	17.20	46	1905	19.05	45	1967	21.00	45	2054	23.03	44					
22000	5054	1589	12.41	50	1619	13.25	50	1649	14.11	50	1679	15.00	50	1709	15.91	50	1739	16.84	50	1843	18.82	48	1924	20.82	47	2003	22.81	46	2081	24.81	45	2137	26.92	45					

Regular type face = Class I, max. RPM 1895

Bold type face = Class II, max. RPM 2436

TCVS 30B4

Wheel Dia.: 30"

Outlet Area: 4.97 ft²

Tip Speed: 7.85 x RPM

CFM	OV	0.25" SP			0.50" SP			0.75" SP			1" SP			1.25" SP			1.50" SP			1.75" SP			2" SP			2.50" SP			3" SP			3.50" SP							
		RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG	RPM	BHP	ANG					
5000	1006	634	0.32	35	864	0.61	31																																
6000	1207	677	0.41	36	876	0.74	33	1053	1.10	31	1205	1.51	30																										
7000	1408	728	0.53	37	893	0.89	35	1053	1.28	33	1219	1.71	31																										
8000	1610	798	0.68	37	930	1.06	36	1086	1.50	34	1211	1.95	33	1343	2.46	32	1473	2.99	31	1596	3.51	30																	
9000	1811	851	0.86	38	990	1.27	36	1117	1.74	35	1239	2.24	34	1357	2.75	33	1480	3.30	32	1601	3.8																		

TCTS 36B6

Wheel Dia.: 36"

Outlet Area: 7.167 ft²

Tip Speed: 9.42 x RPM

Table with 12 columns (CFM, OV, 0.25" SP, 0.50" SP, 0.75" SP, 1" SP, 1.25" SP, 1.50" SP, 2" SP, 2.50" SP, 3" SP, 3.50" SP, 4" SP) and 24 rows of performance data.

Regular type face = Class I, max. RPM 1474

Bold type face = Class II, max. RPM 1895

TCTS 42B3

Wheel Dia.: 42"

Outlet Area: 9.794 ft²

Tip Speed: 11.00 x RPM

Table with 12 columns (CFM, OV, 0.25" SP, 0.50" SP, 0.75" SP, 1" SP, 1.25" SP, 1.50" SP, 1.75" SP, 2" SP, 2.25" SP, 2.50" SP, 3" SP) and 24 rows of performance data.

Regular type face = Class I, max. RPM 1272

Bold type face = Class II, max. RPM 1635

TCTS 48B4

Wheel Dia.: 48"

Outlet Area: 12.77 ft²

Tip Speed: 12.57 x RPM

Table with 12 columns (CFM, OV, 0.25" SP, 0.50" SP, 0.75" SP, 1" SP, 1.25" SP, 1.50" SP, 1.75" SP, 2" SP, 2.50" SP, 3" SP, 3.50" SP) and 24 rows of performance data.

Regular type face = Class I, max. RPM 1114

Bold type face = Class II, max. RPM 1431

TCTS 54B3

Wheel Dia.: 54"

Outlet Area: 16.12 ft²

Tip Speed: 14.14 x RPM

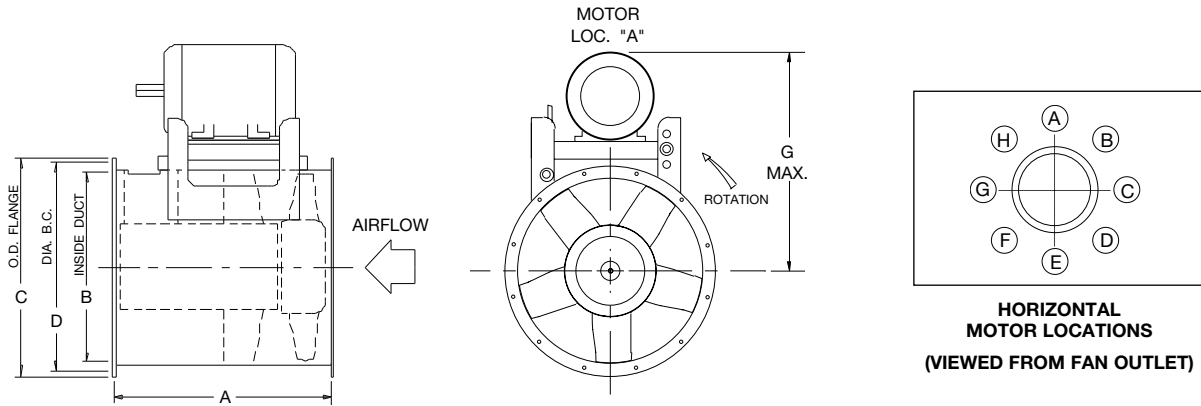
Table with 12 columns (CFM, OV, 0.25" SP, 0.50" SP, 0.75" SP, 1" SP, 1.25" SP, 1.50" SP, 1.75" SP, 2" SP, 2.50" SP, 3" SP, 3.50" SP) and 24 rows of performance data.

Regular type face = Class I, max. RPM 990

Bold type face = Class II, max. RPM 1273

Performance is for TCTS AXIFAN® units with inlet and outlet ducts. BHP shown is a fan shaft brake horsepower and does not include belt drive losses.

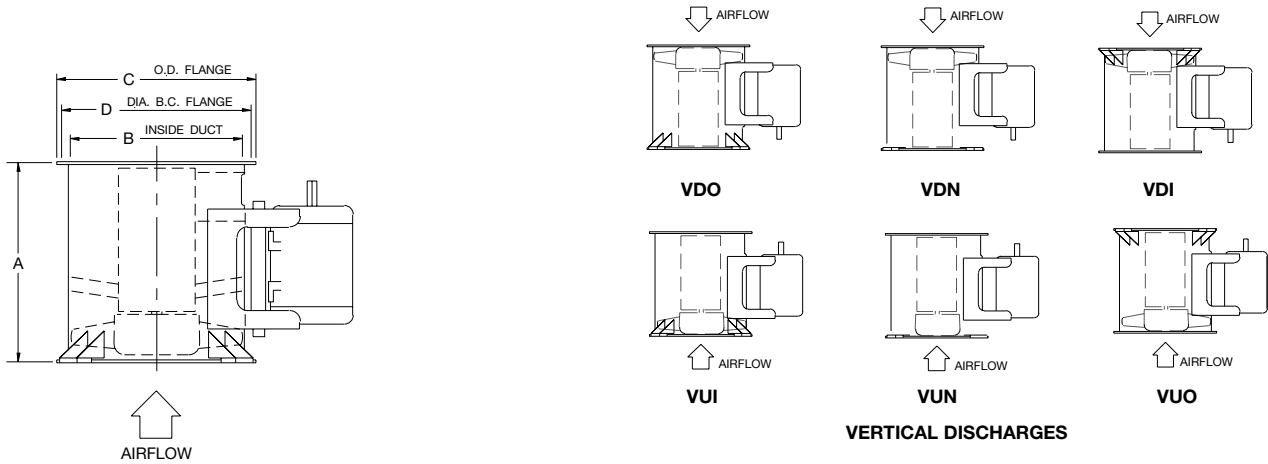
TCVS/TCTS



TCTS/TCVS 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



TCVS/TCTS ARR. 9 – VERTICAL

VERTICAL DISCHARGES

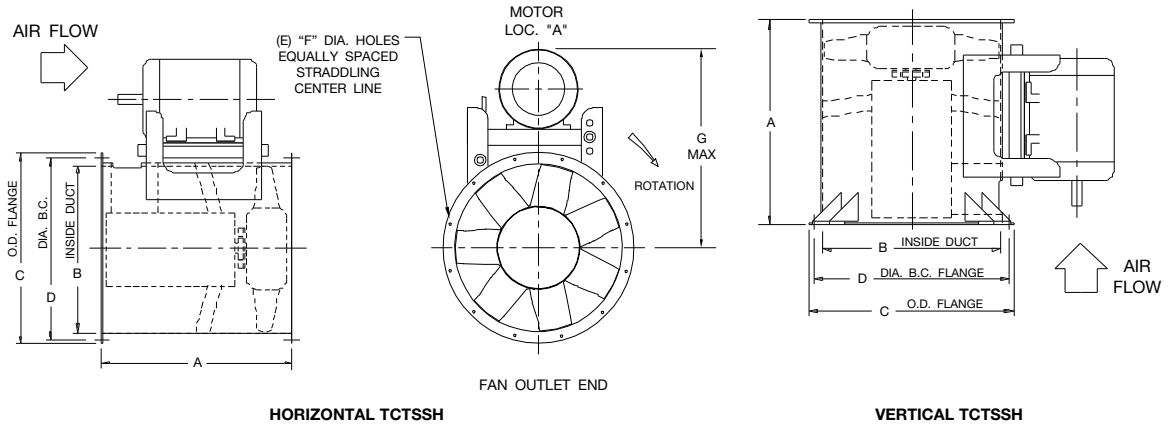
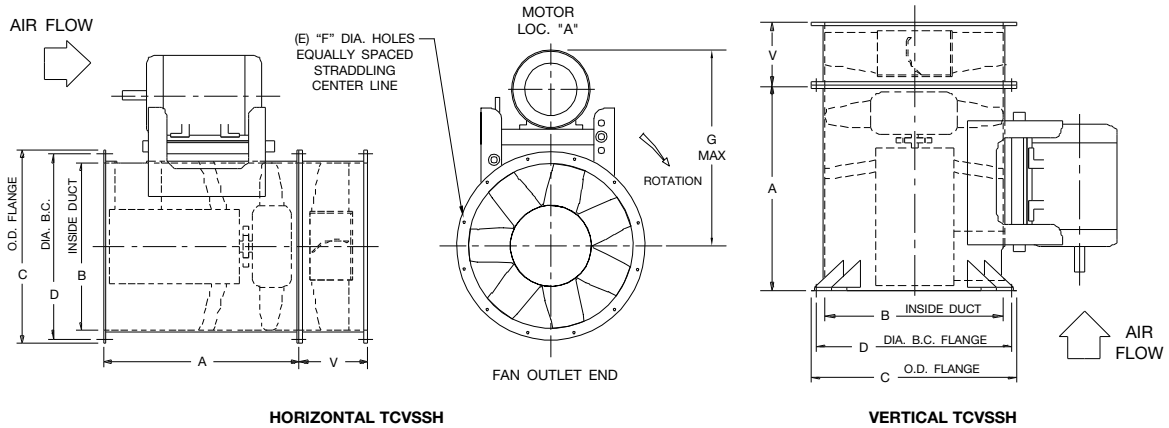
VDO = Vertical Down Floor Mounted With Legs **VUI** = Vertical Up Floor Mounted With Legs
VDN = Vertical Down Discharge Without Legs **VUN** = Vertical Up Discharge Without Legs
VDI = Vertical Down Ceiling Hung With Legs **VUO** = Vertical Up Ceiling Hung With Legs

FAN SIZE	A		B	C	D	G (MAX.)	MAXIMUM MOTOR FRAME
	HUB RATIO						
	3-5	6-7					
12	NA	24.50	12.16	15.16	13.88	19.25	184T
15	NA	27.00	15.16	18.16	16.88	20.50	215T
18	24.50	28.00	18.16	21.16	19.88	27.50	215T
21	27.00	32.00	21.19	24.19	22.88	31.75	256T
24	28.00	36.25	24.19	27.19	25.88	34.50	256T
28	32.00	40.25	28.25	31.25	30.00	38.25	286T
30	36.25	NA	30.25	33.25	32.00	39.75	286T
32	36.25	47.00	32.25	35.25	34.00	41.00	286T
36	40.25	53.25	36.25	39.25	38.00	45.25	326T
42	47.00	NA	42.38	46.38	44.63	49.50	326T
48	53.25	NA	48.38	52.38	50.63	53.25	365T
54	53.25	NA	54.38	58.38	56.63	59.00	365T

14685A
14688A

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

TCVSSH/TCTSSH



FAN SIZE	A		B	C	D	F	G (MAX.)	V		MAXIMUM MOTOR FRAME
	HUB RATIO							HUB RATIO		
	3-5	6-7						3-5	6-7	
12	NA	28.75	12.16	15.38	13.88	0.56	19.25	NA	10.50	184T
15	NA	28.75	15.16	18.38	16.88	0.56	20.50	NA	10.50	215T
18	28.75	33.75	18.16	21.16	19.88	0.56	27.50	10.50	10.50	215T
21	28.75	33.75	21.19	24.19	22.88	0.56	31.75	10.50	10.50	256T
24	33.75	42.00	24.19	27.19	25.88	0.56	34.50	10.50	10.50	256T
28	33.75	42.00	28.25	31.25	30.00	0.56	38.25	10.50	10.50	286T
30	42.00	NA	30.25	33.25	32.00	0.56	39.75	10.50	NA	286T
32	42.00	56.25	32.25	35.25	34.00	0.56	41.00	10.50	10.50	286T
36	42.00	56.25	36.25	39.25	38.00	0.56	45.25	10.50	10.50	326T
42	56.25	NA	42.38	46.38	44.63	0.69	49.50	10.50	NA	326T
48	56.25	NA	48.38	52.38	50.63	0.69	53.25	10.50	NA	365T
54	56.25	NA	54.38	58.38	56.63	0.69	59.00	10.50	NA	365T

1003106 1003108
1003107 1003109



Fans shall be Model TCVS Vaneaxial or TCTS Tubeaxial, fixed pitch, steel wheel AXIFANS®, 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.

PERFORMANCE — Fans shall be tested and rated in accordance with industry accepted test codes and shall be guaranteed by the manufacturer to deliver rated published performance levels. Models TCVS and TCTS shall be available UL/cUL 705 listed. Models TCVSSH and TCTSSH shall be UL listed for Smoke Control Systems (500°F for 4 hours and 1000°F for 15 minutes).

HOUSING — Housings shall be welded of 14 gauge ASTM A-569 hot rolled steel in size 12" diameter, 12 gauge hot rolled steel in sizes 15" through 21" diameter, 10 gauge hot rolled steel in sizes 24" through 36" diameter, and 7 gauge hot rolled steel in sizes 42" through 54" diameter. Inlet and outlet flanges shall be of welded angle ring construction in fan sizes 12" and 15" diameter. In sizes 18" through 54" diameter inlet and outlet flanges shall be integrally rolled mechanically from fan housing sheet steel to insure concentricity and alignment of flanges. Concentricity of housings shall be insured through the use of welding jigs and fixtures. A fabricated adjustable steel motor support platform of minimum $\frac{3}{16}$ " steel plate shall be provided to offer infinite adjustment of belt tension.

Housings shall be fitted with mounting legs, hanging clips, or flange mounted as shown on the drawings. Fan mounting legs and clips shall be fabricated from minimum 12 gauge steel plate suitably braced to insure stability and rigidity.

Models TCVSSH and TCTSSH shall include a belt tube for the protection of belts and drive components from the airstream and a bolted access door.

GUIDE VANES — On Model TCVS fans the housing 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. Guide vanes 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.

WHEEL — The wheel shall be a fabrication consisting of die-formed stamped steel blades of single-surface airfoil shape welded to a spun steel central hub. Precise blade attachment shall be insured through the use of welding jigs and fixtures. The ability to provide various factory-set blade angles ranging from 30° to 50° allows the highest possible latitude in selection and provides fan operation at the highest possible efficiency.

All wheels are statically and dynamically balanced prior to assembly. Fans with motors and drives mounted by Twin City Fan & Blower are test run as a complete assembly and rechecked for balance at the specified operating speed.

SHAFT — Shafts shall be AISI 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 — Bearings shall be heavy duty, grease lubricated, anti-friction flange 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 shall be provided with pre-filled factory extended lubrication lines terminating at the housing exterior to facilitate bearing relubrication without gaining access inside the ductwork.

DRIVE — 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) service factor based upon the required brake horsepower of the fan.

The complete fan shaft and bearing assembly shall be mounted within a steel fabricated inner cylinder. The V-belt drive assembly shall be extended through a two-piece belt fairing. The belt fairing shall be an aerodynamically shaped tube designed to maximize fan efficiency, minimize air blockage and reduce noise generation. The belt fairing shall be welded continuously to both the inner cylinder that houses the fan shaft and bearings and the fan housing, thus protecting and completely isolating the V-belt components from the direct blast of the airstream. Models TCVSSH and TCTSSH shall be equipped with a two-groove drive minimum.

MOTOR — Fan motors shall be manufactured in accordance with current applicable standards of IEEE and NEMA and, where applicable, shall meet current EPACT standards. They 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.

FINISH AND COATING — 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.

ACCESSORIES — When specified, accessories shall be provided by Twin City Fan & Blower to maintain one source responsibility.

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 TCVS and TCVSSH Vaneaxial or TCTS and TCTSSH Tubeaxial AXIFAN® Fans for 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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