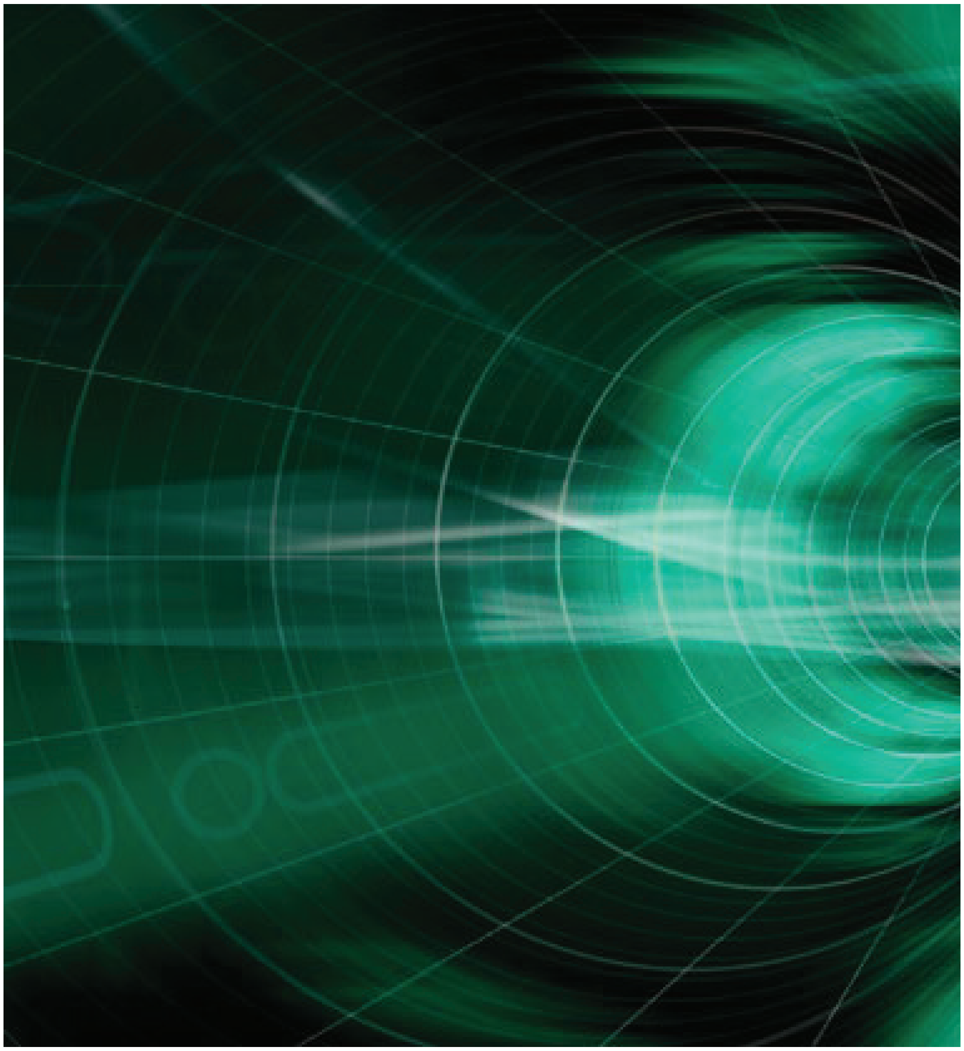


Yilida Air Conditioning Ventilation Technical Manual

Belt-driven

Reference:SYT-MY-2025, August 2025

The Smart Air

This fan features described in the sample, such as size, performance parameters, the Company reserves the right to change without notice; if unknown place, please call us.

The Smart Air

CONTENTS

Fan Applications

A). What is AMCA International?

The Air Movement and Control Association (AMCA International), Inc. is a not-for-profit international association of the world's manufacturers of related air system equipment, primarily, but not limited to: fans, louvers, dampers, air curtains, airflow measurement stations, acoustic attenuators, and other air system components for the industrial, commercial and residential markets.

The association's mission is to advance the knowledge, growth, and integrity of the air movement and control industry. AMCA International is a valuable resource and a strong means of self regulation for our industry. People who buy and specify fans, dampers, and louvers need to be aware of the value of the AMCA International Certified Ratings Seal.

During the last 100 years of representing the air movement and control industry , AMCA International has provided value to its membership with the following services:

1) Certified Ratings Program
2) Unique state-of-the art testing laboratory
3) Participation in the development of standards
4) Independent AMCA accredited laboratories in Singapore, Korea
5) Industry statistics and forecasting reports

B). Certified Rating Program (CRP)

1) AMCA International's Certified Ratings Program (CRP) assures that a product line has been tested and rated in conformance with AMCA International's test standards and rating requirements.

2) Performance seals may be displayed in literature and on equipment after a product has been tested and its cataloged ratings have been submitted to and approved by AMCA International's staff. To maintain a ratings certification, each licensed product line is subject to retesting every 3 years. Published performance is checked for accuracy and validity.

3) An AMCA Certified Ratings Seal gives the buyer, specifier, and end-user of air movement and control equipment assurance that published ratings are reliable and accurate.

4) The AMCA certified ratings program assures buyers and specifiers that competitors' ratings are based on standard test methods and procedures, and are subject to review by AMCA International as an impartial authority.

5) All AMCA certified products are listed on line, so you can verify that the product you are buying is listed. Before you buy, check out the AMCA online Directory of Certified Products at www.amca.org.

C). Fans Testing and Standards

1) Air Performance Testing includes:
· Development of the fan curves.
· Measurement of airflow, pressure, power and efficiency.
Test standards that apply to air performance testing include:
· AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
· AMCA 220, Test Methods for Air Curtain Units. AMCA 230, Laboratory Methods of Testing Air Circulator Fans for Rating.
· AMCA 240, Laboratory Method of Testing Positive Pressure Ventilators for Rating.

2) Sound Testing includes:
· Inlet sound power.
· Outlet sound power.
· Total sound power.
Test standards that apply to air performance testing include:
· AMCA 300, Reverberant Room Method for Sound Testing of Fans.

3) Energy Efficiency Testing includes:
· The fans shall be classified for their fan efficiency by using the Fan Efficiency Grade (FEG).
Test standards that apply to air performance testing include:
· AMCA 205, Energy Efficiency Classification for Fans.

D). Relationship between Yilida and AMCA International, Inc.

1) Yilida is a member of AMCA International, Inc.
2) Yilida has build the first AMCA Standard Laboratory in China. The laboratory was built in accordance to the AMCA Standard.
3) Most of the products are tested and certified by AMCA Certified Rating Program (CRP), and their catalog ratings are approved by AMCA International's staff. All these products and their catalogs are approved to use the AMCA International Certified Ratings Seal.
4) The Certified Rating Seals include: Air Performance, Sound and Fan Efficiency Grade (FEG).

Note:

1) Some manufacturers have printed the following statement: "tested in accordance with AMCA standards" in their catalogs. Please note that there are essentially different from the statement of “ the products are approved to use the AMCA International Certified Ratings Seal". These manufactures statements mean that their products are tested in accordance with AMCA Standards, but the tested data are not recognized and approved by the AMCA International.
2) Another statement that can easily lead to misunderstanding is the difference between the "AMCA International Certified Ratings Seal" and the "AMCA Membership Certificate". Some manufacturers have printed the “AMCA Membership Certificate” in their catalogs. This is misleading to let people believe that their products have tested and certified by AMCA. The “AMCA Membership Certificate” (red and white color) indicates that the manufacturer is a member of the AMCA International only. Only the “AMCA International Certified Ratings Seal” (yellow and green, yellow and blue color) symbols indicates that the products have been tested through the AMCA International Certified Rating Program and have been approved to use the “AMCA International Certified Ratings Seal".(Fig.1)

Fig.1

Yilida committed that all fans and its catalogs affixed with the AMCA International Certified Ratings Seal. The fans are tested and certified by AMCA Certified Rating Program (CRP) and are approved to use the AMCA International Certified Rating Seal.

Fan Laws

The fan performance in this catalogue denotes the peformance under the standard air conditions. The standard air conditions are as follows:

Air pressure	P = 101.325 kPa
Air temperature	t = 20 ℃
Air density	ρ = 1.2 kg/m^3

Fan Laws Equations:

$$\frac{q_{V2}}{q_{V1}} = \frac{n_2}{n_1} \times \left(\frac{D_2}{D_1}\right)^3 \qquad \frac{p_2}{p_1} = \left(\frac{n_2}{n_1}\right)^2 \times \left(\frac{D_2}{D_1}\right)^2 \times \left(\frac{\rho_2}{\rho_1}\right) \qquad \frac{P_2}{P_1} = \left(\frac{n_2}{n_1}\right)^3 \times \left(\frac{D_2}{D_1}\right)^5 \times \left(\frac{\rho_2}{\rho_1}\right)$$

Application 1: Change in Fan Speed.

a) When the fan, the airflow system and the air density remain unchanged:

$$\frac{q_{V2}}{q_{V1}} = \frac{n_2}{n_1} \qquad \frac{p_2}{p_1} = \left(\frac{n_2}{n_1}\right)^2 \qquad \frac{P_2}{P_1} = \left(\frac{n_2}{n_1}\right)^3$$

★ Note: This application is normally used to fix the airflow problems (too big or too small) at site.

E.g. 1: A project needs a backward inclined centrifugal fan to supply air, its airflow is 25,000 m^3/h and the static pressure is 730 Pa. After selection, the fan is SYQ630R, the fan speed is 1220 r/min and the shaft power is 7.47 kW (the motor power is 11 kW). Now the site needs to increase the airflow to 30,000m^3/h. Find the new fan speed, static pressure and the shaft power.

$$\frac{q_{V2}}{q_{V1}} = \frac{n_2}{n_1} \Rightarrow n_2 = \frac{30000}{25000} \times 1220 = 1464\ r/min$$

$$\frac{p_2}{p_1} = \left(\frac{n_2}{n_1}\right)^2 \Rightarrow p_2 = \left(\frac{1464}{1220}\right)^2 \times 730 = 1051\ Pa$$

$$\frac{P_2}{P_1} = \left(\frac{n_2}{n_1}\right)^3 \Rightarrow P_2 = \left(\frac{1464}{1220}\right)^3 \times 7.47 = 12.91\ kW$$

The maximum fan speed of SYQ630R is 1700 r/min, so it is not a problem for the fan speed to run 1464 r/min. Now, the shaft power is increased to 12.91 kW, so the original 11 kW motor cannot be used, the motor needs to be changed.

★ NOTE: When the customer site needs to increase the airflow, please pay attention
(1) The new fan speed cannot exceed the maximum fan speed.
(2) If the original motor cannot meet requirement of the new shaft power, then the motor needs to be replaced.

E.g. 2: In the same case, the client requests for additional airflow, but do not want to invest to replace the motor. Under the same 11 kW motor conditions, what is the new fan speed? And in this new speed, what is the airflow and static pressure?

If the safety factor is 10%, the shaft power will be 9.9 kW.

$$\frac{P_2}{P_1} = \left(\frac{n_2}{n_1}\right)^3 \Rightarrow n_2 = \left(\frac{p_2}{p_1}\right)^{\frac{1}{3}} \times n_1 = \left(\frac{9.9}{7.47}\right)^{\frac{1}{3}} \times 1220 = 1340\ r/min$$

$$\frac{q_{V2}}{q_{V1}} = \frac{n_2}{n_1} \Rightarrow q_{V2} = \frac{1340}{1220} \times 25000 = 27460\ \mathrm{m^3/h} \qquad \frac{p_2}{p_1} = \left(\frac{n_2}{n_1}\right)^2 \Rightarrow p_2 = \left(\frac{1340}{1220}\right)^2 \times 730 = 881 Pa$$

If the motor is not replaced, then the airflow can only be increased from 25000 m^3/h to 27460 m^3/h.

Application 2: Change in Air Density.

(a)When the fan size, the airflow system and the fan speed remain unchanged:

$$q_{V2} = q_{V1} \qquad \frac{p_2}{p_1} = \frac{\rho_2}{\rho_1} \qquad \frac{P_2}{P_1} = \frac{\rho_2}{\rho_1}$$

(b)When the fan, the airflow system and the pressure remain unchanged:

$$p_2 = p_1 \Rightarrow \left(\frac{n_2}{n_1}\right)^2 = \left(\frac{\rho_1}{\rho_2}\right) \Rightarrow \left(\frac{n_2}{n_1}\right) = \left(\frac{\rho_1}{\rho_2}\right)^{\frac{1}{2}} \qquad \frac{q_{V2}}{q_{V1}} = \frac{n_2}{n_1} = \left(\frac{\rho_1}{\rho_2}\right)^{\frac{1}{2}}$$

$$\frac{P_2}{P_1} = \left(\frac{n_2}{n_1}\right)^3 \times \left(\frac{\rho_2}{\rho_1}\right) = \left(\frac{\rho_1}{\rho_2}\right)^{\frac{3}{2}} \times \left(\frac{\rho_2}{\rho_1}\right) = \left(\frac{\rho_1}{\rho_2}\right)^{\frac{1}{2}} \Rightarrow \frac{P_2}{P_1} = \frac{q_{V2}}{q_{V1}}$$

(c)When the fan, the airflow system and the mass flow rate (q_m) remain unchanged:

$$q_m = q_v \times \rho \qquad q_{m2} = q_{m1} \Rightarrow q_{v2} \times \rho_2 = q_{v1} \times \rho_1$$

$$\frac{q_{V2}}{q_{V1}} = \frac{\rho_1}{\rho_2} \qquad \frac{n_2}{n_1} = \frac{\rho_1}{\rho_2} \qquad \frac{p_2}{p_1} = \frac{\rho_1}{\rho_2} \qquad \frac{P_2}{P_1} = \left(\frac{\rho_1}{\rho_2}\right)^2$$

★ Note: The fan performance curves in the catalog are measured under the standard air condition. This application is used for the selection of the fans that running in the high altitude or in the high temperature condition, when there is a change in the air density.

E.g. 3: A factory needs a fan to draw high temperature air from an oven which is delivering 20,000 m³/h of 120 ℃ air against 450 Pa static pressure. Find the shaft power required for the fan.

The air density at 120℃ = 0.9 kg/ m³
The standard air density = 1.2 kg/m³

$$q_{v2} = q_{v1} = 20000\ m^3/h \qquad p_2 = \frac{1.2}{0.9} \times 450 = 600\ Pa$$

Using the airflow 20,000 m³/h and the static pressure 600 Pa, under the standard air condition, the fan selected is SYQS 900E, the fan speed is 770 r/min, the shaft power is 4.93 kW (motor is 5.5 kW).

When running at 120℃ high temperature air,

$$P_2 = \frac{0.9}{1.2} \times 4.93 = 3.7\ kW$$

The shaft power required is 3.7 kW.

Application 3: Change in Fan Size.

(a) When the fan speed and the air density remain unchanged:

$$\frac{q_{V2}}{q_{V1}} = \left(\frac{D_2}{D_1}\right)^3 \qquad \frac{p_2}{p_1} = \left(\frac{D_2}{D_1}\right)^2 \qquad \frac{P_2}{P_1} = \left(\frac{D_2}{D_1}\right)^5$$

(b) When the tip-speed of fan and the air density remain unchanged:

$$u_2 = u_1 \qquad n_2 D_2 = n_1 D_1 \quad \Rightarrow \quad \frac{n_2}{n_1} = \frac{D_1}{D_2} \quad \Rightarrow \quad \frac{q_{V2}}{q_{V1}} = \left(\frac{D_2}{D_1}\right)^2 \qquad p_2 = p_1 \qquad \frac{P_2}{P_1} = \left(\frac{D_2}{D_1}\right)^2 = \frac{q_{V2}}{q_{V1}}$$

★ Note: This application is mostly used by the fan designers, it is rarely used at site.

E.g. 4: A fan manufacturer wishes to project data obtained for a 355 mm fan to a 710 mm fan. At one operating point, the airflow is 8000 m³/h and the static pressure is 300 Pa, the fan speed of the 400 mm fan is 784 r/min, the shaft power is 1.33 kW and its tip-speed is 14.57 m/s.
What will the projected airflow, static pressure, shaft power and tip-speed be for a 710 mm fan at the same fan speed (784 r/min)?

$$\frac{q_{V2}}{q_{V1}} = \left(\frac{D_2}{D_1}\right)^3 \qquad q_{V2} = \left(\frac{710}{355}\right)^3 \times 8000 = 64000\ \mathrm{m^3/h} \qquad \frac{p_2}{p_1} = \left(\frac{D_2}{D_1}\right)^2 \qquad p_2 = \left(\frac{710}{355}\right)^2 \times 300 = 1200\ Pa$$

$$\frac{P_2}{P_1} = \left(\frac{D_2}{D_1}\right)^5 \qquad P_2 = \left(\frac{710}{355}\right)^5 \times 1.33 = 42.56\ kW \qquad \frac{u_2}{u_1} = \frac{D_2}{D_1} \qquad u2 = \left(\frac{710}{355}\right) \times 14.57 = 29.14\ m/s$$

Fan Performance Curves

Since each type and size of fan has different characteristics, fan performance curve must be developed by the fan manufacturers.
A fan performance curve is a graphical presentation of the performance of a fan. Usually it covers the entire range from free delivery (no obstruction to flow) to no delivery (an air tight system with no air flowing). One or more of the following: characteristics may be plotted against volume flow rate (q_V).

Statics Pressure	p_{sF}
Total Pressure	p_{tF}
Power	P
Fan Static Efficiency	η_{sF}
Fan Total Efficiency	η_{tF}

Air density(ρ), fan size, and fan speed(n) are usually constant for the entire curve and must be stated.

A typical fan performance curve is shown in Fig.2. Generally, these curves are determined by laboratory tests, conducted according to an appropriate industry test standard, e.g. Air Movement and Control Association International Inc.(AMCA). The "Fan Laws" are used to determine the brake horsepower and performance characteristics at other speeds and fan sizes. Normally, as mentioned before, only one fan size and speed must be tested to determine the capacity for a given "family" of fans.

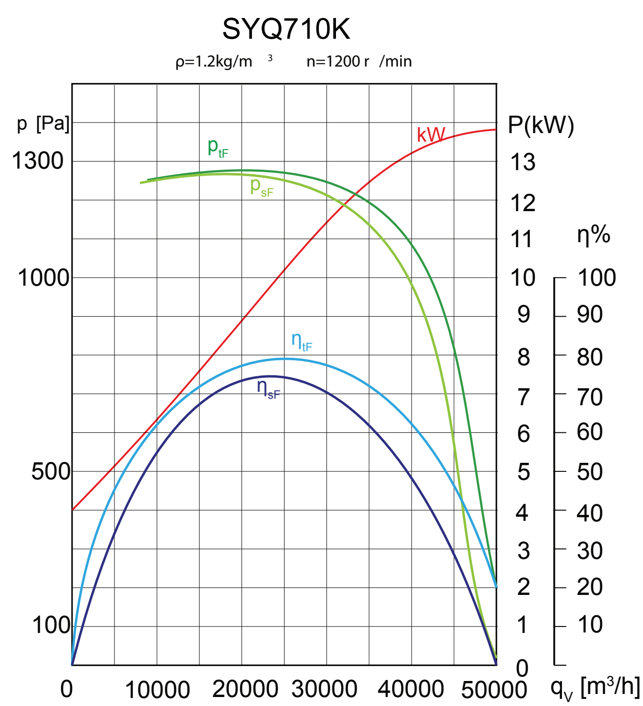


Fig.2 Fan Performance Curve

System Resistance Curve

1) System resistance is the total sum of all pressure losses through filters, coils, dampers, and duct work. The system resistance curve (Fig.3) is simply a plot of the pressure that is required to move the air through the system.

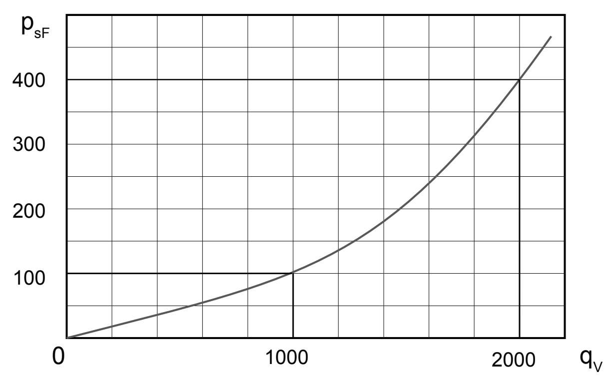


Fig.3 System Resistance Curve

$$\frac{p_{sF2}}{p_{sF1}} = \left(\frac{q_{V2}}{q_{V1}}\right)^2 = \left(\frac{2000}{1000}\right)^2 = \frac{4}{1}$$

2) The pressure equation of a airflow system is:

$$p = k\left(q_V\right)^2$$

The power required for the air moving through the airflow system is :

$$P = \frac{q_V \times p}{3600 \times 1000}$$

3) For example, consider a system handling 1000 m^3/h with a total resistance of 100 Pa SP. If the qV is doubled, the SP resistance will increase to 400Pa, as shown by the squared value of the ratio given in Fig.3.

4) This curve changes, however, as filters load with dirt, coils start condensing moistrue, or when outlet dampers change in position.

5) Operating point: The operating point (Fig.4) at which the fan and system will perform is determined by the intersection of the system resistance curve and fan performance curve. Note that every fan operates only along its performance curve. If the system resistance designed is not the same as the resistance in the system installed, the operating point will change and the static pressure and volume delivers will not be as calculated.

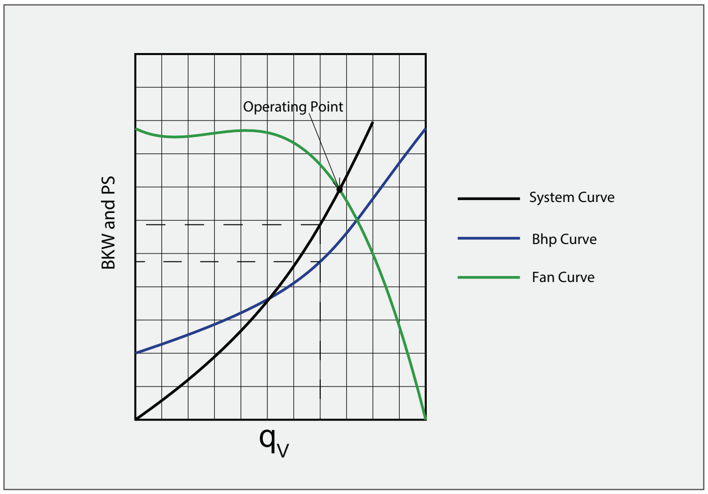


Fig.4 Operating Point

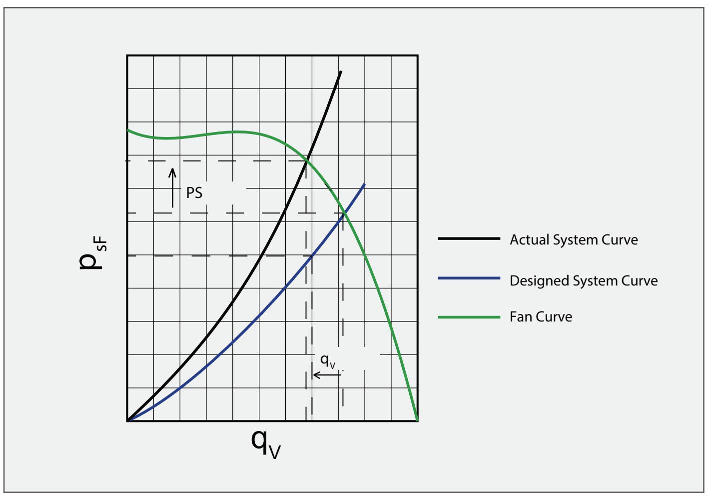


Fig.5 Change In System Resistance Curve——Air Volume Reduced

6) If the actual system has more pressure lose than predicted in the design. Such, air volume is reduced and static pressure is increased. (Fig.5) The shape of the kW curve typically would result in a reduction in BKW.

7) In many cases where there is a difference between actual and calculated fan output, it is due to change in system resistance rather than any shortcomings of the fan or motor. Frequently the mistake is made when taking the static pressure reading across the fan and concluding that if the static pressure is at or above design requirements the volume is also at or above design requirements. Fig.5 shows why the assumption is conpletely invalid.

Fan Vibration and Balancing

Fan Vibration

Unbalanced fan can cause vibration during operation. This vibration in turn may cause excessive wear in shafts, bearings, bushings, etc., and greatly reduce their service lives.
The vibration will then create a very negative alternating stress in structural supports and frames which may eventually lead to their complete destroy. And the fan's performance will decrease due to the power absorbed by the supporting structure. In addition, the vibration can also be transmitted through the floor to the nearby machines, which can seriously affect their accuracy and proper function.

The fan vibration is caused by a variety of reasons, the commons are as follows:

(a) The unbalanced rotor (eg: fan Wheel, shaft, pulley etc.).
(b) The coupling is misaligned.
(c) The rigidity of the foundation, structural support, frame is not enough.
(d) The uneven airflow passing through the inlet or the outlet of the fan.
(e) Insufficient lubrication of the bearings, and so on.
The main cause of the fan vibration is the unbalanced rotor.

Fan Balancing

The effects of the fan trim balancing are:
(a) To improve the fan performance
(b) To reduce the vibration
(c) To reduce the noise
(d) To improve the lifetime of the bearings
(e) To reduce the fatigue and the disturbance of the operators
(f) To reduce the energy losses

Balance Quality Grades for Rotors

Taking into account the advanced technology and economic rationality, in year 1940, the International Organization for Standardization (ISO) have formulated the Balance Quality Grades for Rotors. The Balance Quality Grades for Rotors is divided into 11 grades, each grade is increased by 2.5 times. The balancing machine is requested to balance from the highest grade G0.4 to the lowest grade G4000. The unit of the grade is mm/s.

Table 1 - Guidance for balance quality grades for rotors in a constant (rigid) state

Machinery types: General examples	Balance quality grade G	Magnitude $e_{per} \cdot \Omega$ mm/s
Crankshaft drives of marine diesel engine with rigid installation; Crankshaft drives of large-scale four-stroke engine with rigid installation.	G630	630
Crankshaft drives of high-speed four-stroke diesel engine with rigid installation.	G250	250
Crankshaft drives of 6-stroke or multiple- stroke diesel engine. Complete reciprocating; engines for cars, trucks and locamotives(gasoline, diesel oil).	G100	100
Cars: wheels, wheel rims, wheel sets, drive shafts; Crankshaft drives of the cars, trucks and lacamotives motor.	G 40	40
Components of crushing machines and agricultural machinery; Motor individual component of cars, truck and locomotive(gasoline, diesel oil).	G 16	16
Main turbine gear of seacraft(merchantman); Centrifugal machine, pump Wheel; Fans; Rotors of Aircraft gas turbines; Flywheel; General component of machine-tools; General motor rotor; Individual component of special requirement motor.	G 6.3	6.3

Gas and steam turbine, including ri motor rotor of rigid turbine; Turbo-chargers; Mechine tool actuator; Midsize and large size motor rotor with special requirement; Minitype motor rotor; Turbine pump.	G 2.5	2.5
Audio and video drives; Grinding machine drives; Minitype drives with special requirement.	G 1	1
Spindles and drives of high-precision grinder; drives and gyroscopes.	G 0.4	0.4

NOTE 1 Typically completely assembled rotors are classified here. Depending on the particular application, the next higher or lower grade may be used instead. For components, see Clause 9.

NOTE 2 All items are rotating if not otherwise mentioned (reciprocating) or self-evident (e.g. crankshaft drives).

NOTE 3 For limitations due to set-up conditions (balancing machine, tooling), see Notes 4 and 5 in 5.2.

NOTE 4 For some additional information on the chosen balance quality grade, see Figure 2. It contains generally used areas (service speed and balance quality grade G), based on common experience.

NOTE 5 Crankshaft drives may include crankshaft, flywheel, clutch, vibration damper, rotating portion of connecting rod. Inherently unbalanced crankshaft drives theoretically cannot be balanced; inherently balanced crankshaft drives theoretically can be balanced.

NOTE 6 For some machines, specific International Standards stating balance tolerances may exist (see Bibliography).

In the table, the ISO suggested that the balance quality grade for the fans is G6.3.
However, in order to have a better performance and a longer lifetime of the fans, YILIDA has balanced all the fans to a higher grade G2.5.

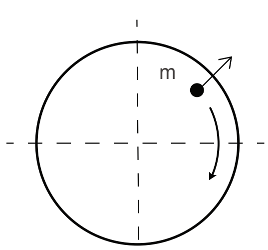
The Purpose of Balancing Machine

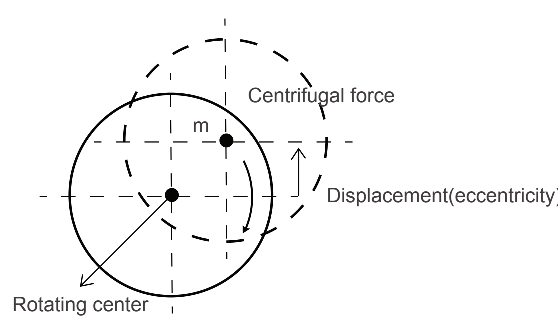
A balancing machine is necessary to detect, measure and determine the location of unbalance. The data measured by the balancing machine can be used to change the mass distribution of a rotor. When measuring is done accurately, it can balance the rotor.

Permissible Residual Unbalance

Since it is not possible to have 100% balancing, so there must be some unbalance in tolerance.

A wheel with radius R (mm) and weight M (kg), has a little overweight m (g) at a point. When the wheel is rotating, a centrifugal force F acts upon m and is transmitted to the centre axis. As the result, the axis is displaced from its original position and rotate around its original position to form a small circle. This displacement is called the eccentricity. See below





This eccentricity e_{per} is expressed its relationship with the wheel of weight M (kg), radius R (mm) and over weight point m (g) by the formula below:

$$e_{per} = \frac{m \times R}{M} \ (g.mm/kg) \text{ or } (\mu m)$$

e_{per} is also called the residual unbalance.

The International Organization for Standardization (ISO) uses the following formula:

$$e_{per} = \frac{1000 \times G}{\omega} = \frac{60 \times 1000G}{2\pi n} \approx \frac{9550 \times G}{n} \quad (g.mm/kg) \text{ or } (\mu m)$$

To express the relationship about the maximum residual unbalance e_{per} (g.mm/kg), the balance quality grades G (mm/s) and the rotation speed n (r/min). (Table 2)

E.g. 1: The fan SYT10-10L(DK) Wheel, and the fan's top speed is 1800 r/min. If it is required to balance to Balance quality Grade G2.5, find the permissible residual unbalance.

(1) The permissible residual unbalance:

$$e_{per} = \frac{9550 \times G}{n} = \frac{9550 \times 2.5}{1800} = 13.26 \ \mu m$$

The mass of SYT10-10L fan Wheel is 3.23kg; The mass of balance shaft is 4.446kg. Add up to 7.677kg.

$$\vec{U} = e \times M = 13.26\ (\mu m) \times 7.677\ (kg) = 101.8\ g.mm$$

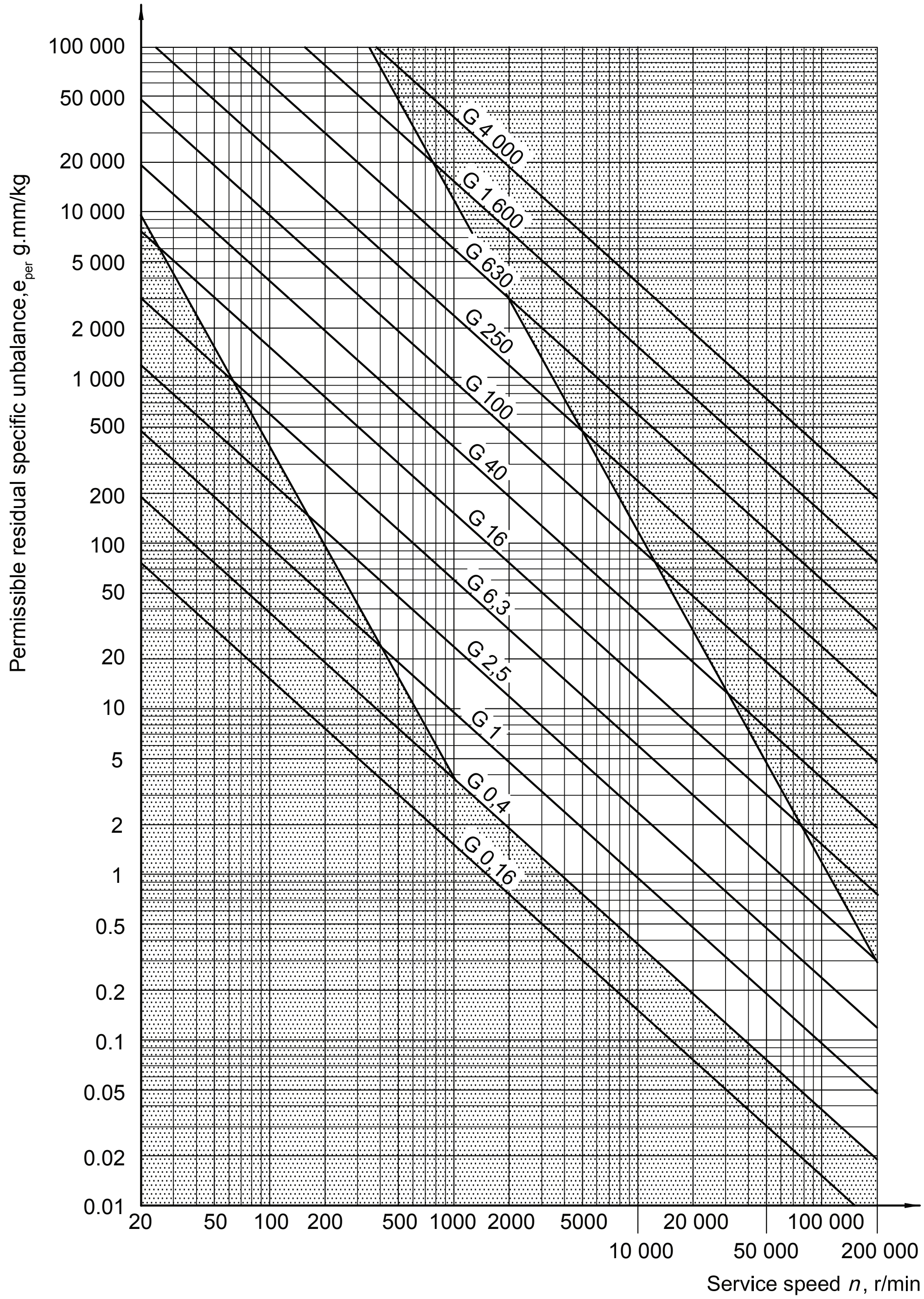
(2) The residual unbalance of correcting plane:

Cause SYT10-10L is the double-inlet centrifugal fan, so it needs to check the radiuses of the right and left plane.

$$m = \frac{\vec{U}}{2r} = \frac{e \times M}{2r} = \frac{13.26\ (\mu m) \times 7.677\ (kg)}{2 \times 141\ (mm)} = 0.361\ g \quad = 361\ mg$$

The Balancing of the Yilida Fans

In order to ensure that all the fans are running with good performance and long lifetime, Yilida ensures that all its fans are going through 3 types of balancing, each type of balancing has reached the ISO Balance Quality Grades of G2.5.
The three types of balance are as follows:



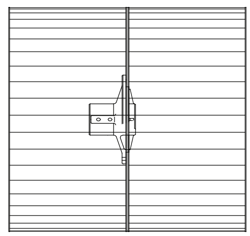
NOTE The white area is the generally used area, based on common experience.

Figure 2-Permissible residual specific unbalance based on balance quality grade G and service speed n (see 6.2)

Fan Vibration and Balancing

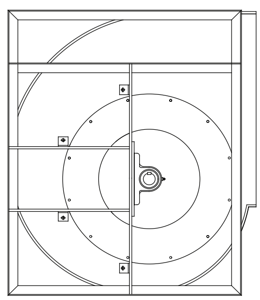
(a) Fan Wheel Balancing

Every wheel that manufactured by Yilida has to do the dynamic and static balance, so that each wheel is balanced to G2.5 before assembly.



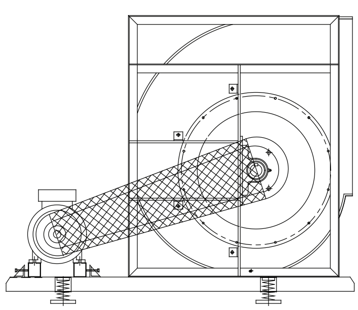
(b) Bare Fan Balancing

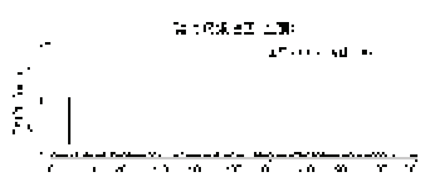
After assembly, the bare fan has to go through the balancing again, to reach G2.5 balance grade.



(c) Complete Fan Balancing

The bare fan, motor, pulleys, base frame, the isolators are assembled together to have a complete fan. The complete fan has to go through the last balance to reach G2.5 balance grade. After balancing that the fan,motor etc will be running more stable.





Fre	19.8	49.4	99.3	130.3	147.7	216.7	247.1	296.0	343.1	376.0
Rpm	1187	2965	5957	7820	8863	13000	14825	17763	20585	22559
Data	0.1	1.8	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1

Outlines

The sound is a travelling oscillation. The sound that the human can hear is within the frequency range from 20 Hz to 20,000 Hz. Sound source can be from the vibration of the solid or fluid (liquid and gas).

1) Sound Power Level

The sound power is the sound energy radiated constantly from a sound source. Sound power is expressed in watts (W). Sound power converted to the decibel scale is called sound power level (L_w).

$$L_W = 10\lg\frac{W}{W_0}$$

where L_W——sound power level, dB
W_0——reference sound power, W
W——sound power, W

2) Sound Intensity Level and Sound Pressure Level

The sound power from the sound source cannot be directly measured. The sound power is calculated from the sound pressure or the sound intensity that measured from the sound source. Similarly, sound pressure level and sound intensity level are expressed as below:

$$L_p = 20\lg\frac{p}{p_0}$$

where L_p——sound pressure level, dB
p——sound pressure, Pa
p_0——reference sound pressure, p_0=2 x 10-5 Pa,
This value is the minimum sound level at 1,000 Hz that the human ear can hear.

$$L_1 = 10\lg\frac{I}{I_0}$$

where L_I——sound intensity level, dB
I——sound intensity, W/m^2
I_0—— reference sound intensity.
This value is the minimum sound intensity that the human ear can feel, and is the human hearing threshold. The maximum sound intensity that the human ear can tolerate is Imax = 1 w/m^2, it is known as the pain threshold.

3) Octave Bands and Sound Spectrum Characteristics

Normally, human can hear sounds within frequency range from 20 Hz to 20,000 Hz. For the convenient measuring, this frequency range is divided into several small octave bands. The most commonly used in sound measurement is the octave bands and 1/3 octave bands. An octave band is the frequency interval between two sounds whose ratio is 2. Table 1 shown the octave bands from the IEC Standard. 1/3 octave band is an octave band that divided into three portions. Spectrum is the graphics that the sound pressure level or the sound power level changes with the frequency. The sound from a fan can be roughly divided into three categories:
a) The maximum sound pressure level of the center frequency of the band below 500 Hz is called low-frequency noise.
b) The maximum sound pressure level of the center frequency of the band within 500 Hz to 1,000 Hz is called medium frequency noise.
c) The maximum sound pressure level of the center frequency of the band greater than 1,000 Hz is called high frequency noise.

Octave number	1	2	3	4	5	6	7	8
center frequency /Hz	63	125	250	500	1000	2000	4000	8000

frequency coverage /Hz	45	90	180	355	710	1400	2800	5600	11200

Sound Testing Method

Sound pressure level and sound intensity level can be measured from the sound level measuring meter or the sound intensity meter.
Besides the three basic parameters of the sound, it is important to understand the sound frequency which will have to analyze the sound spectrum. The sound spectrum can be measured from the sound frequency analyzer. From the analysis of the sound spectrum, the sound level can be reduced and the radiation of the sound power level can also be reduced.
The sound power can be determined indirectly from the measuring of the sound pressure level. However the sound pressure level is not easy to measure, as it is influenced by the effects of the testing environment. In order to minimize the impact of the testing environment, two ideal state of the laboratory testing methods are created, free field method and reverberant field method.
When sound source is running in a given space, all the sound energy radiated from the sound source is absorbed by the boundary without reflection, and form a specific propagation of the sound waves in this space. This particular space is called the free field. The laboratory that simulates the free field is normally used full-anechoic room or semi-anechoic room. Conversely, if the sound energy is totally reflected by the boundary of this particular space with no absorption, and it forms another specific propagation of the sound waves in this space. This particular space is called the reverberant field. The laboratory that simulates the reverberant sound field is normally used the reverberant room.

Below is the introduction of the reverberant room.
A sound source is set in a closed room (reverberant room), after a time, a constant sound pressure level is produced in the room. In this stable state, if ignored the loss of the sound power due to the absorption of the air and the wall surround, the sound power is equal to the sound power releases from the sound source. This process is the direct sound field.
After switching off the sound source, the sound does not disappear immediately, The sound energy in the room is gradually attenuated, this process is the diffuse sound field or the reverberant sound field. The reverberation time is defined as the time required to let the sound energy density attenuate to 60 dB (i.e. 10 to 6 times the original value).
In the reverberant room, measuring the full diffusion of the sound field is known as the diffuse sound field method. The sound power level is corresponding to the average sound pressure level Lp in the diffuse sound field as follow:

$$L_W = L_P + 10\lg V - 10\lg T - 14 \quad \text{(dB)}$$

Where V ----- the volume of the reverberant room (m^3)
T ----- the reverberation time (s).
If the reverberant room constant is R and the sound pressure level measured in the full diffusion of the sound field is L_p, then the corresponding sound power level is :

$$L_W = L_P + 10\lg R - 6 \quad \text{(dB)}$$

$$R = \frac{\alpha S}{1-\alpha^2} (m^2)$$

Where R ----- the reverberant room constant
And α ----- the absorption coefficient, normally α = 0 ~ 1.0
S ----- the surface area of the reverberant room.

In fact, all the sound frequencies can not be totally absorbed or reflected by the boundaries of the laboratory, this difference provides the accuracy requirement the sound power level measurement in the laboratory (it is the allowable deviation requirement of the sound pressure level). So, the test must have a unitary standard for the sound testing methods. There are two standards, one is the ISO standards, and the other is the AMCA or ASHRAE standards. There are some differences between the two standards.
Yilida's comprehensive fan performance test laboratory has a reverberant room and an aerodynamic performance lab. This reverberant room is built in according to the requirements and the regulations of AMCA 300 (Reverberant Room Method for Sound Testing of Fans).

Sound Calculation

As mentioned earlier, when the sound signal enters the A weighting network, the low-frequency sound will attenuate proportionally through the network. The sound pressure level that was adjusted by A weighting network is called A-weighted sound level L_A, its unit is dB(A). The A-weighted sound level can be measured directly, can also be calculated from the 8 octave bands of the sound pressure level. Its expression is:

$$L_A = 10\lg \sum_{i=1}^{8} 10^{0.1(L_{pi} + \Delta A_i)}$$

Where L_{pi} ----- octave band sound pressure level, in dB
A_i ----- weighted attenuated value, refer to table 1, in which i=1,2,....., 8 represent the 8 octave band centre frequency 63, 125, 250, 500, 1k, 2k, 4k, 8k Hz.

Center frequency/Hz	63	125	250	500	1000	2000	4000	8000
Weighted attenuated value/Hz	-26.22	-16.29	-8.67	-3.25	0.00	1.2	0.96	-1.25

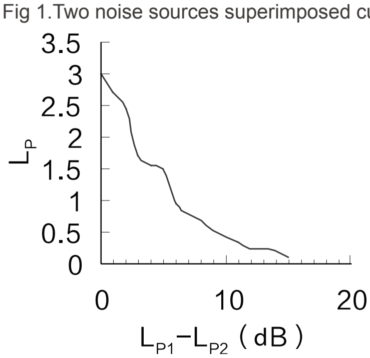
The A-weighted sound level of the fans is not only related with the fan size and the fan speed, but also depended on the air flow-rate and the pressure. In order to compare the sound characteristics of different models and different performance parameters, the specific A-weighted sound level L_{SA} is introduced. The specific A-weighted sound level is expressed as:

$$L_{SA} = L_A - 10\lg(q_V\, p_{tF}^2) + 19.8$$

Where L_{SA} ----- the specific A-weighted sound level, in dB(A)
L_A ----- the A-weighted sound level, in dB(A)
q_V ------ the air flow-rate, in m^3/min
p_{tF} ------ the total pressure in Pa.
At present, the fan noise standards are using the specific A-weighted sound level to evaluate the noise characteristics of the fans.

In actual work, when the sounds are combining, the curve shown in Figure 1 can be used to calculate the value of the combined sounds.
When two sounds are combined, $L_{ptotal} = L_{p1} + L_{p2}$, the rules are as follow:
a) The total sound pressure level is no more than any of the two sound pressure level by 3 dB.
b) If the difference of the two sound pressure level is equal to, or more than 10 dB, the increment is negligible.
c) When the difference of the two sound pressure level is less than 10 dB, then find the increment from the table, and add to the bigger sound pressure level.
d) For more than two sound sources, just combine any two sound pressure level each time until the finished sound. pressure level is calculated, the sequence does not matter.

Fig 1.Two noise sources superimposed curve



The Causes of the Noise Generated

There are three causes of the fan noise generated: aerodynamic, mechanical vibration, between the aerodynamic and the vibration.

1) The noise generated by aerodynamic

(a) The impact noise

When the Wheel is rotating at a high speed and the blade is moving periodically, the air particle is affected by the periodic force, that pushes the pressure waves at the sound speed to generate noise.

(b) Turbulancel Noise

When the Wheel is rotating at a high speed, there may have a swirl occurred at the inlet of the fan, then a noise is generated due to turbulance.

2) The noise from the mechanical vibration

The unbalance Wheel, the damaged bearing and others will cause vibration. The vibration will generate noise. If the blade is not rigid enough, it will vibrate when rotating that will also generate noise.

3) The noise generated from the interaction between the aerodynamic and the vibration

Vibration caused by the rotating blades and transmitted through the duct, then occur impact and swirl in the bending of the duct that increase the vibration and increase the noise. Especially when the air pressure wave frequency is same as the vibration frequency of the duct that cause a strong resonance, then the noise suddenly increases. It can result in serious damage to the fan.

The Control of the Noise of the Fans

1) Well-designed of Fans

When design the fans, in order to prevent or reduce the generation of the sound source, should minimize the impact of the air flow, the side plate and the scroll must be smooth without uneven prominent, and avoid the sharp turn of the air flow. The fan speed must be selected correctly, and the gap between the cutoff and the wheel must be controlled, as the smaller the gap, the greater the noise.

2) Silencer

Silencer can generally absorb the sound source and the noise generated from the inlet and the outlet of the fans. Different types of fans will use different kind of silencers.

The Principle of Fan Selection

First, we must determine the airflow and the pressure in the system. As the fan performance data in the catalog are usually given in the standard conditions, all the data of the operating point in the system must be converted to the standard atmospheric conditions before selection.

The standard atmospheric conditions are referred to altitude 0 m, temperature 20 ℃, atmospheric pressure 101.325 kPa, air density 1.2 kg/m^3.

The Effects of Temperature and Altitude

Some fans are used in a high altitude and different temperature conditions, where the air density will vary accordingly. The effects of the temperature and the altitude must be considered, when doing selection.

1) The effect of the altitude to the atmospheric pressure can be expressed as the following formula:

$$p_1 = p_0 \times (0.885)Z \div 1000$$

Note: p_1—— actual atmospheric pressure,
p_0—— standard atmospheric pressure,
Z—— altitude.

2) The effects of the temperature and the atmospheric pressure to the air density can be expressed as the following formula:

$$\rho_1 = \rho_0 \left(\frac{p_1}{p_0} \times \frac{273 + t_0}{273 + t_1} \right)$$

where:
ρ_0=1.2kg/m^3—— air density in the standard atmospheric condition,
p_0=101.325kPa—— standard atmospheric pressure,
t_0=20℃—— temperature in the standard atmospheric condition,
p1, ρ1, t1——actual atmospheric pressure, air density and temperature.

3) If

$$e = \frac{p_1}{p_0} \times \frac{273 + t_0}{273 + t_1}$$

then:

$$e = \frac{\rho_1}{\rho_0}$$

e—— the correction factor of air density.

$$\therefore \; p_1 = p_0 \times (0.885)Z \div 1000 \qquad \therefore \; \frac{p_1}{p_0} = (0.885)Z \div 1000$$

then:

$$e = \frac{(0.885)Z}{1000} \times \frac{273 + t_0}{273 + t_1}$$

From the above, the following table can be calculated:

Atmospheric density correction factor table

Air Temperature ℃	Altitude (m)															
	0	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000
- 40	1.26	1.20	1.14	1.09	1.04	0.99	0.94	0.89	0.85	0.81	0.76	0.73	0.69	0.65	0.62	0.59
- 20	1.16	1.11	1.05	1.00	0.96	0.91	0.87	0.82	0.78	0.74	0.70	0.67	0.64	0.60	0.57	0.54
0	1.07	1.03	0.98	0.93	0.89	0.84	0.80	0.76	0.73	0.69	0.65	0.62	0.59	0.56	0.53	0.50
20	1.00	0.96	0.91	0.87	0.83	0.78	0.75	0.71	0.68	0.64	0.61	0.58	0.55	0.52	0.49	0.47
40	0.94	0.89	0.85	0.81	0.77	0.73	0.70	0.67	0.63	0.60	0.57	0.54	0.51	0.49	0.46	0.44
60	0.88	0.84	0.80	0.76	0.73	0.69	0.66	0.63	0.59	0.56	0.54	0.51	0.48	0.46	0.43	0.41
80	0.83	0.79	0.76	0.72	0.69	0.65	0.62	0.59	0.56	0.53	0.51	0.48	0.46	0.43	0.41	0.39
100	0.79	0.75	0.71	0.68	0.65	0.62	0.59	0.56	0.53	0.50	0.48	0.45	0.43	0.41	0.39	0.37
140	0.71	0.68	0.65	0.62	0.59	0.56	0.53	0.50	0.48	0.46	0.43	0.41	0.39	0.37	0.35	0.33
180	0.65	0.62	0.59	0.56	0.53	0.51	0.48	0.46	0.44	0.42	0.39	0.37	0.35	0.34	0.32	0.30
220	0.59	0.57	0.54	0.52	0.49	0.47	0.44	0.42	0.40	0.38	0.36	0.34	0.33	0.31	0.29	0.28
260	0.55	0.53	0.50	0.48	0.45	0.43	0.41	0.39	0.37	0.35	0.33	0.32	0.30	0.29	0.27	0.26
300	0.51	0.49	0.47	0.44	0.42	0.40	0.38	0.36	0.35	0.33	0.31	0.30	0.28	0.27	0.25	0.24
350	0.47	0.45	0.43	0.41	0.39	0.37	0.35	0.33	0.32	0.30	0.29	0.27	0.26	0.24	0.23	0.22
400	0.44	0.42	0.40	0.38	0.36	0.34	0.33	0.31	0.29	0.28	0.27	0.25	0.24	0.23	0.21	0.20
450	0.41	0.39	0.37	0.35	0.33	0.32	0.30	0.29	0.27	0.26	0.25	0.23	0.22	0.21	0.20	0.19
500	0.38	0.36	0.35	0.33	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22	0.21	0.20	0.19	0.18

Note: When the actual temperature or altitude is not on the table, the data can be interspersed calculation

Fig 1

E.g. 1: A chemical factory which is located at an altitude 0 m and average temperature 10℃ place needs a DIDW centrifugal fan to supply air. The required mass flow rate is 12000 kg/h and the static pressure is 500 Pa.

Before selection, the following must be considered:
First, if the flow rate given is mass flow rate, then convert the mass flow rate to the volume flow rate.
Second, when there is a difference in the air density, the pressure p must be converted to the pressure in the standard atmospheric condition.

From the table, at altitude 0 m and temperature 10℃, the corrective factor of the air density e is 1.07.
Convert to standard atmospheric condition:

$$q_{V1} = \frac{q_{m1}}{\rho_1} \quad \rho_1 = \rho_0 \times e \quad \therefore \; q_{V1} = \frac{q_{m1}}{\rho_0 \times e} = \frac{12000 \ kg/h}{1.2 \ kg/m^3 \times 1.07} = 9346 \ m^3/h$$

Because the volume flow rate is unchanged when the air density is changing, but the fan diameter and rpm are not changing.

$$\therefore \; q_{V0} = q_{V1} = 9346 \ m^3/h$$

$$\frac{p_1}{p_0} = \frac{\rho_1}{\rho_0} = e \qquad \therefore \; p_0 = p_1 \div e = 500 Pa \div 1.07 = 467 \ Pa$$

From the above data, the fan selected is SYD 450 K, fan speed is 735 r/min, shaft power is 1.824 kW and the motor power is 2.2 kW.

In summer, the client find that the air flow does not meet the requirement, so he calls for help.

Knowing that the temperature now is 40℃, from the table, at altitude 0 m and temperature 40℃, the corrective factor of the air density e is 0.94.
Convert to standard atmospheric condition:

$$q_{V1} = \frac{q_{m1}}{\rho_1} \qquad q_{V1} = \frac{q_{m1}}{\rho_0 \times e} = \frac{12000 kg/h}{1.2\, kg/m^3 \times 0.94} = 10638\ m^3/h$$

Similarly:

$$q_{V0} = q_{V1} = 10638\ \mathrm{m^3/h}$$

$$\frac{p_1}{p_0} = \frac{\rho_1}{\rho_0} = e \qquad p_0 = p_1 \div e = 500 Pa \div 0.94 = 532\ \ Pa$$

From the data above, the fan selected is SYD 450 K, fan speed is 775 r/min, brake horsepower is 2.323 kW and the motor power is 3 kW. For this project, the air mass flow rate must be constant, so it is recommended to use 3 kW motor. By using the VFD to change the motor speed or using damper to control the air volume, to ensure that the air mass flow rate is constant.

E.g. 2: A project which is located at altitude 800 m and average temperature 60℃ place requires a single inlet backward inclined centrifugal fan to supply air. The air volume is 20000 m^3/h and the static pressure is 900 Pa.

From the table, at altitude 800 m and temperature 60℃, the corrective factor of the air density e is 0.80.
Convert to standard atmospheric condition:

$$\frac{p_1}{p_0} = \frac{\rho_1}{\rho_0} = e \qquad p_0 = p_1 \div e = 900 Pa \div 0.80 = 1125 Pa$$

From the above data, the fan selected is SYQS 900 E, fan speed is 933 r/min, brake horsepower is 8.124 kW and the motor power is 11 kW. After some times, the fan is moved to a location at altitude 3200 m and temperature 60℃, then find that the static pressure is not enough for the operating. Find the solution.

From the table, at altitude 3200 m and temperature 60℃, the corrective factor of the air density e is 0.59.
Convert to standard atmospheric condition:

$$\frac{p_1}{p_0} = \frac{\rho_1}{\rho_0} = e \qquad p_0 = p_1 \div e = 900 Pa \div 0.59 = 1525 Pa$$

From the above data, the fan selected is SYQS 900 E, fan speed is 1061 r/min, brake horsepower is 11.35 kW and the motor power is 15 kW.
So, to solve the problem, the motor and the drive package must be changed to satisfy the requirement.

Centrifugal Ventilators

Yilida Malaysia ventilator Sdn Bhd certifies that the SYT Series fans 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 AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.
All the Centrifugal Fans described herein are licensed to bear the AMCA Seal, and their certified ratings are shown on pages 034 through 045, except page 040.

Summary

The SYT Series of centrifugal air conditioning fans was developed with advanced technologies. They are licensed to bear the AMCA Seal for air performance, sound, and FEG. The SYT Series includes 12 models as described in this catalogue. The volume flow of the SYT Series ranges from 1,000 m^3/h to 40,000 m /h. Some of the features and characteristics of these fans are: forward Wheel blades, a wide range of applications, high efficiency, low noise, and low power consumption. These fans are ideal for use in central air-conditioning systems, in purifiers. They are also suitable for use in a variety of other ventilation applications.

Nomenclature

SYT 7 - 7 L

- L — Construction Type
  - Type L, R (Basic Model)
  - Type K (Heavy Duty Model)
- 7 (second) — Width diameter of Wheel (inch)
- 7 (first) — Nominal diameter of Wheel (inch)
- SYT — Fan series with multi-vane forward curved blades

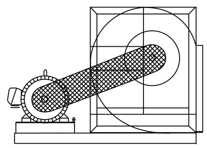
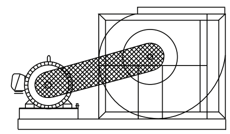
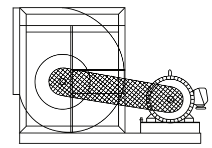
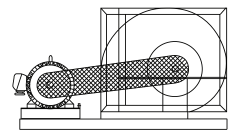
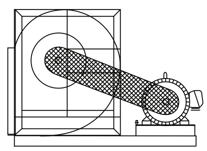
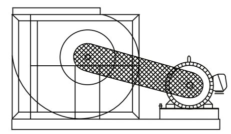
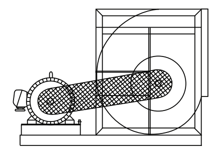
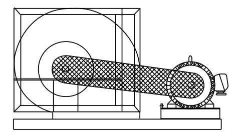
Product Features

1. Rotation

SYT series fans have two direction of rotations, left-hand rotation (LG) and right-hand rotation (RD); Viewing from drive side, if the Wheel rotates clockwise, it is left hand (LG) rotation. If the Wheel rotates counter clockwise, it is right-hand (RD).

As shown in Fig1, SYT Series fans can be constructed in four discharge directions: 0°, 90°, 180°, and 270°.

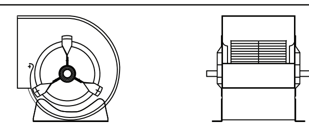
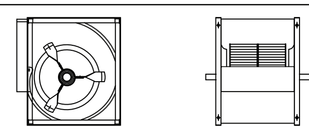
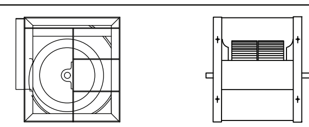
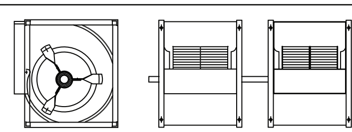
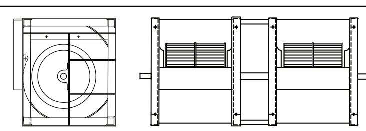
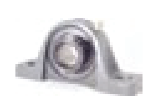
Fig 1

	0°	90°	180°	270°
Left Hand				
Right Hand				

3. type of Construction

As shown in Fig 2, SYT series fans can be divided into category L, R, K, category R2, K2.

Fig 2

Fan Type	Fan Size	Fan Diagram	Bearing Type
TYPE L. LK	7-18in		
TYPE R. RK	7-18in		
TYPE K	20-30in		
TYPE L2	7-18in		
TYPE R2	7-18in		

Construction of Product

SYT series fans are mainly constructed of housing, Wheel, frame, bearing and shaft. Outlet flange (is optional).

1. Housing

The housing is made of hot galvanized steel sheet. The side plates include inlets cones that are designed with the best aerodynamics for inlet condition. The scroll is fixed to the side plates by spot welding or "Pittsburg seam locking."

2. Wheel

Forward curved Wheel is constructed of high-grade hot galvanized steel sheet with the advanced aerodynamics profile to achieve the highest efficiency and the lowest noise level. The Wheel is fixed on the center plate and on the end ring with riveting grip pres. The Wheel is constructed with maximum strength that endures the continuous operation with maximum power.All Wheels are balanced to ANSI/AMCA Standard 204-05 . Yilida's internal standard is G2.5 or higher for wheel balancing.

3. Frame

The frames for type R and tyoe L constructions are made of galvanized steel angle iron bars. The cutting and bending of the frame parts, as well as the TOX connections, are formed with the use of toolings to ensure the high accuracy and the rigidity of the frames; The farmes for K constructions are welded by angle steel and flat steel, and finished with polyester coating in order to ensure sufficient rigidity and strength. The bearing supports are machined to ensure proper installation and alignments of the bearings.

4. Bearings

Ball bearings are used in all of the SYT Series fans. They are high quality bearings and they are selected to minmize the noise levels. The bearings are pre-lubricated, sealed, and self-centering. For type R and L fans, the bearings aremounted using vibration resistant washers. For type K fans bearing are supplied with lubrication fittings..Bearing service life for L10 ≥ 100000 hours.

5. Shaft

The shafts are made of 40 Cr carbon steel bars. The shafts are rough machined and then stress relieved with heat treatment before final machining. The shaft diameters are machined to very accurate tolerance levels, and they are fully checked to ensure precision fit. Each shaft is made turned, ground and polished. They are coated after assembly to provide corrosion resistance. Shaft size should be designed to meet the first critical speed of at least fan maximum running speed 1.4 times.

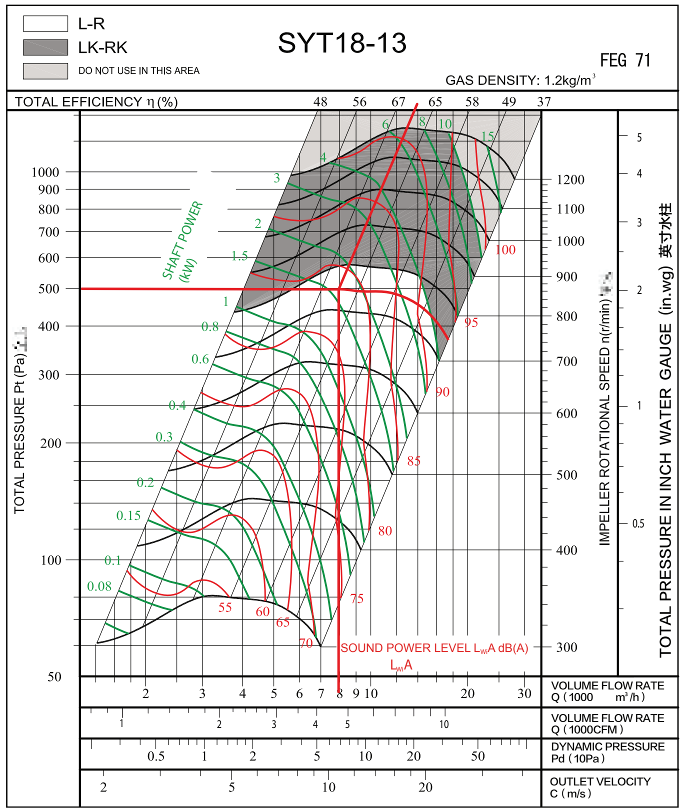
6. Outlet Flange

The outlet flange is made of galvanized steel. The connections of the flange components to the scroll are made using a TOX non-welding process. This maintains a good flange appearance while also providing sufficient strength and rigidity.

Performance Chart

1. Fan Performance Curve

Type	SYT18-13R
Volume	q_V =8000m³/h
Total Pressure	P_{tF} =500Pa
Dynamic Pressur	P_{dF}=70Pa
Outlet Velocity	C=10.81m/s
Fan Speed	n=761r/min
Shaft Power	P_{sh} =1.63kW
A Sound Power Level	L_{wi} A=79dB(A)
Total Efficiency	η_{tF} =68.3 %



2. Motor selection

The power (P_{sh}) on the performance chart refers to the shaft power of the fan.
The rated power of the drive motor equals the total requried shaft input multiplied by the safety factor : $P_{sh \cdot p}=P_{sh} \times K \div \eta_{me}$
The value of mechanical drive efficiency can be obtained from Table 1.
The required safety factors is provided in Table 2.

Table 1

Drive Type	η_{me}
Motor direct drive	1
Coupling direct drive	0.98
V−blet drive	0.95

Table 2

Power of electric motor (kW)	Value k
≤ 0.75kW	1.3
≤ 2.2kW	1.2
≤ 7.5kW	1.15
≥ 11kW	1.1

3. The twin fans' performance calculation is the double fan performance calculation formula:

Comparing the performance of the twin fan of Category L2 Category R2 and Category K2 with the performance of Category L Category R and K in the chart in the same condition of pressure, the twin fans' performance is as the following.

Volume	x2	Speed	x1.05
Shaft Power	x2.15	Noise	+3 dB

Performance of twin fans are not licensed by AMCA International.

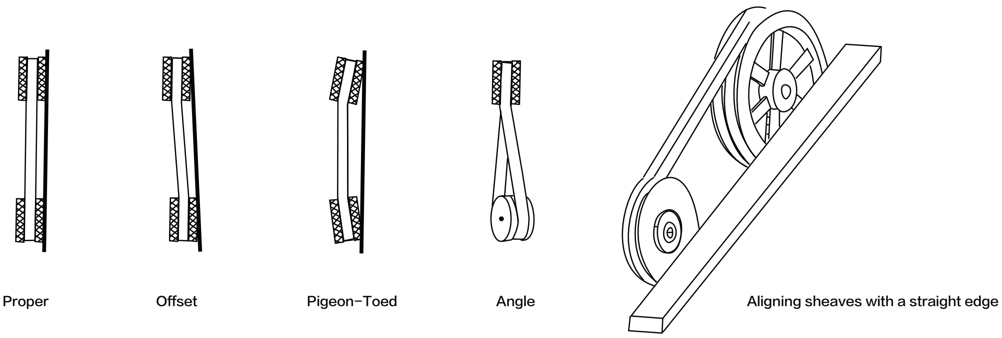
Installation and Maintenance

A) V-belt drive Installation

1. Remove the protective coating from the ends of the fan shaft and ensure that the shaft ends are free of nick and burrs.
2. Check fan and motor shafts for alignment.
3. The center distance must be controlled as 0.7(d1+d2) < a < 2 (d1+d2). The belt speed of forward curve fan should be more than 10m/s, but less than 15m/s, (10 < v < 15m/s) . The belt speed of backward curve fan should be more 25m/s, but less than 35m/s (25 < v < 35m/s).
4. Slide sheaves on to the shafts, Do not hammer the sheaves on to the shafts with force as this may result in bearing damage.
5. Align fan and motor sheaves with a straight-edge, and tighten the sheaves.
6. Place belts over the sheaves with care. Do not bend or squeeze the belts, or it might get damaged.

7. Adjust the belt tension until the belts appear snug. Run the unit for a few minutes and allow the belts to set properly.
8. Switch off the fan, adjust the belt tension by moving the motor base. When in operation, the tight side of the belts should be in a straight line from sheave to sheave and there should be a slight bow on the slack side.

Fig 3



B) Belt tenstion

A proper level of belt tension is required in order to obtain a satisfactory belt life. If the belt tension level is too high, excessive loads will be imposed on the belts and the bearing, and this will reduce the lives of both of these components. If the belt tension level is too low, the belt will slip. Belt slippage generates a large amount of heat, and this heat will drastically reduce the life of a belt.
Belt-tensioning gauges can be used to determine whether the belts are tensioned properly. A chart is normally supplied with the gauge which indicates the ranges of forces required to deflect the belts by a given amount to obtain the proper belt tension level. The required forces are based upon the center distance of the sheaves and the belt cross-section. The belts are properly tensioned when the forces required to deflect the belt are within the specified range, see Fig 4 and Table 3.
If a belt-tensioning gauge is not available, then the belt should be tightened just enough so that the belt does not squeal when the fan is started. A very short period of noise during the starting of a fans is allowable, but a squeal lasting several seconds or longer is not acceptable. After tensioning the belts and before starting the fan, check to make sure that the sheaves is properly aligned.
Realign the sheaves if necessary. Note that new belts may stretch a little during initial use, so the belt tension level should be checked after a few days of operation.

☒4（Fig4）

Belt tension indicator applied to mid centre distance.

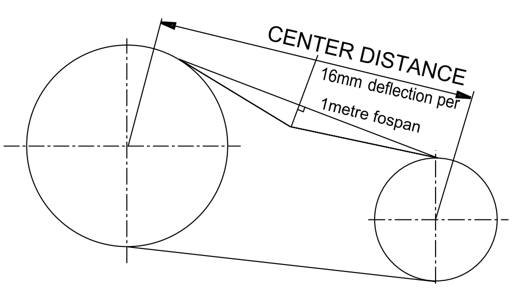


Table 3

Belt Section	Force required to deflect belt 16mm per metre of span		
	Smiall Pulle/Diamter (mm)	Newtonian (N)	Kilogram force (Kgf)
SPZ	56-95	13-20	1.3-2.0
	100-140	20-25	2.0-2.5
SPA	80-140	25-35	2.5-3.6
	140-200	35-45	3.6-4.6
SPB	112-224	45-65	4.6-6.6
	236-315	65-85	6.6-8.7
SPC	224-335	85-115	8.7-11.7
	375-560	115-150	11.7-15.3
A	40-140	10-15	1.1-1.5
B	125-200	20-30	2.0-3.1

C) Bearing Lubreication

The fan bearings are filled with lubricant when they ship from the factory, so the bearings do not require any additional grease to be supplied before staring the fan. The fans that are equipped with pillow block bearing are provided with lubrication fittings, and these fittngs allow for additional lubrication to the supplied to the bearings at regular intervals.
The allowable period of time between lubrication of these bearings depends upon the operating speeds and temperatures of the bearing as well as on the type of lubrication, It is recommended to inspect the condition of the grease that is discharged from the bearings when new grease is added. If the discharged grease looks similar to the new grease, then a longer period of time between lubrications is possible. If the discharged grease is much darker than the new grease, this indicates that the grease is being oxidized and more frequent lubrications of the bearings are required.

Instructions

1) When placing the order, it is necessary to state the type of fan, speed, air volume, air pressure, discharge direction, rotation direction, type of electric motor and its specifications.
2) Prior to installation, the fan should be carefully inspected. Special care should be taken in checking the shalf, Wheel and bearings. If there is an indication of any damage, the damaged parts should be repaired or repaired before the fan is installed or commissioned.
3) The inside of the scroll and casing need to be checked to make sure that there are no foreign objects inside the housing, such as tools or loose parts.
4) The rotational directions of the motor and Wheel should be checked to ensure that they are in compliance with the specification and purchase orders.
5) A flexible connector should be used between the fan out let flange and its mating ductwork. The flex connector should not be over-stretched.
6) Following the installation, the Wheel should be turned by hand or with the use of a wrench to make sure that it turns freely without colliding with other parts of the fan. Once all this is done, the fan can be commissioned normally.
7) The rated motor power as calculated herein might not be sufficient to drive the fan with an unrestricted discharge flow. Operating the fan with an unrestricted discharge outlet will result in flow rate that exceeds the specified fan capabilities. Such operation will quickly burn the motor and damage the fan. Great care must be taken in operating the fan to make sure that the maximum rated flows, as provided on the performance charts in this catalog, are not exceeded.
8) The fan is limited for use in areas where air substances are non-corrosive, non-toxics and non-erosive and where dust particles are less than 150mg/m^3 with a temperature between -20℃ and 85℃. Special care should be taken during transportation, load and unload.

SYT7-7 FEG80

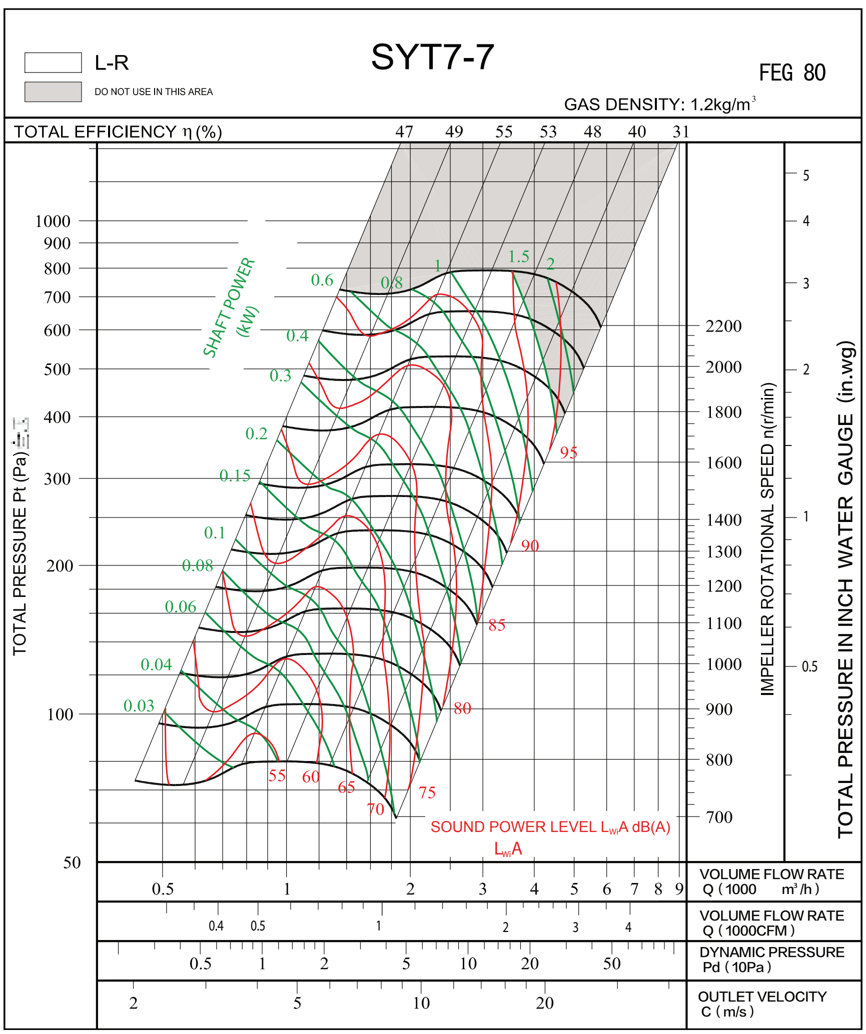
The SYT Series Centrifugal Fan

Technical Data

Wheel diameter	D = 7 inch	Fan weight	m = 8.5 kg
Moment of inertia	J = 0.009 kg·m²	Speed limit	n_{max} = 2200 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet $L_{wi}A$ sound power levels for installation type B: free inlet, ducted outlet.



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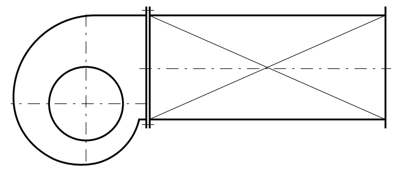
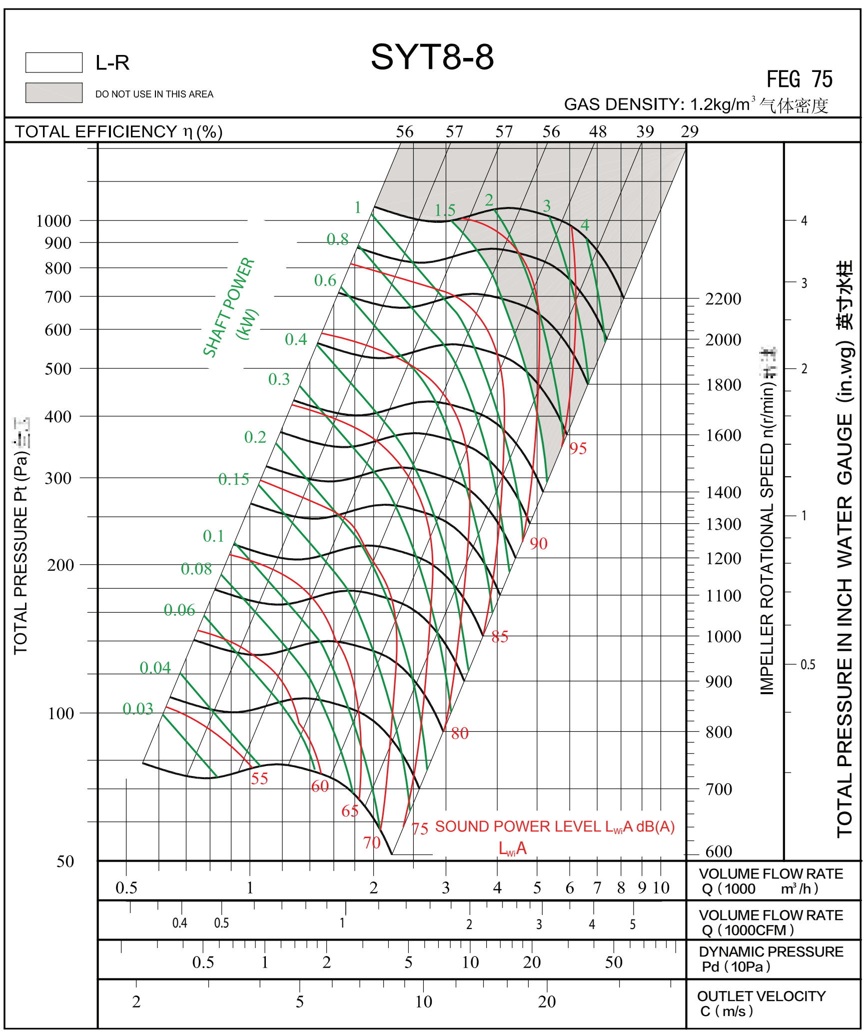


Technical Data

Wheel diameter	D = 8 inch	Fan weight	m = 9.5 kg
Moment of inertia	J = 0.015 kg·m²	Speed limit	n_{max}= 2200 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet L_{wi}A sound power levels for installation type B: free inlet, ducted outlet.



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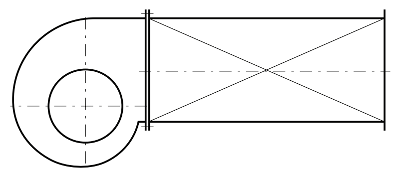
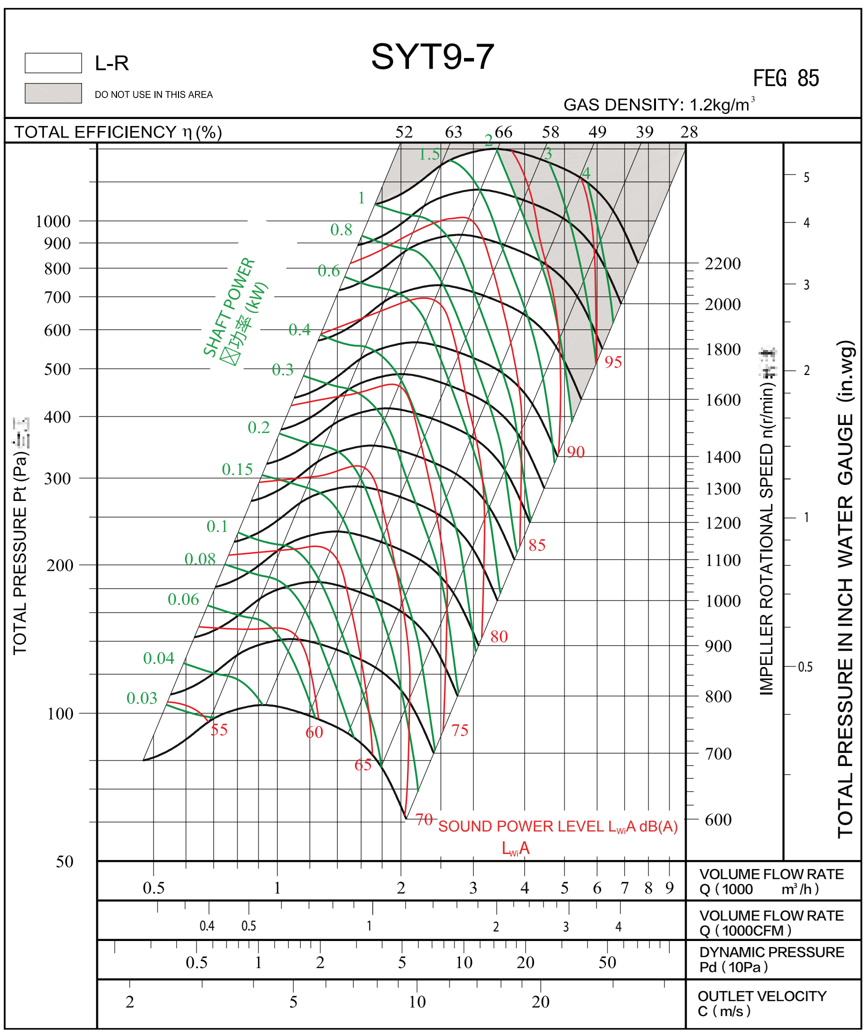


Technical Data

Wheel diameter	D = 9 inch	Fan weight	m = 10.2 kg
Moment of inertia	J = 0.029 kg·m²	Speed limit	n_{max} = 2200 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet $L_{wi}A$ sound power levels for installation type B: free inlet, ducted outlet.



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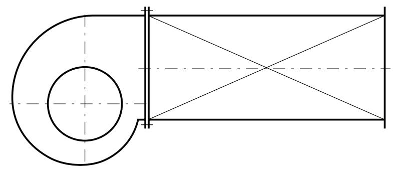

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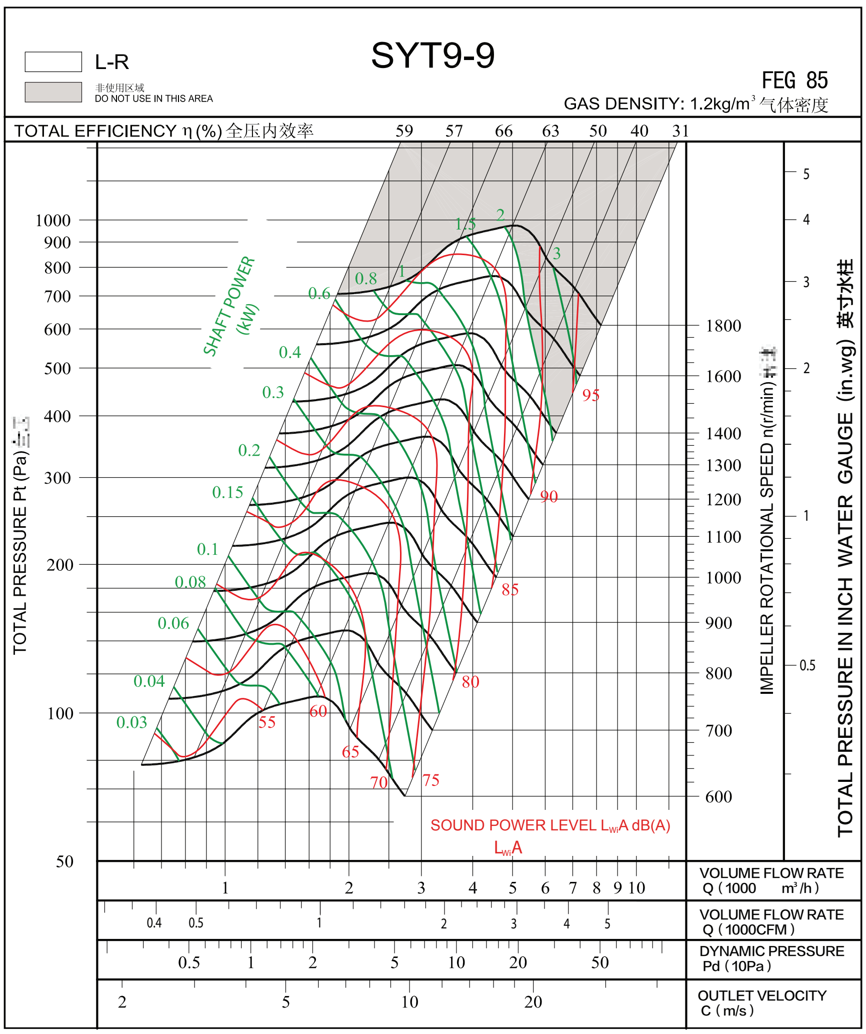
Technical Data

Wheel diameter	D = 9 inch	Fan weight	m = 11.4 kg
Moment of inertia	J = 0.034kg·m²	Speed limit	n_{max}= 1800 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet $L_{wi}A$ sound power levels for installation type B: free inlet, ducted outlet.



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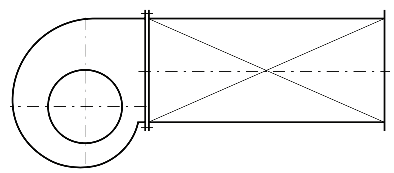
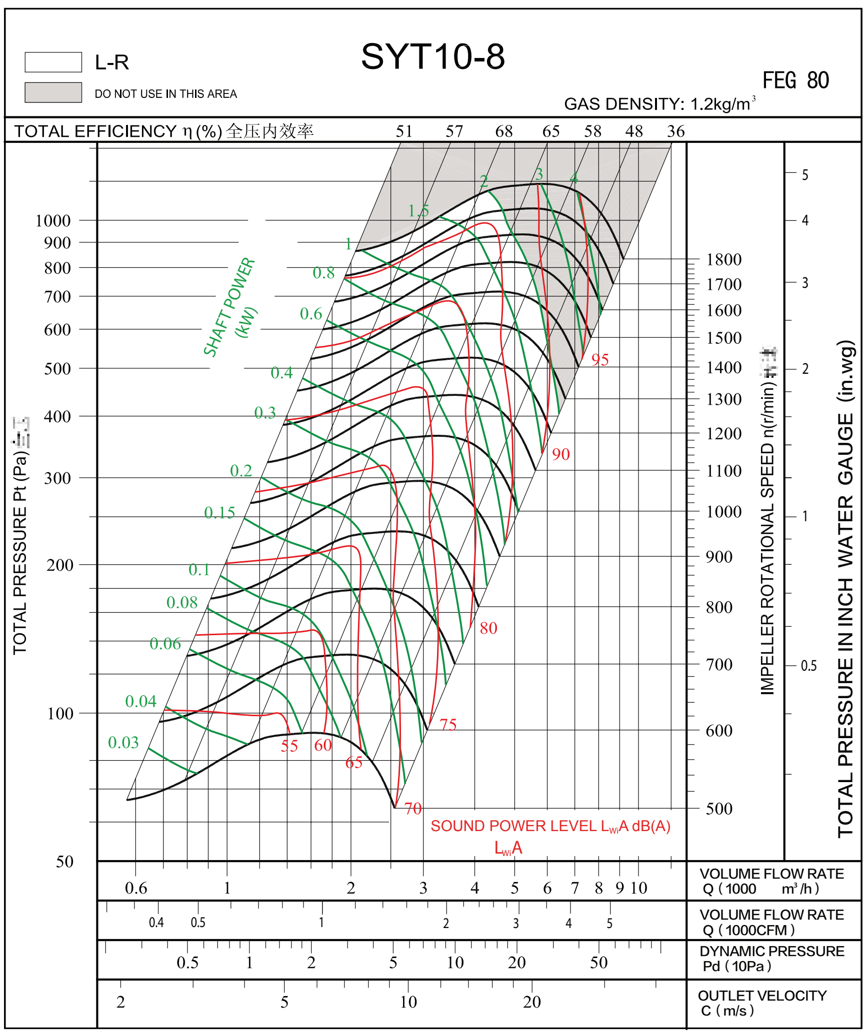


Technical Data

Wheel diameter	D = 10 inch	Fan weight	m = 12.3 kg
Moment of inertia	J = 0.047 kg·m²	Speed limit	n_{max} = 1800 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet $L_{WI}A$ sound power levels for installation type B: free inlet, ducted outlet.



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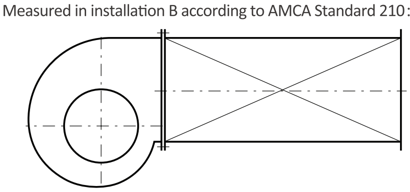
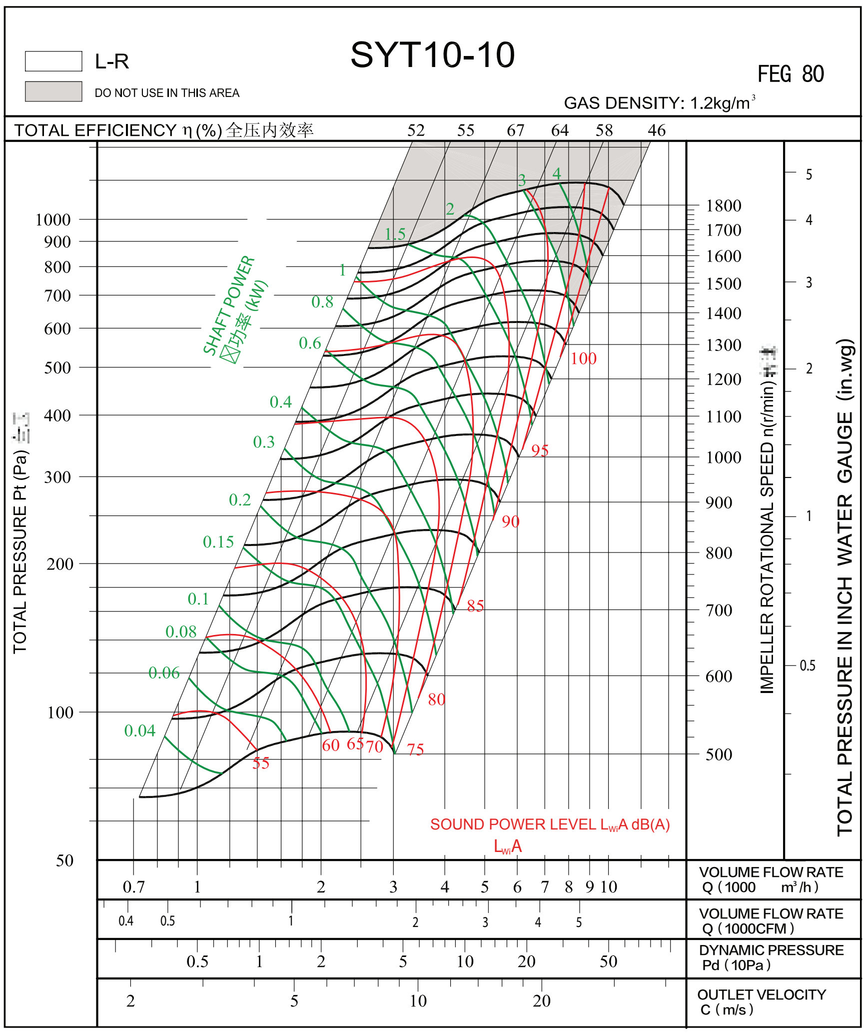


Technical Data

Wheel diameter	D = 10 inch	Fan weight	m = 13.2 kg
Moment of inertia	J = 0.055 kg·m²	Speed limit	n_{max}= 1800 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet $L_{wi}A$ sound power levels for installation type B: free inlet, ducted outlet.



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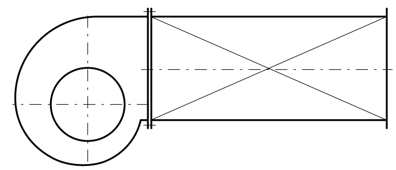
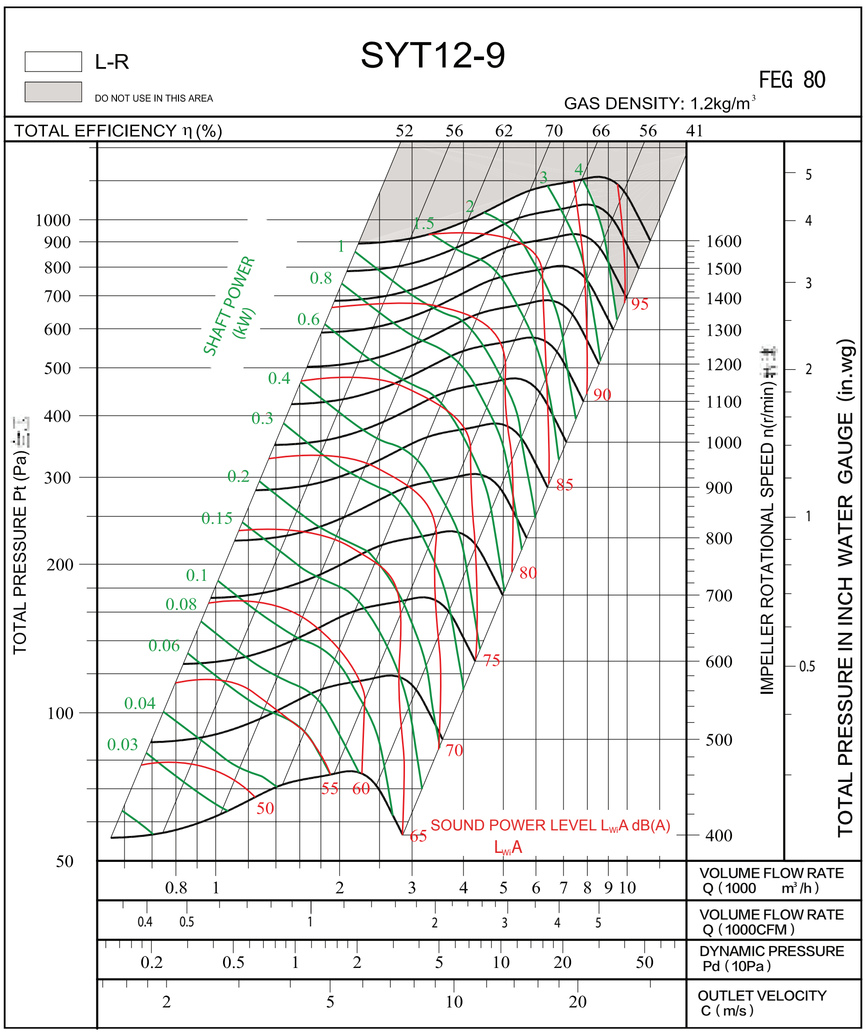


Technical Data

Wheel diameter	D = 12 inch	Fan weight	m = 19.1 kg
Moment of inertia	J = 0.097 kg·m²	Speed limit	n_{max} = 1600 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet L_{wi}A sound power levels for installation type B: free inlet, ducted outlet.



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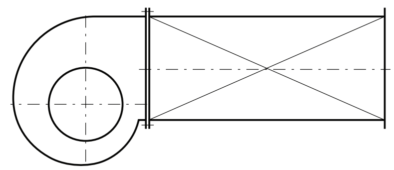


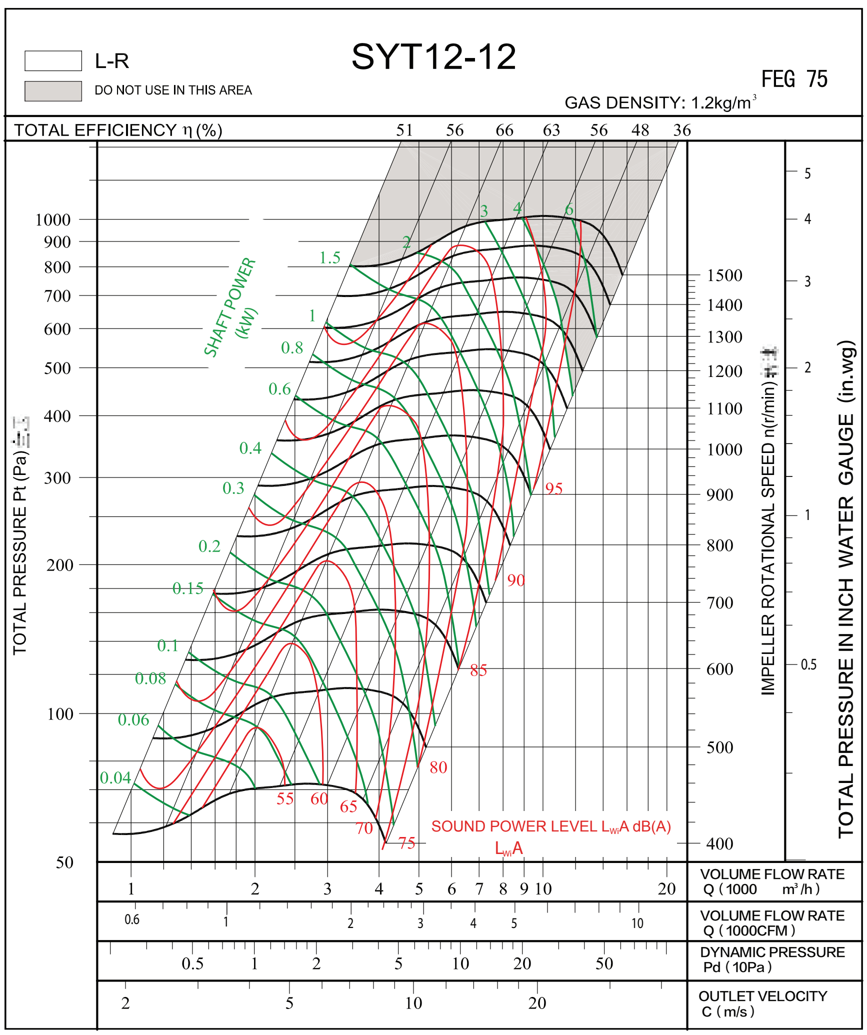
Model SYT 12-9 is not licensed to bear the AMCA certified ratings seal

Technical Data

Wheel diameter	D = 12 inch	Fan weight	m = 22 kg
Moment of inertia	J = 0.12 kg·m²	Speed limit	n_{max} = 1500 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet L_{Wi}A sound power levels for installation type B: free inlet, ducted outlet.



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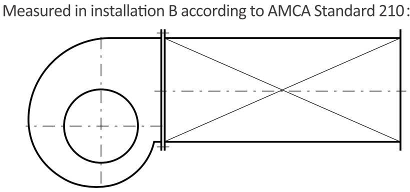
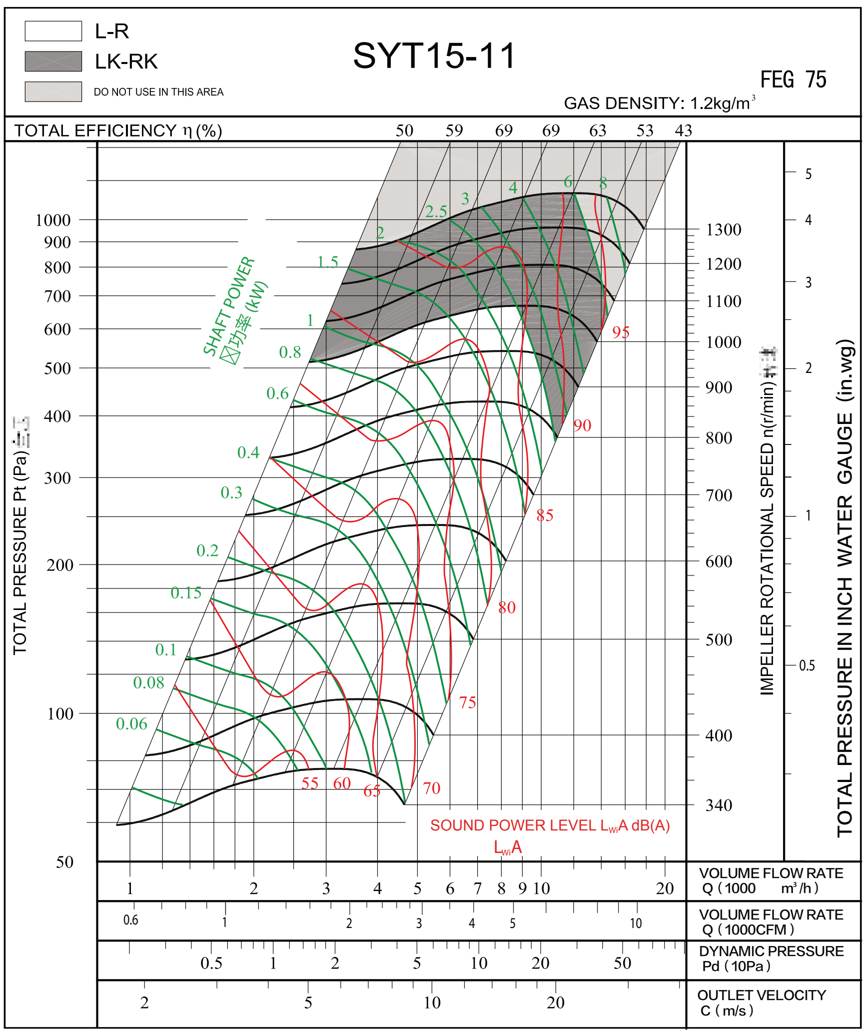


Technical Data

Wheel diameter	D = 15 inch	Fan weight	m = 25.1 kg
Moment of inertia	J = 0.19 kg·m²	Speed limit	n_{max} = 1300 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet $L_{Wi}A$ sound power levels for installation type B: free inlet, ducted outlet.



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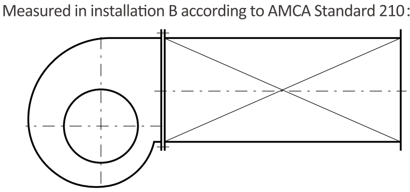
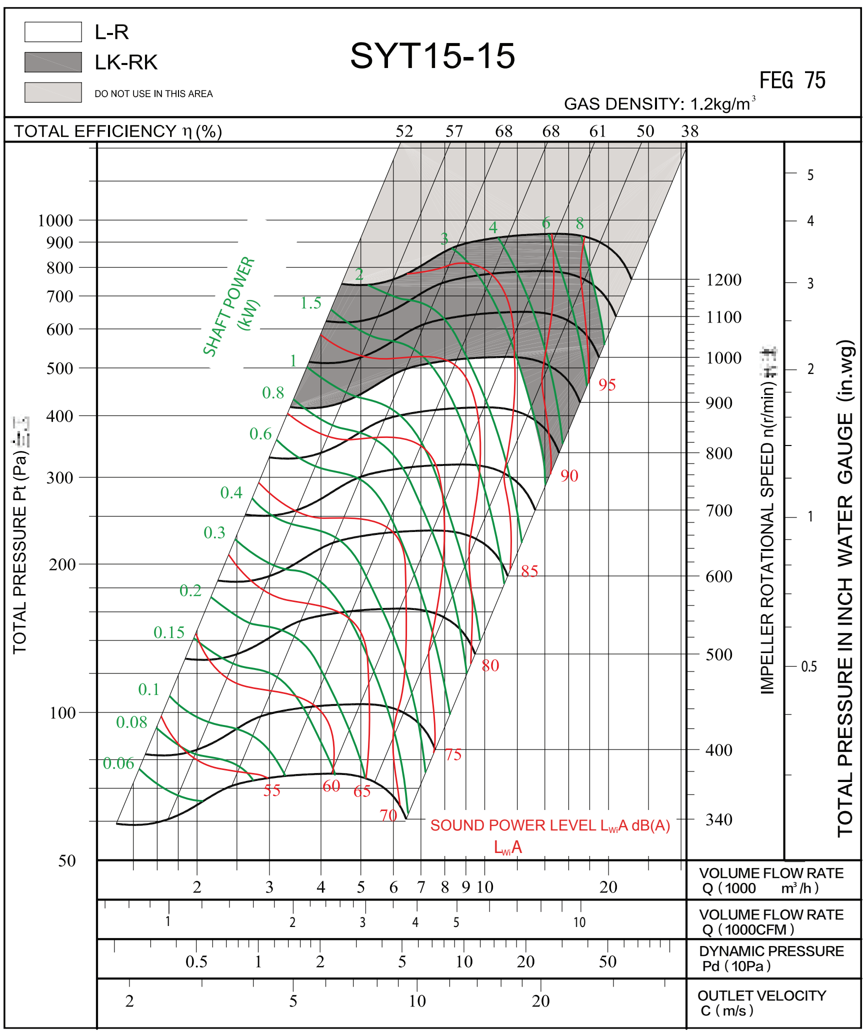


Technical Data

Wheel diameter	D = 15 inch	Fan weight	m = 29.4 kg
Moment of inertia	J = 0.23 kg·m²	Speed limit	n_{max}= 1200 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet $L_{Wi}A$ sound power levels for installation type B: free inlet, ducted outlet.



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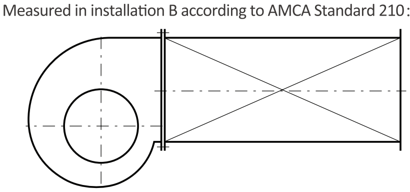

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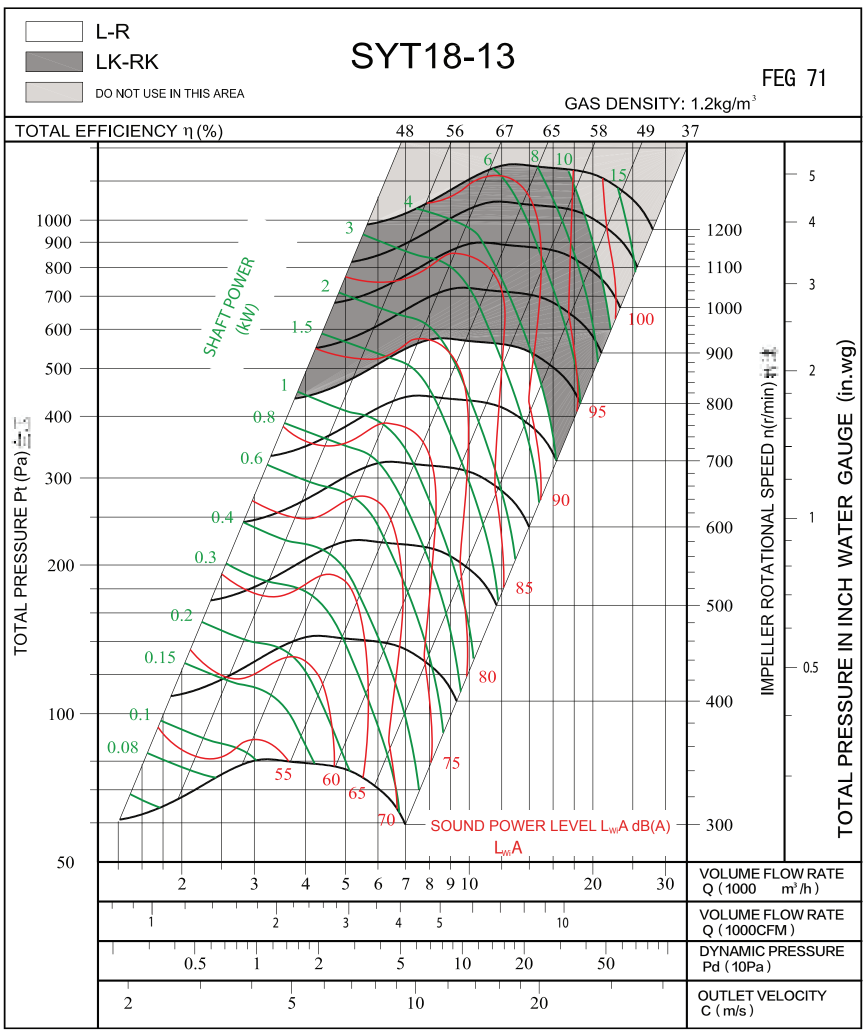
Technical Data

Wheel diameter	D = 18 inch	Fan weight	m = 39.6 kg
Moment of inertia	J = 0.46 kg·m²	Speed limit	n_{max}= 1200 r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet $L_{Wi}A$ sound power levels for installation type B: free inlet, ducted outlet.



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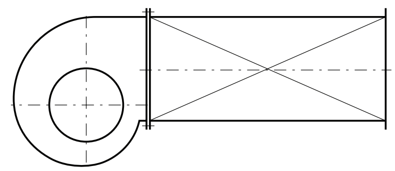
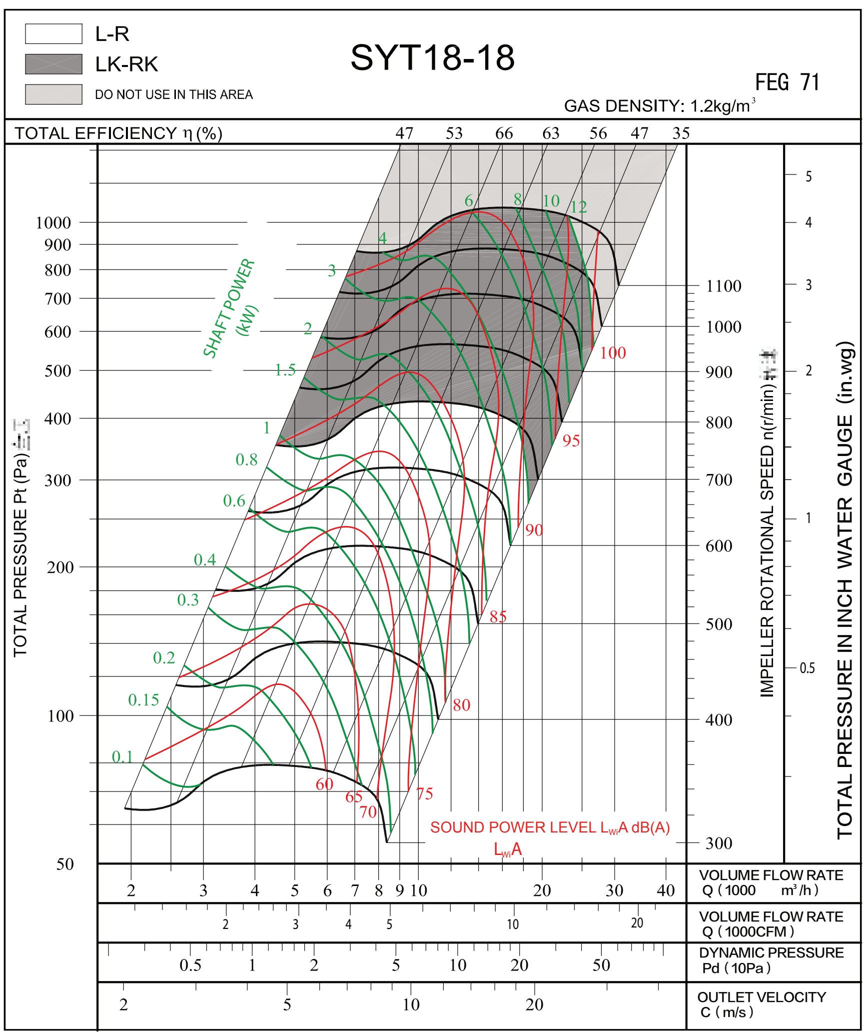


Technical Data

Wheel diameter	D = 18 inch	Fan weight	m = 45.5 kg
Moment of inertia	J = 0.57kg·m²	Speed limit	n_{max}= 1100r/min

Performance Curves

Performance certified is for installation type B: free inlet, ducted outlet. Power rating (kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet L_{Wi}A sound power levels for installation type B: free inlet, ducted outlet.



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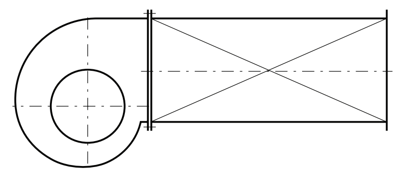
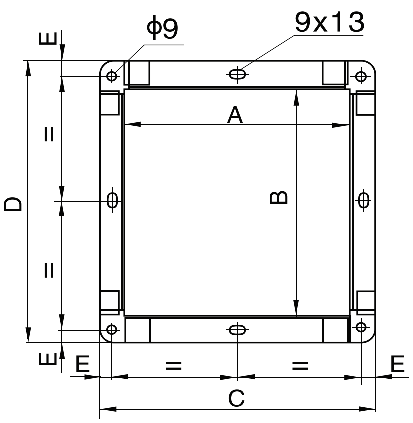
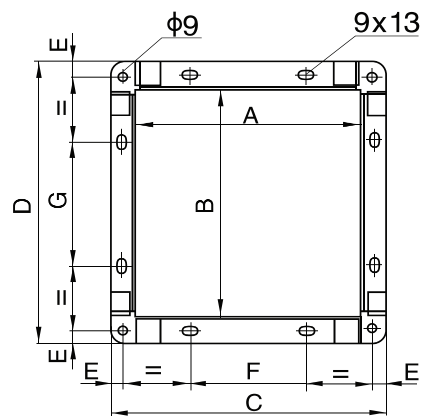


Outlet Flange

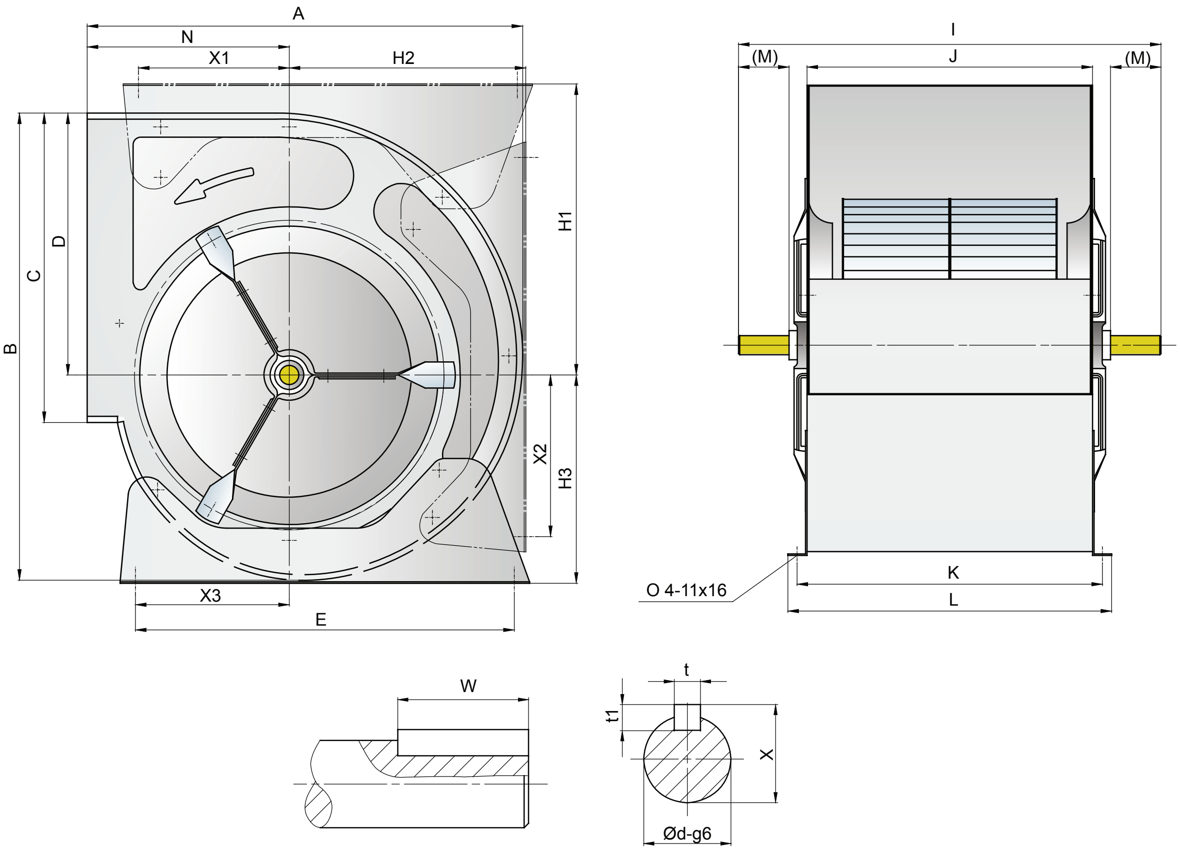




mm

Modle / Dim	7-7	8-8	9-7	9-9	10-8	10-10	12-9	12-12	15-11	15-15	18-13	18-18
A	259	287	232	298	265	331	309	395	373	471	430	557
B	228	256	262	262	289	289	341	341	404	404	478	478
C	299	327	272	338	321	387	365	451	429	527	486	613
D	268	296	302	302	345	345	397	397	460	460	534	534
E	10	10	10	10	13	13	13	13	13	13	13	13
F	\	\	\	\	\	\	125	150	145	180	160	200
G	\	\	\	\	\	\	140	140	160	160	180	180

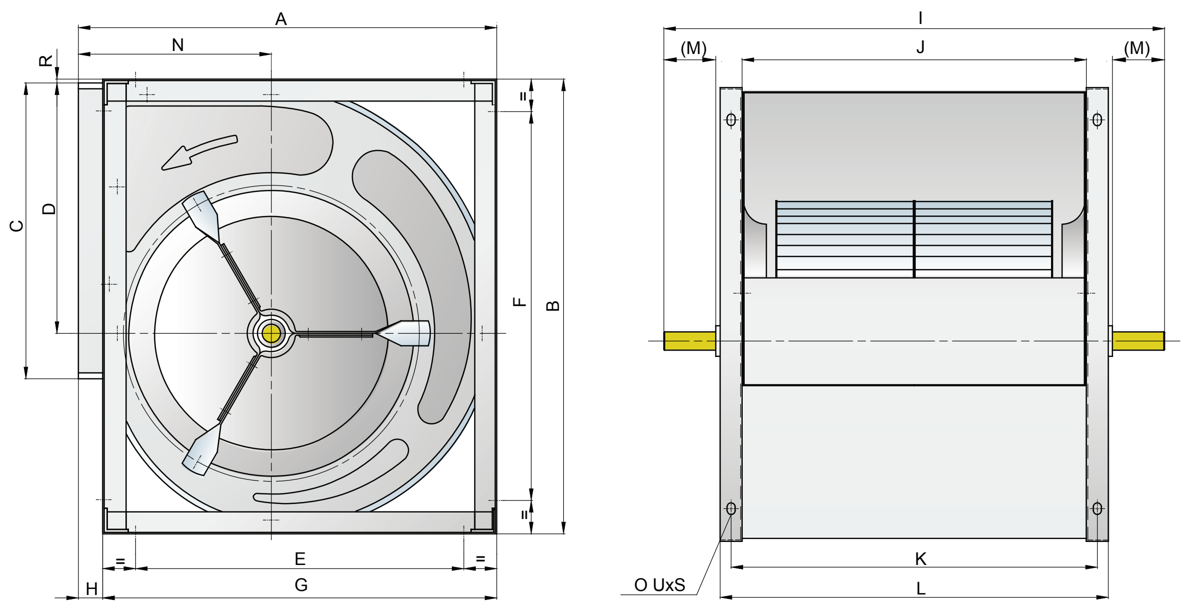
SYT-L(LK)

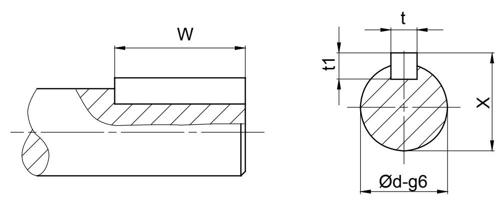


mm

Modle \ Dim	A	B	C	D	E	I	J	K	L	M	N	X	t	t1	W	ød	H1	H2	H3	X1	X2	X3
7-7L	312	328	228	192	180	370	259	279	299	32	152	22.5	6	6	30	20	224	164	164	90	90	90
8-8L	346	365	256	216	224	420	287	312	337	43	164	22.5	6	6	40	20	245	184	181	112	112	112
9-7L	380	387	262	215	300	370	232	258	282	45.5	185	22.5	6	6	40	20	253	199	177	119	124	123
9-9L	380	387	262	215	300	447	298	324	348	51	185	22.5	6	6	30	20	253	199	177	119	124	123
10-8L	430	446	289	249	340	409	265	291	315	48.5	203	28	8	7	40	25	287	227	198	136	132	135
10-10L	430	446	289	249	340	490	331	357	381	56	203	28	8	7	55	25	287	227	198	136	132	135
12-9L	492	521	341	294	408	464	309	335	359	54	230	28	8	7	40	25	332	266	232	161	153	161
12-12L	492	521	341	294	408	564	395	421	445	61	230	28	8	7	60	25	332	266	232	161	153	161
15-11L	569	609	404	342	495	552	373	399	423	66	264	28	8	7	50	25	380	309	272	197	211	161
15-11LK	569	609	404	342	495	570	373	399	423	71.8	264	33	8	7	40	30	380	309	272	197	211	201
15-15L	569	609	404	342	495	650	471	497	521	66	264	28	8	7	60	25	380	309	272	197	211	201
15-15LK	569	609	404	342	495	675	471	497	521	75.3	264	33	8	7	65	30	380	309	272	197	211	201
18-13L	684	739	478	415	608	610	430	456	480	66.5	314	28	8	7	65	25	457	376	340	262	283	278
18-13LK	684	739	478	415	608	610	430	456	480	60.6	314	38	10	8	60	35	457	376	340	262	283	278
18-18L	684	739	478	415	608	740	557	583	607	68	314	28	8	7	65	25	457	376	340	262	283	278
18-18LK	684	739	477	415	608	790	557	583	607	87.1	314	38	10	8	70	35	457	376	340	262	283	278

SYT-R(RK)

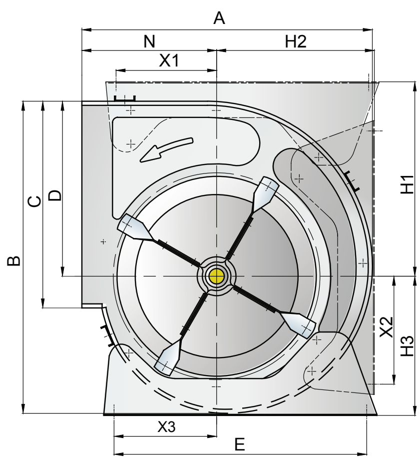


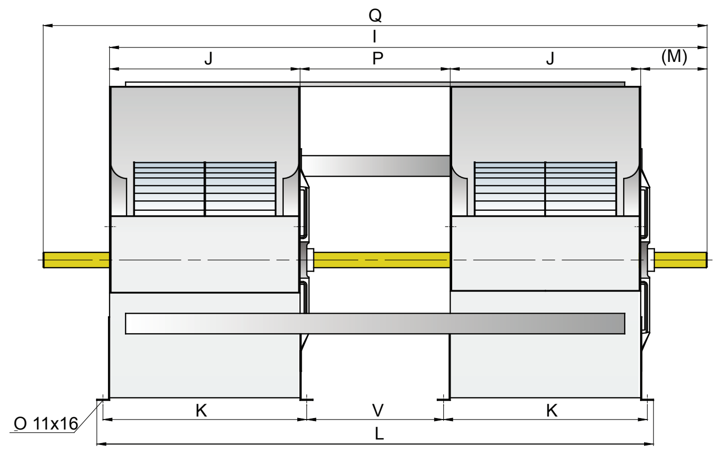


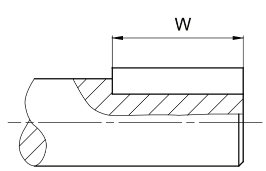
mm

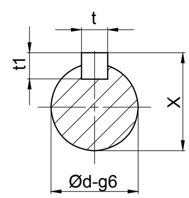
Modle \ Dim	A	B	C	D	E	F	G	H	I	J	K	L	M	N	R	t	t1	W	X	Ød	UxS
7-7R	323	336	228	192	180	180	294	29	420	259	281	299	57	152	6	6	6	40	22.5	20	9x12
8-8R	348	370	256	216	224	224	314	34	460	287	312	337	63	164	3	6	6	50	22.5	20	9x12
9-7R	385	399	262	215	274	324	349	36	388	232	254	272	54.5	185	6	6	6	40	22.5	20	9x12
9-9R	385	399	262	215	274	324	349	36	460	298	320	338	57.5	185	6	6	6	50	22.5	20	9x12
10-8R	431	455	289	249	330	390	395	36	425	265	287	305	56.5	203	6	8	7	40	28	25	11x16
10-10R	431	455	289	249	330	390	395	36	490	331	353	371	56	203	6	8	7	55	28	25	11x16
12-9R	494	527	341	294	371	443	458	36	490	309	339	369	67	230	3	8	7	50	28	25	11x16
12-12R	494	527	341	294	371	443	458	36	600	395	425	455	79	230	3	8	7	40	28	25	11x16
15-11R	575	619	402	343	449	531	539	36	585	373	403	433	82.5	267	4	8	7	50	28	25	11x16
15-11RK	575	619	402	343	449	531	539	36	625	373	403	433	99.3	267	4	8	7	40	33	30	11x16
15-15R	575	619	402	343	449	531	539	36	685	471	501	531	83.5	267	4	8	7	65	28	25	11x16
15-15RK	575	619	402	343	449	531	539	36	725	471	501	531	100	267	4	8	7	65	33	30	11x16
18-13R	690	751	478	415	544	641	654	36	666	430	470	510	94.5	314	6	8	7	65	28	25	11x16
18-13RK	690	751	478	415	544	641	654	36	666	430	470	510	88.6	314	6	10	8	55	38	35	11x16
18-18R	690	751	478	415	544	641	654	36	790	557	597	637	93	314	6	8	7	65	28	25	11x16
18-18RK	690	751	477	415	544	641	654	36	790	557	597	637	89.8	314	6	10	8	70	38	35	11x16

SYT-L2





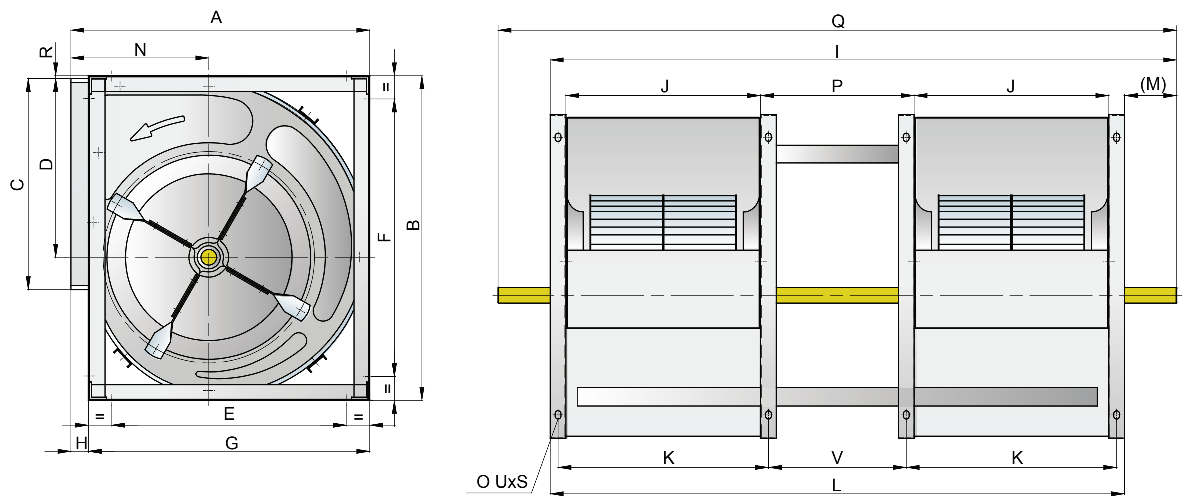


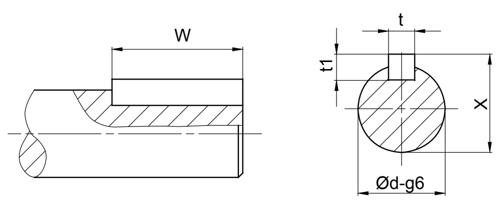


mm

Modle \ Dim	A	B	C	D	E	I	J	K	L	M	N	P	Q	V	X	t	t1	W	Ød	H1	H	H3	X1	X2	X3
7-7L2	312	328	228	192	180	\	259	279	742	80	152	184	862	164	22.5	6	6	60	20	224	164	164	90	90	90
8-8L2	346	365	256	216	224	\	287	312	838	95	164	214	978	189	22.5	6	6	60	20	245	184	181	112	112	112
9-7L2	380	387	262	215	300	\	232	258	698	90	185	184	828	159	22.5	6	6	60	20	253	199	177	119	124	123
9-9L2	380	387	262	215	300	\	298	324	890	90	185	244	1020	218	28	8	7	60	25	253	199	177	119	124	123
10-8L2	425	443	289	249	340	\	265	291	794	90	203	214	924	188	28	8	7	60	25	287	227	198	136	132	135
10-10L2	425	443	289	249	340	\	331	357	976	90	203	264	1106	238	28	8	7	60	25	287	227	198	136	132	135
12-9L2	492	521	341	294	408	\	309	335	912	110	230	244	1082	218	28	8	7	60	25	332	266	232	161	153	161
12-12L2	492	521	341	294	408	1224	395	421	1164	110	230	324	\	298	33	8	7	70	30	332	266	232	161	153	161
15-11L2	569	609	404	342	495	1170	373	399	1090	130	264	294	\	268	33	8	7	70	30	380	309	272	197	211	201
15-15L2	569	609	404	342	495	1456	471	497	1376	130	264	384	\	358	33	8	7	70	30	380	309	272	197	211	201
18-13L2	684	739	478	415	608	1343	430	454	1253	140	314	343	\	319	38	10	8	90	35	457	376	340	262	283	278
18-18L2	684	739	478	415	608	1702	557	581	1622	130	314	458	\	434	38	10	8	90	35	457	376	340	262	283	278

SYT-R2



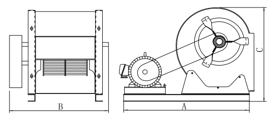
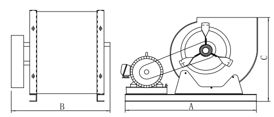
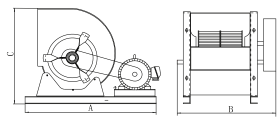
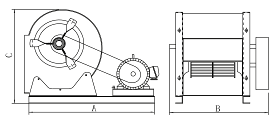
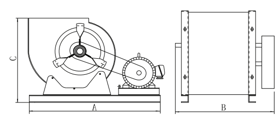
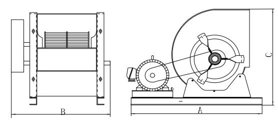


mm

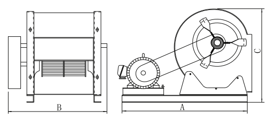
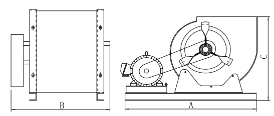
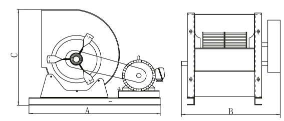
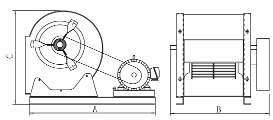
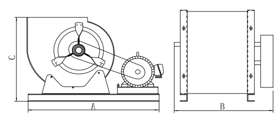
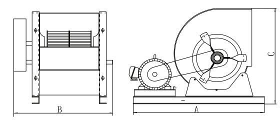
Modle \ Dim	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	V	R	t	t1	W	X	Ød	UxS
7-7R2	323	336	228	192	180	180	294	29	\	259	281	742	70	152	184	882	162	6	6	6	60	22.5	20	9x12
8-8R2	348	370	256	216	224	224	314	37	\	287	312	838	70	164	214	978	189	3	6	6	60	22.5	20	9x12
9-7R2	385	399	262	215	274	324	349	36	\	232	254	688	70	185	184	828	162	6	6	6	60	22.5	20	9x12
9-9R2	385	397	262	215	274	324	349	36	\	298	320	880	70	185	244	1020	222	6	8	7	60	28	25	9x12
10-8R2	431	455	289	249	330	390	395	36	\	265	287	784	70	203	214	924	192	7	8	7	60	28	25	11x16
10-10R2	431	455	289	249	330	390	395	36	\	331	353	966	70	203	264	1106	242	7	8	7	60	28	25	11x16
12-9R2	494	527	341	294	371	443	458	36	\	309	339	918	82	230	244	1082	214	3	8	7	60	28	25	11x16
12-12R2	494	527	341	294	371	443	458	36	1274	395	425	1174	100	230	324	\	294	3	8	7	60	33	30	11x16
15-11R2	575	619	402	343	449	531	539	36	1200	373	403	1100	100	266.7	294	\	264	4	8	7	70	33	30	11x16
15-15R2	575	619	402	343	449	531	539	36	1486	471	501	1386	100	266.7	384	\	354	4	8	7	70	33	30	11x16
18-13R2	690	751	478	415	544	641	654	36	1383	430	470	1283	100	314	343	\	303	6	10	8	90	38	35	11x16
18-18R2	690	751	478	415	544	641	654	36	1752	557	597	1652	100	314	458	\	418	6	10	8	90	38	35	11x16

注 :SYT7-7 至 SYT12-9 系列□机□双出□ / SYT12-12 至 SYT18-18 系列□机□□出□

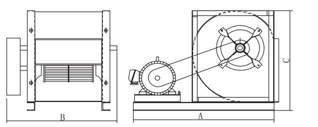
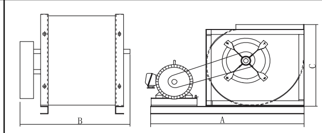
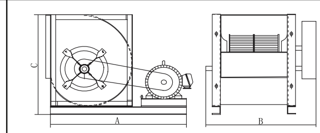
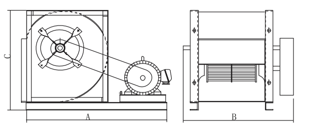
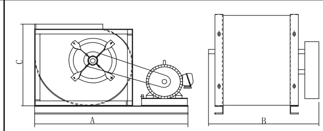
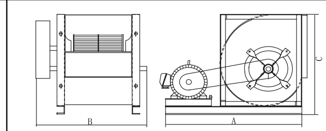
SYT-L(LK)

		0°			90°			180°		
Left Hand										
Right Hand										
Model	Motor Frame Size	A	B	C	A	B	C	A	B	C
7-7	63	690	400	410	690	400	366	690	400	406
	71	690	400	410	690	400	366	690	400	406
	80	690	400	410	690	400	366	690	400	406
	90	690	400	410	690	400	366	690	400	406
8-8	63	710	450	443	710	450	378	710	450	447
	71	710	450	443	710	450	378	710	450	447
	80	710	450	443	710	450	378	710	450	447
	90	710	450	443	710	450	378	710	450	447
9-7	71	810	400	474	810	400	434	810	400	444
	80	810	400	474	810	400	434	810	400	444
	90	810	400	474	810	400	434	810	400	444
	100	810	400	474	810	400	434	810	400	444
	/	/	/	/	/	/	/	/	/	/
9-9	71	810	439	474	810	439	434	810	439	444
	80	810	439	474	810	439	434	810	439	444
	90	810	439	474	810	439	434	810	439	444
	100	810	439	474	810	439	434	810	439	444
	/	/	/	/	/	/	/	/	/	/
10-8	71	850	465	531	850	465	480	850	465	497
	80	850	465	531	850	465	480	850	465	497
	90	850	465	531	850	465	480	850	465	497
	100	850	465	531	850	465	480	850	465	497
	/	/	/	/	/	/	/	/	/	/
10-10	80	860	490	531	860	490	480	7	490	497
	90	860	490	531	860	490	480	8	490	497
	100	860	490	531	860	490	480	8	490	497
	112	860	490	531	860	490	480	9	490	497

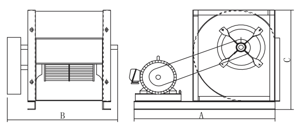
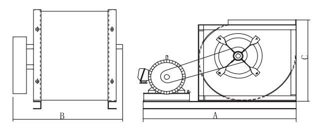
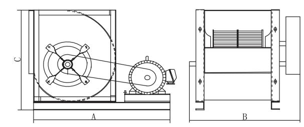
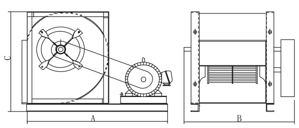
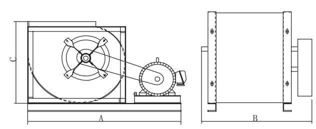
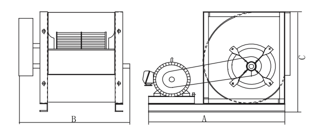
SYT-L(LK)

		0°			90°			180°		
Left Hand										
Right Hand										
Model	Motor Frame Size	A	B	C	A	B	C	A	B	C
12-9	80	960	494	610	960	494	546	960	494	576
	90	960	494	610	960	494	546	960	494	576
	100	960	494	610	960	494	546	960	494	576
	112	960	494	610	960	494	546	960	494	576
	132	960	494	610	960	494	546	960	494	576
12-12	80	960	580	610	960	580	546	960	580	576
	90	960	580	610	960	580	546	960	580	576
	100	960	580	610	960	580	546	960	580	576
	112	960	580	610	960	580	546	960	580	576
	132	960	580	610	960	580	546	960	580	576
15-11	80	1070	582	687	1070	582	613	1070	582	664
	90	1070	582	687	1070	582	613	1070	582	664
	100	1070	582	687	1070	582	613	1070	582	664
	112	1070	582	687	1070	582	613	1070	582	664
	132	1070	582	687	1070	582	613	1070	582	664
15-15	80	1080	680	687	1080	680	613	1080	680	664
	90	1080	680	687	1080	680	613	1080	680	664
	100	1080	680	687	1080	680	613	1080	680	664
	112	1080	680	687	1080	680	613	1080	680	664
	132	1080	680	687	1080	680	613	1080	680	664
18-13	90	1240	640	821	1240	640	730	1240	640	805
	100	1240	640	821	1240	640	730	1240	640	805
	112	1240	640	821	1240	640	730	1240	640	805
	132	1240	640	821	1240	640	730	1240	640	805
	160	1240	640	821	1240	640	730	1240	640	805
18-18	90	1250	770	821	1250	770	730	1250	770	805
	100	1250	770	821	1250	770	730	1250	770	805
	112	1250	770	821	1250	770	730	1250	770	805
	132	1250	770	821	1250	770	730	1250	770	805
	160	1250	770	821	1250	770	730	1250	770	805

SYT-R(RK)

		0°			90°			180°		
Left Hand										
Right Hand										
Model	Motor Frame Size	A	B	C	A	B	C	A	B	C
7-7	63	690	398	386	690	398	373	690	398	386
	71	690	398	386	690	398	373	690	398	386
	80	690	398	386	690	398	373	690	398	386
	90	690	398	386	690	398	373	690	398	386
8-8	63	710	484	420	710	484	393	710	484	420
	71	710	484	420	710	484	393	710	484	420
	80	710	484	420	710	484	393	710	484	420
	90	710	484	420	710	484	393	710	484	420
9-7	71	810	418	449	810	418	435	810	418	449
	80	810	418	449	810	418	435	810	418	449
	90	810	418	449	810	418	435	810	418	449
	100	810	418	449	810	418	435	810	418	449
	/	/	/	/	/	/	/	/	/	/
9-9	71	810	490	449	810	490	435	810	490	449
	80	810	490	449	810	490	435	810	490	449
	90	810	490	449	810	490	435	810	490	449
	100	810	490	449	810	490	435	810	490	449
	/	/	/	/	/	/	/	/	/	/
10-8	71	850	455	505	850	455	481	850	455	505
	80	850	455	505	850	455	481	850	455	505
	90	850	455	505	850	455	481	850	455	505
	100	850	455	505	850	455	481	850	455	505
	/	/	/	/	/	/	/	/	/	/
10-10	80	860	520	505	860	520	481	860	520	505
	90	860	520	505	860	520	481	860	520	505
	100	860	520	505	860	520	481	860	520	505
	112	860	520	505	860	520	481	860	520	505

SYT-R(RK)

		0°			90°			180°		
Left Hand										
Right Hand										
Model	Motor Frame Size	A	B	C	A	B	C	A	B	C
12-9	80	960	525	583	960	525	547	960	525	583
	90	960	525	583	960	525	547	960	525	583
	100	960	525	583	960	525	547	960	525	583
	112	960	525	583	960	525	547	960	525	583
	132	960	525	583	960	525	547	960	525	583
12-12	80	960	615	583	960	615	547	960	615	583
	90	960	615	583	960	615	547	960	615	583
	100	960	615	583	960	615	547	960	615	583
	112	960	615	583	960	615	547	960	615	583
	132	960	615	583	960	615	547	960	615	583
15-11	80	1070	615	661	1070	615	615	1070	615	661
	90	1070	615	661	1070	615	615	1070	615	661
	100	1070	615	661	1070	615	615	1070	615	661
	112	1070	615	661	1070	615	615	1070	615	661
	132	1070	615	661	1070	615	615	1070	615	661
15-15	80	1080	715	661	1080	715	615	1080	715	661
	90	1080	715	661	1080	715	615	1080	715	661
	100	1080	715	661	1080	715	615	1080	715	661
	112	1080	715	661	1080	715	615	1080	715	661
	132	1080	715	661	1080	715	615	1080	715	661
18-13	90	1240	696	791	1240	696	730	1240	696	791
	100	1240	696	791	1240	696	730	1240	696	791
	112	1240	696	791	1240	696	730	1240	696	791
	132	1240	696	791	1240	696	730	1240	696	791
	160	1240	696	791	1240	696	730	1240	696	791
18-18	90	1250	820	791	1250	820	730	1250	820	791
	100	1250	820	791	1250	820	730	1250	820	791
	112	1250	820	791	1250	820	730	1250	820	791
	132	1250	820	791	1250	820	730	1250	820	791
	160	1250	820	791	1250	820	730	1250	820	791

SYT Series Fan Operational Limits

			7-7	8-8	9-7	9-9	10-8	10-10	12-9	12-12	15-11	15-15	18-13	18-18
Max.Absorbed Power	L-R	Kw	1	1.5	2	2	2	3	4	4	2.5	3	4	4
	LK-RK	Kw	/	/	/	/	/	/	/	/	6	8	10	12
	L2-R2	Kw	2	3	4	4	4	6	8	8	12	16	20	24
Max.Speed	L-R	rmp	2200	2200	2200	1800	1800	1800	1600	1500	1000	900	800	700
	LK-RK	rmp	/	/	/	/	/	/	/	/	1300	1200	1200	1100
	L2-R2	rmp	2200	2200	2200	1800	1800	1800	1600	1500	1300	1200	1200	1100
Air Temperature Limits（Min-20℃）	L-R	Max.℃	85	85	85	85	85	85	85	85	85	85	85	85
	L2-R2	Max.℃	85	85	85	85	85	85	85	85	85	85	85	85
Bearing Dynamic Load	L-R	N	12800	12800	12800	12800	14000	14000	14000	14000	14000	14000	14000	14000
	LK-RK	N	/	/	/	/	/	/	/	/	19500	19500	25700	25700
	L2-R2	N	12800	12800	12800	12800	14000	1400	14000	19500	19500	19500	25700	25700
Fan Weight	L	Kg	6	7	8	9.5	10	11	15.2	18.2	21.2	24.7	32.4	39.6
	R	Kg	8.5	9.5	10.2	11.4	12.3	13.2	19.1	22	25.1	29.4	39.6	45.5
	LK	Kg	/	/	/	/	/	/	/	/	24.5	28.2	38.6	45.8
	RK	Kg	/	/	/	/	/	/	/	/	28.5	32.8	45.8	51.7
	L2	Kg	14	15.6	17.9	21.7	22.2	25.3	33.9	40.6	47.6	54.3	69.3	84.6
	R2	Kg	20	24	25.8	29.7	29.7	34.1	50	56	63	74.8	100.1	116.3