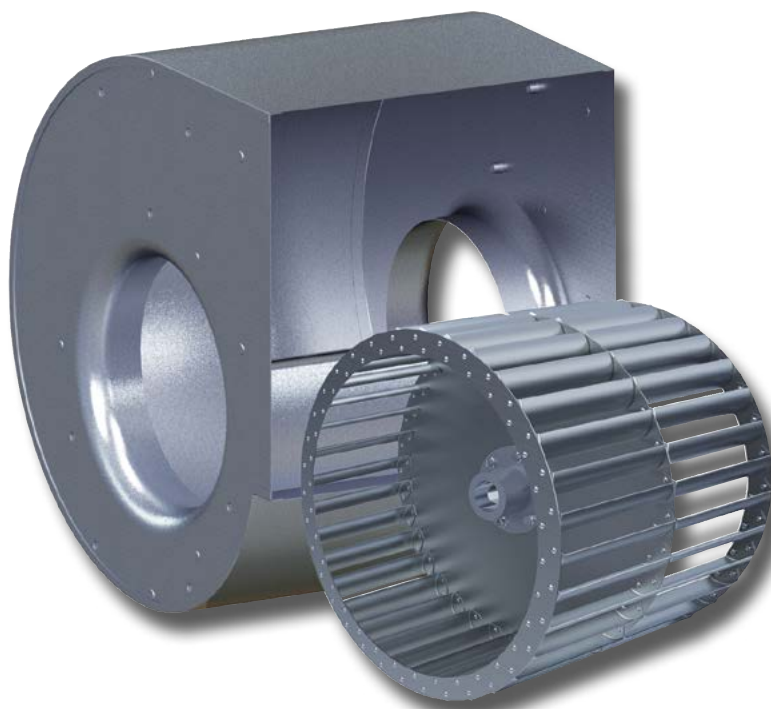


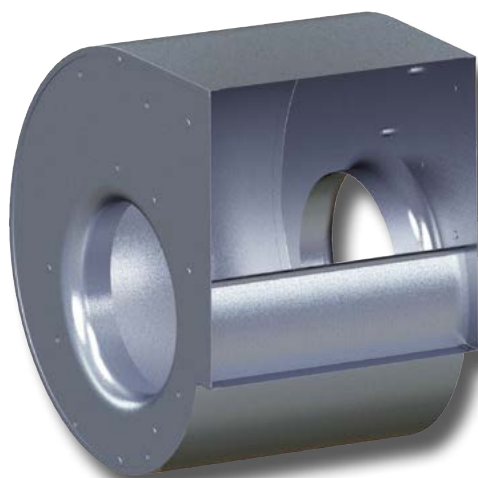


INDUSTRIAL PROCESS AND
COMMERCIAL VENTILATION SYSTEMS

AIR KITS

Model FC





Twin City Fan & Blower air kits are provided with the forward curve design in the double-width, double-inlet arrangement. This design allows for a low operating speed and economically sized shafting. These air kits provide reliable and quiet operation in ovens and plenums where it is not desirable to have the fan bearings in the airstream. The air kit design is commonly used to economically provide large volumes of air (up to 100,000 CFM) at static pressures up to 6" w.g. in a compact design.

Air kits may be supplied in two standard configurations:

1. The single fan kit has one fan impeller centered in the plenum.
2. The twin fan has two impellers spaced on a common shaft in such a way that the restriction is the same on all four inlets.

General Construction

Typically, air kits are sold as sets of components such as impellers, housings, shafts, bearings and other accessories (shaft coolers, cooler guards, shaft seals, recess cones and straightening vanes).

Construction may be a standard size oven with minimum recommended clearances between the fan inlets and the oven walls. It is assumed that a standard oven would have a 4" thick wall. Example 1 on page 3 and the charts on pages 7 through 10 are used for shaft selection and sizing of these standard units. Drawings on pages 11 and 12 illustrate the dimensions for single and twin fan designs.

Custom ovens are required at times, necessitating a larger or smaller clearance between the fan inlets and the oven walls. In these cases, the shafts may be longer than our standard design, and Example 2 on page 4, along with the charts on pages 7 through 10, should be used to properly select and size the shaft. Bearings sizing and selection is shown on page 6.

Fan housing cut-off plates are bolted in to allow for installation and removal of the fan impeller.

Overview

FC

Impeller Construction

Air kit impellers are designed for speeds up to 7,000 ft/min. at 70°F. The blades are die-formed from high strength, low alloy steel and are riveted and welded to the end rings and centerplate.

Balancing of Air Kit Impellers

Air kit parts manufactured by Twin City Fan & Blower carry our standard warranty against defects in workmanship and materials.

Air kit impellers are carefully balanced at the factory to the following limits:

Impeller Diameter	Maximum Grams of Unbalance at Impeller Outside
12"	2 grams
15"	3 grams
18 – 48"	6 grams

Air kit components are sold as parts to be installed by customers in their units. Therefore, the OEM customer is responsible for the final balance. Factors such as stiffness and mass of the supporting structures, fit between shaft and bearings, fit between shaft and impeller, shaft straightness, unbalance and numerous other factors may affect the overall balance and are beyond Twin City Fan & Blower's control. TCF recommends that the OEM customer check and correct (if required) the final balance of the running assembly. TCF will not accept any back charges associated with final balancing.

If a customer suspects a impeller to be out of balance, it should be returned to the factory, freight prepaid. TCF will then recheck the balance and make corrections, if necessary. If the unbalance is found to be beyond the tolerances listed above, TCF will pay freight charges (by common carrier) both ways. TCF does not assume any other liabilities.

Customers with recurring problems are advised to discuss their applications with TCF engineering personnel.

Housing Construction

All air kit housings are seam-welded to insure a tight seam under elevated temperatures. Housings are usually furnished without side bracing (frame angles), and it is the customer's responsibility to rigidly support housings so that sides do not distort with pressure and temperature in their equipment. Housings are supplied with inlet funnels and removable cut-offs.

Overview

FC

Standard Unit Selection

Example 1

An air kit is required for an oven that needs 24,200 CFM at 2.5" static pressure at 70°F. The design temperature is 600°F. The oven wall will have 4" of insulation and the outside oven width is approximately 103".

1. Refer to the performance tables in our Fan Selector software and select the best size and number of fans to be used for the specified performance. In this instance, the best selection appears to be a Size 24 twin fan assembly. (Refer to the Size 24 performance in our Fan Selector software.) These fans will deliver 12,100 CFM per fan against 2.5" static pressure when operating at 707 RPM. The BHP is 9.05 per fan and the outlet velocity will be 2,200 ft/min.
2. Next, determine the proximity factors for the inlet/wall clearance and the point of operation. Standard single fan and twin fan air kit assembly drawings are shown on pages 12 and 13. These should be used whenever they fit the application. The Size 24 twin fan assembly shown on page 12 matches the outside oven width required (103.25") and can be used. The clearance between the oven wall and fan housing is calculated. This is found to be 8". The inlet/wall clearance in percent of impeller diameter is equal to:

$$8" (\text{clearance}) \div 24" (\text{impeller dia.}) \times 100 = 33\frac{1}{3}\%$$

All of the standard assembly drawings are based on an inlet/wall clearance of 33 $\frac{1}{3}$ % impeller diameter.

The operating point in percent of Wide Open Volume (WOV) is found by first determining WOV. This is determined by multiplying the WOV factors from the table on page 8 by the RPM determined in Step 1. The WOV factor for a Size 24 fan is 41.1:

$$\text{WOV} = 707 \times 41.1 = 29,058 \text{ CFM}$$

The operating percent of WOV is then equal to the design CFM per fan (12,100) divided by the WOV value (29,058).

$$12,100 \div 29,058 = 41.6\%$$

The proximity factors for 33 $\frac{1}{3}$ % impeller clearance and 41.6% WOV operating point are shown on page 8. By extrapolation we find them to be 1.02 for RPM and 1.11 for BHP. The operating RPM and BHP for the specified capacity are then:

$$\begin{aligned} 707 \text{ RPM} \times 1.02 &= 721 \text{ RPM} \\ 9.05 \text{ BHP} \times 1.11 &= 10.0 \text{ BHP} \end{aligned}$$

3. The safe impeller speed must now be checked for the design operating temperature. Safe impeller speeds at 70°F are shown on page 8. The 70°F safe impeller speed of a Size 24 impeller is 1,114 RPM. The impeller temperature

derating factor from the table on page 8 for a steel impeller is 0.904 for 600°F. The safe operating speed for a Size 24 impeller at 600°F is therefore:

$$1,114 \text{ RPM} \times 0.904 = 1,007 \text{ RPM}$$

This is well above the 721 RPM required.

The shaft's temperature derating factor is taken from the table on page 8. It is 0.94 for 600°F.

Examining the constructions available for a Size 24 twin fan assembly, from drawing AC12892 on page 12 we find that the allowable speeds at 600°F for the various constructions are:

$$\begin{aligned} \text{Shaft Design A} &= 641 \text{ RPM} \times 0.94 = 602 \text{ RPM} \\ \text{Shaft Design B} &= 768 \text{ RPM} \times 0.94 = 722 \text{ RPM} \\ \text{Shaft Design C} &= 953 \text{ RPM} \times 0.94 = 896 \text{ RPM} \end{aligned}$$

Shaft Design B can therefore be used for an operating speed of 721 RPM.

Should a standard air kit assembly from either page 12 or 13 not be used, the shaft size and safe shaft speed must be selected from the shaft selection tables shown on pages 7 through 10. (See Example 2 on page 4.)

4. The shaft expansion can be calculated from the formula:

$$\begin{aligned} \text{Expansion} &= 0.0000067 \times \text{temp. rise (600-70°F)} \\ &\quad \times \text{bearing span (106.75")} \\ \text{Expansion} &= 0.379" \end{aligned}$$

CAUTION: Should customers wish to supply their own expansion type bearings, the expansion capability of the bearing selected must exceed 0.379". Various bearing types and manufacturers have different expansion capabilities.

Twin City Fan & Blower recommends that the high temperature shaft expansion modification explained on page 4 be used for all high temperature applications.

Referring to the bearing selection table on page 6, we find that for a construction B shaft, 3 $\frac{7}{16}$ " turned down to 2 $\frac{7}{16}$ ", the standard duty 2 $\frac{7}{16}$ " ball bearing is good up through a 30 HP motor. This application would not have a motor greater than 25 HP. Since the design temperature is greater than 300°F, shaft coolers will be required.

Summary

The air kit selected for this application will be:

1. A standard Size 24 twin fan assembly, with shaft design B per drawing AC12892 (page 12).
2. High temperature shaft expansion modification.
3. Shaft coolers.
4. Standard 2 $\frac{7}{16}$ " ball bearings.

SIZE & PERFORMANCE

Selection of Custom Size Units

Example 2

If in the previous example the outside oven width had been 129" instead of 103", the standard Size 24 twin fan assembly could not have been selected. The procedure for selecting an air kit in this situation would be:

1. Step 1 would be the same. A Size 24 twin fan assembly would be the best selection operating at 707 RPM, 2,200 ft/min. outlet velocity and requiring 9.05 BHP per fan.
2. The proximity factors for the inlet/wall clearance would change because the clearance would now increase. The clearance calculates to be 14.438" using the 129" oven width, 4" of insulation width and the 31.625" housing width for a Size 24 fan (drawing AC12892, page 12). The wall clearance/impeller diameter ratio is now:

$$(14.438 \div 24) \times 100 = 60\%$$

The percent of WOV would remain the same as in the previous example (41.6% WOV). The proximity factors for a 60% impeller diameter clearance and a 41.6% WOV operating point are shown in the chart on page 8. These factors are 1.01 for RPM and 1.03 for BHP. The operating RPM and BHP will then be:

$$\begin{aligned} 707 \text{ RPM} \times 1.01 &= 714 \text{ RPM} \\ 9.05 \text{ BHP} \times 1.03 &= 9.32 \text{ BHP/fan} \end{aligned}$$

3. The safe impeller speed is checked for the design operating temperature in the same way as in the previous example and is found to be 1007 RPM, which is well above the 714 RPM required.
4. The shaft is selected as follows. The shaft's temperature derating factor is taken from the table on page 8. This is 0.94 for 600°F (the same as in the previous example).

The shaft diameter must be selected for a speed equal to 714 RPM (operating speed) $\div$ 0.94 (shaft derating factor) = 760 RPM.

The bearing span is equal to the outside oven width plus approximately 3". (Use drawing AC12892 as a guide.) The designed bearing span is then 132". Referring to the Size 24 twin fan shaft selection table on page 9 for a 132" bearing span and a required 760 RPM, we find by interpolation that a $4\frac{7}{16}$ " shaft is good up to 753 RPM and a $4\frac{15}{16}$ " shaft is good up to 863 RPM. A $4\frac{15}{16}$ " shaft is therefore required for 760 RPM.

5. Referring to the shaft turndown and bearing selection chart on page 6, we find that a $4\frac{15}{16}$ " shaft, turned down to $2\frac{15}{16}$ ", and with standard duty $2\frac{15}{16}$ " ball bearings will be adequate for a 20 or 25 HP motor application. The shaft expansion will be:

$$\begin{aligned} \text{Expansion} &= 0.0000067 \times \text{temp. rise (600}^\circ - 70^\circ\text{F)} \\ &\quad \times \text{bearing span (132")} \end{aligned}$$

$$\text{Expansion} = 0.469"$$

The high temperature shaft expansion modification as explained below must be used and shaft coolers will also be necessary.

Summary

The air kit selected for this non-standard assembly will be:

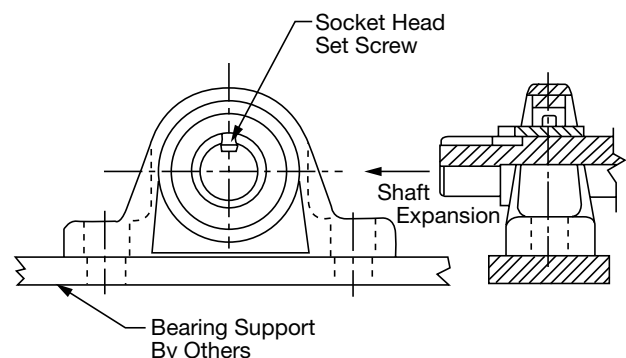
1. Two standard Size 24 air kit impellers with $4\frac{15}{16}$ " bores.
2. A $4\frac{15}{16}$ " shaft, turned down to $2\frac{15}{16}$ " for drive and bearings.
3. High temperature shaft expansion modification.
4. Shaft coolers.
5. Standard duty $2\frac{7}{16}$ " ball bearings.

HIGH TEMPERATURE SHAFT EXPANSION MODIFICATION

For high temperature applications the "floating end" of the shaft (side opposite the drive) should use the following modification.

Standard set screws are to be removed and then a socket head setscrew must be inserted from inside of bearing bore. Use anaerobic adhesive on the threads to prevent the screw from loosening.

Machine a keyway to fit the head screw size in the floating end of the shaft. The setscrew will slide in the keyway allowing a shaft expansion up to 1 inch.



Bearing Selection Chart

MOTOR HP	BEARING SIZE													
	1"	1 ³ / ₁₆ "	1 ⁷ / ₁₆ "	1 ¹¹ / ₁₆ "	1 ¹⁵ / ₁₆ "	2 ³ / ₁₆ "	2 ⁷ / ₁₆ "	2 ¹¹ / ₁₆ "	2 ¹⁵ / ₁₆ "	3 ⁷ / ₁₆ "	3 ¹⁵ / ₁₆ "	4 ⁷ / ₁₆ "	4 ¹⁵ / ₁₆ "	
THRU 7 1/2	SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB	
10	→	SDB	SDB	SDB	SDB	SDB	SDB	SDB	SDB 1 15/16	SDB 2 3/16	SDB 2 7/16	SDB 2 11/16	SDB 2 15/16	
15		→	SDB	SDB	SDB	SDB	SDB	SDB	SDB 1 15/16	SDB 2 3/16	SDB 2 7/16	SDB 2 11/16	SDB 2 15/16	
20			→	SDB	SDB	SDB	SDB	SDB	SDB 1 15/16	SDB 2 3/16	SDB 2 7/16	SDB 2 11/16	SDB 2 15/16	
25			→	HDB	HDB	SDB	SDB	SDB	SDB 1 15/16	SDB 2 3/16	SDB 2 7/16	SDB 2 11/16	SDB 2 15/16	
30				→	HDB	HDB	SDB	SDB	SDB 2 7/16	SDB 2 7/16	SDB 2 7/16	SDB 2 11/16	SDB 2 15/16	
40				→	R	R	HDB	HDB	HDB 2 7/16	HDB 2 7/16	HDB 2 7/16	HDB 2 11/16	SDB 2 15/16	
50					→	R	R	HDB	R 2 3/16	R 2 3/16	R 2 7/16	R 2 11/16	HDB 2 15/16	
60						→	R	R	R 2 7/16	R 2 7/16	R 2 7/16	R 2 11/16	HDB 2 15/16	
75							→	R	R	R 2 11/16	R 2 11/16	R 2 11/16	R 2 15/16	
100								→	R	R 2 15/16	R 2 15/16	R 2 15/16	R 2 15/16	

KEY:

SDB = Standard duty ball bearings such as SKF type SY or equivalent
HDB = Heavy-duty ball bearings such as SealMaster type MP or equivalent
R = Roller bearings such as SKF type SYR or Link Belt PB 22400 or equivalent

The bearing size is the same as the shaft size except minimum turndown diameters for bearings are shown for shafts 2¹⁵/₁₆" diameter and larger. For example, a 3¹⁵/₁₆" diameter shaft at the impeller may be turned down to 2⁷/₁₆" diameter at the bearings ends for under 60 HP application.



For complete product performance, drawings and available accessories, download our Fan Selector software at tcf.com.

OPTIONS / ACCESSORIES

- Shafts** are solid steel, type AISI 1040 or 1045, turned, ground and polished. Larger shafts are normally turned down at the ends for bearings and shaft coolers.
- Shaft Coolers** Split cast aluminum shaft coolers are recommended for temperatures over 300°F. Shaft coolers help disperse heat being conducted down the shaft and provide air over the bearings for a cooling effect.
- Shaft Cooler Guard** A split type guard with expanded metal can be used with shaft coolers and is designed to be used with recess cone only.
- Recess Cone** To minimize bearing spans, the shaft cooler (and/or shaft seal) can be recessed inside the oven wall with a spun recess cone only.
- Shaft Seals** A gasket type seal with close clearance aluminum cover plate provides for low leakage of air into the system.
- Straightening Vanes** In some cases, plenums may have an air spin induced at the inlet of the fan, thus reducing the fan performance. Straightening vanes alleviate the spin by producing uniform airflow in the inlet of the fan and allowing full performance potential of these units.
- Bearings** Ball and unit roller bearings are available. Refer to chart above for proper bearing selection.

Proximity Factors

% WOV	WALL CLEARANCE IN PERCENT OF IMPELLER DIAMETER							
	33 1/3%		40%		50%		80% & ABOVE	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
40	1.02	1.10	1.02	1.07	1.01	1.03	1.00	1.00
50	1.03	1.14	1.03	1.10	1.02	1.05	1.00	1.00
60	1.05	1.18	1.05	1.13	1.02	1.07	1.00	1.00
70	1.07	1.23	1.06	1.18	1.03	1.08	1.00	1.00
80	1.11	1.29	1.07	1.22	1.03	1.09	1.00	1.00
90	1.14	1.36	1.07	1.24	1.04	1.11	1.00	1.00
95	1.16	1.43	1.08	1.25	1.04	1.12	1.00	1.00

WOV Factors

FAN SIZE	WOV FACTOR
12	5.1
15	9.9
18	17.2
21	27.5
24	41.1
27	59.4
30	81.5
33	108.5
36	145.3
39	184.7
42	230.7
48	344.4

Air Density Factors For Various Temperatures & Altitudes

Unit Basis = Standard Air Density of 0.075 lb/ft³

At sea level (29.92 in. Hg barometric pressure), this is equivalent to dry air at 70°F.

AIR TEMP °F	ALTITUDE IN FEET ABOVE SEA LEVEL											
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	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
-50	1.293	1.247	1.201	1.159	1.116	1.076	1.036	.997	.960	.924	.889	.729
0	1.152	1.111	1.071	1.032	.995	.959	.923	.889	.856	.824	.792	.650
50	1.039	1.003	.967	.932	.897	.864	.833	.801	.772	.743	.715	.586
70	1.000	.964	.930	.896	.864	.832	.801	.772	.743	.714	.688	.564
100	.946	.912	.880	.848	.818	.787	.758	.730	.703	.676	.651	.534
150	.869	.838	.808	.770	.751	.723	.696	.671	.646	.620	.598	.490
200	.803	.774	.747	.720	.694	.668	.643	.620	.596	.573	.552	.453
250	.747	.720	.694	.669	.645	.622	.598	.576	.555	.533	.514	.421
300	.697	.672	.648	.624	.604	.580	.558	.538	.518	.498	.480	.393
350	.654	.631	.608	.586	.565	.544	.524	.505	.486	.467	.450	.369
400	.616	.594	.573	.552	.532	.513	.493	.476	.458	.440	.424	.347
450	.582	.561	.542	.522	.503	.484	.466	.449	.433	.416	.401	.328
500	.552	.532	.513	.495	.477	.459	.442	.426	.410	.394	.380	.311
550	.525	.506	.488	.470	.454	.437	.421	.405	.390	.375	.361	.296
600	.500	.482	.465	.448	.432	.416	.400	.386	.372	.352	.344	.282
650	.477	.460	.444	.427	.412	.397	.382	.368	.354	.341	.328	.269
700	.457	.441	.425	.410	.395	.380	.366	.353	.340	.326	.315	.258
750	.439	.423	.407	.393	.379	.365	.351	.338	.326	.313	.303	.248
800	.420	.404	.389	.375	.362	.350	.336	.323	.311	.300	.290	.237
850	.404	.391	.376	.363	.349	.336	.324	.312	.300	.289	.279	.228
900	.389	.376	.363	.349	.336	.324	.312	.300	.289	.279	.268	.220
950	.376	.363	.350	.337	.325	.313	.301	.290	.279	.269	.259	.212
1000	.363	.350	.338	.325	.314	.302	.291	.280	.270	.259	.250	.205

NOTE: The fan performance found in our Fan Selector software is based on standard air density, which is 0.075 lb/ft³. When desired performance is at other than standard conditions, it must be converted to equivalent standard conditions before selecting fans from the performance tables.

Derating Factors For High Temperature

TEMP. (°F)	IMPELLER DERATING (RPM)		SHAFT STANDARD STEEL
	STEEL	STAINLESS	
70	1.000	0.94	1.00
200	0.990	0.89	0.99
300	0.975	0.86	0.98
400	0.955	0.83	0.97
500	0.930	0.79	0.96
600	0.904	0.76	0.94
700	0.880	0.73	0.93
800	0.837	0.71	0.92
900	—	0.69	—
1000	—	0.66	—

When elevated temperatures are encountered, maximum RPM shown in the table at right must be derated according to this table. Standard steel construction is not suitable for use in gas temperature over 800°F. Aluminum impellers are suitable for use up to 250°F only.

Max. Safe Impeller Speed at 70°F

SIZE	MAX. IMPELLER RPM @ 70°F
12	2228
15	1783
18	1485
21	1273
24	1114
27	990
30	891
33	810
36	743
39	686
42	637
48	557

Single Fan Assembly

Size 12

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM												
	1" SHAFT	1 ³ / ₁₆ " SHAFT	1 ⁷ / ₁₆ " SHAFT	1 ¹¹ / ₁₆ " SHAFT	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
20	2967	4107	—	—	—	—	—	—	—	—	—	—	—
30	1579	2170	2970	—	—	—	—	—	—	—	—	—	—
40	1002	1368	1858	2279	2884	—	—	—	—	—	—	—	—
50	702	951	1283	1569	1971	2389	2435	NA	NA	—	—	—	—
60	522	704	944	1151	1436	1731	1779	2074	NA	—	—	—	—
70	—	544	726	883	1095	1313	1359	1578	1800	2250	2702	—	—
80	—	—	576	700	864	1031	1073	1241	1412	1755	2099	2365	2636
90	—	—	—	570	700	832	870	1003	1137	1407	1677	1890	2108
100	—	—	—	—	578	685	720	828	936	1154	1370	1545	1723
110	—	—	—	—	—	575	606	695	784	963	1141	1286	1434
120	—	—	—	—	—	—	517	592	666	816	964	1087	1213

Size 15

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM												
	1" SHAFT	1 ³ / ₁₆ " SHAFT	1 ⁷ / ₁₆ " SHAFT	1 ¹¹ / ₁₆ " SHAFT	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
30	1362	1884	2620	—	—	—	—	—	—	—	—	—	—
40	870	1197	1653	2072	—	—	—	—	—	—	—	—	—
50	612	837	1149	1436	1817	2219	2313	—	—	—	—	—	—
60	—	624	851	1060	1333	1618	1697	1985	2281	—	—	—	—
70	—	—	658	817	1022	1234	1300	1515	1735	2181	—	—	—
80	—	—	526	651	810	974	1030	1196	1365	1706	2049	—	—
90	—	—	—	531	659	789	837	969	1102	1371	1641	1858	2078
100	—	—	—	—	546	652	694	801	909	1126	1343	1521	1701
110	—	—	—	—	—	549	585	674	763	942	1120	1268	1418
120	—	—	—	—	—	—	500	575	650	799	943	1073	1199

Size 18

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM										
	1 ⁷ / ₁₆ " SHAFT	1 ¹¹ / ₁₆ " SHAFT	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
30	2232	—	—	—	—	—	—	—	—	—	—
40	1419	1821	—	—	—	—	—	—	—	—	—
50	995	1271	1622	1997	—	—	—	—	—	—	—
60	741	944	1199	1468	1580	1857	—	—	—	—	—
70	577	732	925	1128	1216	1425	1638	1823	—	—	—
80	463	586	737	895	967	1129	1294	1446	1782	—	—
90	—	481	602	729	789	918	1049	1176	1443	1646	—
100	—	—	502	605	656	762	868	976	1193	1360	1549
110	—	—	—	511	555	642	731	823	1003	1143	1300
120	—	—	—	—	476	549	624	704	855	974	1106
130	—	—	—	—	—	475	539	609	737	840	953

Size 21

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM										
	1 ⁷ / ₁₆ " SHAFT	1 ¹¹ / ₁₆ " SHAFT	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
40	1328	1718	—	—	—	—	—	—	—	—	—
50	933	1203	1539	—	—	—	—	—	—	—	—
60	697	895	1141	1402	1525	—	—	—	—	—	—
70	543	696	883	1080	1177	1382	1592	—	—	—	—
80	437	558	705	859	938	1097	1260	1420	—	—	—
90	—	459	577	701	766	893	1024	1156	1422	—	—
100	—	—	482	584	638	742	848	960	1176	1345	—
110	—	—	—	494	540	627	715	811	990	1131	1288
120	—	—	—	—	464	537	611	694	844	964	1097
130	—	—	—	—	—	465	528	601	729	832	945

Single Fan Assembly

Size 24

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM									
	1 ¹¹ / ₁₆ " SHAFT	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ¹ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
50	1030	1329	—	—	—	—	—	—	—	—
60	771	992	1157	1401	—	—	—	—	—	—
70	602	772	900	1086	1281	—	—	—	—	—
80	486	620	722	869	1022	1179	1356	—	—	—
90	401	511	594	712	835	961	1107	1368	—	—
100	—	428	498	595	696	800	922	1134	1305	—
110	—	—	424	505	590	676	780	956	1100	1258
120	—	—	—	435	506	579	669	817	939	1073
130	—	—	—	—	440	502	580	707	811	926
140	—	—	—	—	—	439	508	617	708	807

Size 27

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM									
	1 ¹¹ / ₁₆ " SHAFT	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ¹ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
50	1382	1795	—	—	—	—	—	—	—	—
60	732	943	1109	—	—	—	—	—	—	—
70	572	736	864	1045	1235	—	—	—	—	—
80	462	592	695	837	987	1142	—	—	—	—
90	—	488	572	687	808	932	1083	—	—	—
100	—	410	480	575	675	777	903	1114	—	—
110	—	—	409	489	572	657	764	940	1084	—
120	—	—	—	422	492	564	656	804	926	1060
130	—	—	—	—	428	489	569	696	801	916
140	—	—	—	—	—	429	499	608	699	799

Size 30

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM								
	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ¹ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
60	763	938	—	—	—	—	—	—	—
70	598	734	895	1026	—	—	—	—	—
80	484	593	721	826	966	—	—	—	—
90	401	491	595	681	795	993	—	—	—
100	—	414	500	572	666	830	—	—	—
110	—	354	428	489	568	706	876	—	—
120	—	—	370	422	490	608	752	876	—
130	—	—	—	369	427	529	652	759	874
140	—	—	—	—	376	465	572	665	764

Size 33

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM							
	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
70	692	844	975	—	—	—	—	—
80	559	682	786	920	—	—	—	—
90	463	563	649	759	955	—	—	—
100	391	475	576	737	800	999	—	—
110	—	428	489	568	706	876	—	—
120	—	352	404	470	587	729	853	—
130	—	—	353	410	512	633	740	855
140	—	—	—	362	450	556	649	748

Size 36

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM							
	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
70	589	723	867	—	—	—	—	—
80	478	586	701	825	—	—	—	—
90		486	581	682	881	—	—	—
100		411	490	575	740	904	—	—
110	—		420	492	632	770	—	—
120	—		365	426	546	665	805	—
130	—	—	320	373	477	580	701	815
140	—	—	—	330	421	510	615	715

Twin Fan Assembly

Size 12

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM											
	1 ³ / ₁₆ " SHAFT	1 ⁷ / ₁₆ " SHAFT	1 ¹¹ / ₁₆ " SHAFT	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
50	802	1096	1349	1721	2118	2120	2511	2922	—	—	—	—
60	608	826	1014	1284	1569	1584	1868	2162	2774	—	—	—
70	—	647	792	996	1210	1232	1445	1665	2118	2581	—	—
80	—	521	637	796	962	986	1152	1322	1669	2021	2277	3174
90	—	—	524	651	783	808	940	1075	1348	1624	1831	2043
100	—	—	—	543	650	674	782	891	1112	1333	1504	1678
110	—	—	—	—	548	571	660	750	932	1114	1256	1402
120	—	—	—	—	—	—	565	641	793	944	1065	1188
130	—	—	—	—	—	—	—	554	682	811	914	1020

Size 15

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM											
	1 ³ / ₁₆ " SHAFT	1 ⁷ / ₁₆ " SHAFT	1 ¹¹ / ₁₆ " SHAFT	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
50	697	969	1220	1565	1936	1994	2368	—	—	—	—	—
60	532	735	922	1175	1446	1498	1772	2057	—	—	—	—
70	—	579	724	918	1122	1170	1377	1591	2035	—	—	—
80	—	—	585	738	897	940	1101	1268	1610	1959	—	—
90	—	—	—	606	734	772	901	1034	1305	1580	1791	2005
100	—	—	—	508	612	646	752	860	1079	1300	1474	1650
110	—	—	—	—	518	549	637	726	907	1089	1233	1381
120	—	—	—	—	—	—	546	621	773	925	1047	1172
130	—	—	—	—	—	—	—	538	666	795	900	1007

Size 18

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM											
	1 ⁷ / ₁₆ " SHAFT	1 ¹¹ / ₁₆ " SHAFT	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT	
60	631	810	1040	1289	1379	1637	—	—	—	—	—	
70	500	640	818	1009	1082	1279	1485	1635	—	—	—	
80	—	520	662	812	873	1029	1189	1316	1644	—	—	
90	—	—	547	668	720	846	974	1083	1346	1538	1759	
100	—	—	460	560	605	708	813	907	1122	1281	1466	
110	—	—	—	477	516	601	689	771	949	1081	1238	
120	—	—	—	—	—	517	591	663	814	929	1060	
130	—	—	—	—	—	450	513	577	705	805	917	
140	—	—	—	—	—	—	450	506	617	704	801	

Size 21

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM										
	1 ⁷ / ₁₆ " SHAFT	1 ¹¹ / ₁₆ " SHAFT	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
70	469	605	776	960	1042	1234	1435	—	—	—	—
80	—	493	629	775	843	995	1152	1289	—	—	—
90	—	410	521	639	697	819	946	1062	1273	1514	—
100	—	—	440	537	586	687	791	890	1103	1264	1449
110	—	—	—	458	500	585	671	757	935	1070	1225
120	—	—	—	395	432	504	577	652	802	918	1049
130	—	—	—	—	—	439	501	568	696	796	908
140	—	—	—	—	—	386	440	499	609	696	794

Size 24

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM									
	1 ¹¹ /16" SHAFT	1 ¹⁵ /16" SHAFT	2 ³ /16" SHAFT	2 ⁷ /16" SHAFT	2 ¹¹ /16" SHAFT	2 ¹⁵ /16" SHAFT	3 ⁷ /16" SHAFT	3 ¹⁵ /16" SHAFT	4 ⁷ /16" SHAFT	4 ¹⁵ /16" SHAFT
80	424	546	637	773	916	1066	1221	—	—	—
90	354	455	530	641	758	879	1009	1262	—	—
100	—	385	449	541	638	738	849	1057	1220	—
110	—	331	386	464	545	629	724	897	1035	1190
120	—	—	335	402	471	542	625	772	889	1021
130	—	—	—	—	411	473	545	671	772	885
140	—	—	—	—	362	416	480	589	677	775

Twin Fan Assembly

Size 27

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM								
	1 ¹⁵ / ₁₆ " SHAFT	2 ³ / ₁₆ " SHAFT	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
100	367	431	521	616	714	828	1034	—	—
110	—	371	447	526	609	707	879	1017	—
120	—	323	388	456	526	611	757	875	1007
130	—	—	340	399	459	534	659	761	874
140	—	—	301	352	404	470	578	667	765

Size 30

BRG. SPAN (IN.)	MAXIMUM SHAFT RPM						
	2 ⁷ / ₁₆ " SHAFT	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
120	336	385	449	560	700	819	891
130	—	338	394	491	611	714	827
140	—	300	349	434	538	628	726

Size 33

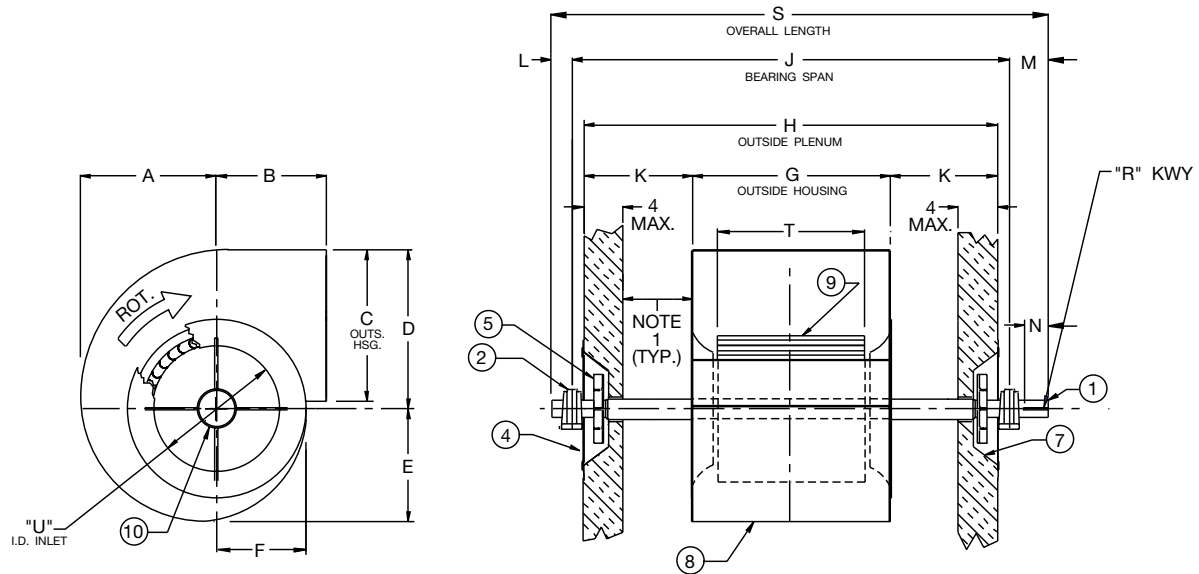
BRG. SPAN (IN.)	MAXIMUM SHAFT RPM					
	2 ¹¹ / ₁₆ " SHAFT	2 ¹⁵ / ₁₆ " SHAFT	3 ⁷ / ₁₆ " SHAFT	3 ¹⁵ / ₁₆ " SHAFT	4 ⁷ / ₁₆ " SHAFT	4 ¹⁵ / ₁₆ " SHAFT
130	323	376	473	591	694	806
140	—	334	418	521	611	709



ENERGY REGULATIONS

Twin City Fan & Blower supports energy efficiency regulations enacted by the U.S. Department of Energy (DOE) and specific states. The selection and application of fan products is a significant part of these regulations. Engineers and specifiers must understand how to apply TCF products to their specific applications to meet applicable DOE and state regulatory requirements. Twin City Fan & Blower has made significant investments in product testing and development to provide efficient products. Developments in Twin City Fan & Blower's Fan Selector software are in place to aid your decision in product selection to assist with meeting the efficiency requirements as stipulated in the applicable regulations.

Single Fan Assembly



BILL OF MATERIALS				
ITEM	DESCRIPTION	DWG.	FURN. BY	
			TCF	OTHER
1	SHAFT "P" DIAMETER WITH "Q" DIAMETER TURNDOWN			
2	BEARING "Q" DIAMETER			
3	HIGH-EXPANSION BEARING MODIFICATION	BC12895		
4	COOLER GUARD	BS12895		
5	SHAFT COOLER "Q" BORE	BS12895		
6	SHAFT SEAL (NOT SHOWN)	BS12895		
7	RECESS CONE	BS12895		
8	HOUSING	SHOWN		
9	IMPELLER	SHOWN		
10	STRAIGHTENING VANES	BS12895		
11	MOTOR			
12	V-BELT DRIVE			

NOTES:

1. CLEARANCE = "K" MINUS INSULATION THICKNESS.
2. MAX. RPM = 100 HP

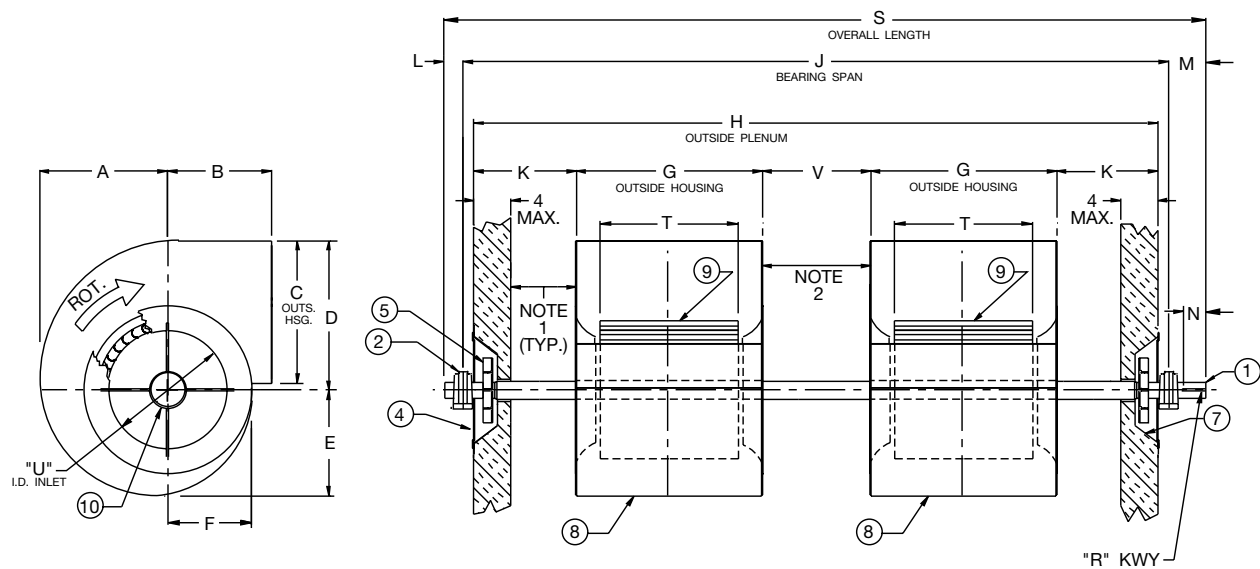
FAN SIZE	IMPELLER DIA.	MAX RPM
12	12.25	2228
15	15.25	1783
18	18.25	1485
21	21.25	1273
24	24.00	1114
27	27.00	990
30	30.00	891
33	33.00	810
36	36.25	743
39	39.25	686
42	42.25	637
48	48.25	515

FAN SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U
12	11.13	9.38	12.50	12.88	9.38	7.75	16.25	32.25	34.25	8	1.50	5.00	2.5	1.437	1.437	.38x.19	40.75	12.00	9.94
15	13.88	11.13	16.00	16.25	11.50	9.13	20.25	38.25	40.25	9	1.69	5.19	2.5	1.687	1.687	.38x.19	47.13	15.00	12.31
18	16.56	13.25	18.50	19.44	13.69	10.81	23.50	43.50	46.00	10	1.81	7.31	4.0	2.187	2.187	.50x.25	55.13	18.00	15.00
21	19.38	14.75	22.00	22.63	16.13	12.88	28.13	50.13	53.13	11	2.06	7.56	4.0	2.187	2.187	.50x.25	62.75	21.00	18.13
24	22.25	17.19	24.88	25.88	18.63	15.00	31.63	55.63	59.13	12	2.31	7.81	4.0	2.437	2.437	.63x.31	69.25	24.00	20.50
27	25.00	18.00	29.00	29.13	20.88	16.75	34.63	60.63	63.13	13	2.75	8.13	4.0	2.437	2.437	.63x.31	74.00	27.00	23.25
30	27.75	20.31	30.63	32.38	23.13	18.50	40.25	68.25	70.75	14	3.00	8.38	4.0	2.687	2.687	.63x.31	82.13	30.00	24.56
33	30.38	22.38	33.88	35.56	25.19	20.00	44.75	74.75	77.25	15	3.00	8.38	4.0	2.687	2.687	.63x.31	88.63	33.13	28.50
36	33.75	24.50	38.38	39.50	28.00	22.25	47.75	79.75	82.25	16	2.75	8.13	4.0	2.937	2.437	.63x.31	93.13	36.25	30.00
39	36.00	26.00	40.88	42.00	30.00	24.00	53.75	87.75	90.75	17	3.06	8.31	4.0	3.437	2.937	.75x.38	102.13	38.88	33.00
42	38.75	27.88	44.00	45.13	32.38	26.00	60.25	96.25	99.25	18	3.06	8.31	4.0	3.437	2.937	.75x.38	110.63	41.88	36.50
48	44.31	31.50	49.81	51.63	37.00	29.69	65.25	105.25	108.25	20	3.06	8.31	4.0	3.437	2.937	.75x.38	119.63	48.00	40.00

AC12891D

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

Twin Fan Assembly



BILL OF MATERIALS				
ITEM	DESCRIPTION	DWG.	FURN. BY	
			TCF	OTHER
1	SHAFT "P" DIAMETER WITH "Q" DIAMETER TURNDOWN			
2	BEARING "Q" DIAMETER			
3	HIGH-EXPANSION BEARING MODIFICATION	BC12895		
4	COOLER GUARD	BS12895		
5	SHAFT COOLER "Q" BORE	BS12895		
6	SHAFT SEAL (NOT SHOWN)	BS12895		
7	RECESS CONE	BS12895		
8	HOUSING	SHOWN		
9	IMPELLER	SHOWN		
10	STRAIGHTENING VANES	BS12895		
11	MOTOR			
12	V-BELT DRIVE			

- NOTES:**
- 1. CLEARANCE = "K" MINUS INSULATION THICKNESS.
 - 2. CLEARANCE = APPROXIMATELY 2/3 IMPELLER DIAMETER.
 - 3. MAX. RPM GIVEN IS AT 70°F.

Twin Fan Assembly

FAN SIZE	IMPELLER DIA.	A	B	C	D	E	F	G	H	K	N	T	U	V
12	11.13	12.25	9.38	12.50	12.88	9.38	7.75	16.25	56.50	8.00	4.00	12.00	9.94	8.00
15	13.88	15.25	11.13	16.00	16.25	11.50	9.13	20.25	68.50	9.00	4.00	15.00	12.31	10.00
18	16.56	18.25	13.25	18.50	19.44	13.69	10.81	23.50	79.00	10.00	4.00	18.00	15.00	12.00
21	19.38	21.25	14.75	22.00	22.63	16.13	12.88	28.13	92.25	11.00	4.00	21.00	18.13	14.00
24	22.25	24.00	17.19	24.88	25.88	18.63	15.00	31.63	103.25	12.00	4.00	24.00	20.50	16.00
27	25.00	27.00	18.00	29.00	29.13	20.88	16.75	34.63	113.25	13.00	4.00	27.00	23.25	18.00
30	27.75	30.00	20.31	30.63	32.38	23.13	18.50	40.25	128.50	14.00	4.00	30.00	24.56	20.00
33	30.38	33.00	22.38	33.88	35.56	25.19	20.00	44.75	141.50	15.00	4.00	33.13	28.50	22.00

FAN SIZE	SHAFT DESIGN "A"								SHAFT DESIGN "B"							
	J	L	M	P	Q	R	S	MAX. RPM	J	L	M	P	Q	R	S	MAX. RPM
12	59.00	2.19	7.56	2.44	2.44	0.63x0.31	68.75	1584	59.50	2.31	7.69	2.69	2.69	0.63x0.31	69.50	1868
15	71.50	2.31	7.69	2.69	2.69	0.63x0.31	81.50	1335	71.00	2.19	7.56	2.94	2.44	0.63x0.31	80.75	1542
18	82.00	2.31	7.69	2.69	2.69	0.63x0.31	92.00	983	81.50	2.19	7.56	2.94	2.44	0.63x0.31	91.25	1135
21	95.25	2.31	7.69	2.69	2.69	0.63x0.31	105.25	740	94.75	1.81	7.31	2.94	2.19	0.50x0.25	103.88	853
24	105.25	1.81	7.31	2.94	1.94	0.50x0.25	114.38	641	106.75	2.31	7.69	3.44	2.44	0.63x0.31	116.75	768
27	115.75	1.81	7.31	2.94	2.19	0.50x0.25	124.88	551	116.75	2.31	7.69	3.44	2.44	0.63x0.31	126.75	640
30	131.00	1.81	7.31	3.44	2.19	0.50x0.25	140.13	480	131.50	2.75	8.13	3.94	2.44	0.63x0.31	142.38	596
33	145.00	2.31	7.69	3.44	2.44	0.63x0.31	155.00	445	144.50	2.75	8.13	3.94	2.44	0.63x0.31	155.38	492

FAN SIZE	SHAFT DESIGN "C"								SHAFT DESIGN "D"							
	J	L	M	P	Q	R	S	MAX. RPM	J	L	M	P	Q	R	S	MAX. RPM
12	59.00	1.81	7.31	2.94	2.31	0.50x0.25	68.13	2162	—	—	—	—	—	—	—	—
15	72.00	2.31	7.69	3.44	2.44	0.63x0.31	82.00	1782	—	—	—	—	—	—	—	—
18	82.50	2.31	7.69	3.44	2.44	0.63x0.31	92.50	1257	82.00	2.75	8.13	3.94	2.44	0.63x0.31	92.88	1485
21	95.75	2.31	7.69	3.44	2.44	0.63x0.31	105.75	959	95.25	2.75	8.13	3.94	2.44	0.63x0.31	106.13	1190
24	106.25	3.00	8.38	3.94	2.69	0.63x0.31	117.63	953	106.25	3.00	8.38	4.44	2.94	0.75x0.38	117.63	1100
27	116.25	2.75	8.13	3.94	2.44	0.63x0.31	127.13	794	116.25	3.00	8.38	4.44	2.94	0.75x0.38	127.63	918
30	131.25	3.00	8.38	4.44	2.69	0.63x0.31	142.88	697	131.50	3.00	8.38	4.94	2.94	0.75x0.38	142.88	807
33	144.50	3.00	8.38	4.44	2.69	0.63x0.31	155.88	577	144.50	3.00	8.38	4.94	2.94	0.75x0.38	155.88	668

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



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