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LKQ系列离心式空调风机技术手册 The LKQ Series Centrifugal Fan



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浙江莱恩克风机有限公司
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Qualification Certificate

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Mutual benefits are the way to lead us to a great future. With honest attitude, pragmatic work style and innovative thinking, we'll try our best to achieve multi-win situation for our company, employees, customers, partners and the society, which will help us for a long-time sustainable development.



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Zhejiang Lion King Ventilator Co Ltd certifies that the LKQ Centrifugal Fan series shown herein is 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.

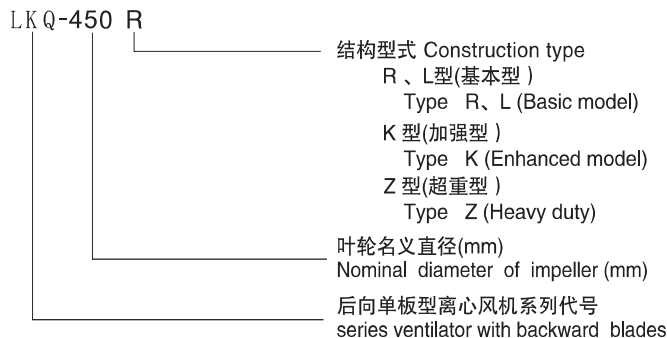


命名方式

Nomenclature

LKQ系列风机命名方式由风机系列代号、叶轮名义直径、结构型式组成:

The model designations signify the nominal impeller outside diameters:



产品形式

Product Features

1. 旋向

LKQ系列风机可分为左旋(LG)和右旋(RD)两种旋转方式,从风机皮带轮一端正视,叶轮顺时针旋转的称为右旋风机,逆时针旋转的称为左旋风机。皮带轮可左右调向,因此不受左右方向的限制。

LKQ Series ventilator can be divided into two direction of rotations, left-hand rotation (LG) and right-hand rotation (RD); Viewing from end of motor outlet line if the impeller rotates clockwise, it is called right hand ventilator. If the impeller rotates anti-clockwise, it is called left hand ventilator. The pulley can adjust its direction, left or right, therefore there is no limitation in directionality.

2. 出风口方向

LKQ系列风机可按图1所示制成0°、90°、180°、270°四种出风方向。

2. Direction of Air Outlet

According to Fig 1, LKQ Series ventilator can be made in four air-outlet directions: 0°, 90°, 180°, and 270°.

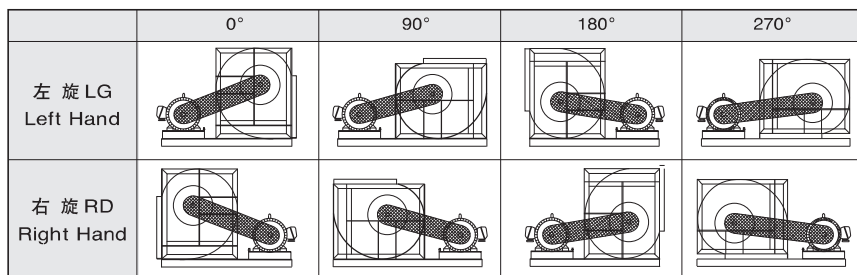


图1(Fig1)

3. 结构形式

LKQ系列风机分为R型、K型和Z型三种形式, R型为基本型, K型为用于大功率的加强型, Z型用于重载的超重型。

3. Type of structure

There are three types of LKQ ventilators, type R, type K and type Z. The type R represents the basic model, while the type K is designed for use at the higher power levels, and the type Z at the heavy duty levels.

产品结构

Construction of Product

LKQ系列风机主要由机壳、叶轮、框架、轴承、轴、出风口法兰(常规配置不带法兰)构成。

1) 机壳

机壳采用热镀锌钢板制造,侧板具有符合空气动力的外形,进风口整体拉伸成型,蜗板采用咬口或点焊的方式与侧板连接成一体。

2) 叶轮

叶轮采用优质冷轧钢板制成,按三元流理论设计的单板式叶片焊接在经数控机床加工的中盘和端圈上,整体喷塑。叶轮按高于国家标准的内控动平衡精度等级全检合格。

3) 框架

框架由角钢和扁钢焊接制成,表面喷塑,以保证足够的刚度和强度。

4) 轴承

轴承均采用优质滚珠或滚柱轴承,并根据噪声最低来选择,该轴承设有加润滑油的孔,已预先加润滑油并自动对中。L、R、K型风机采用向心球轴承,Z型风机采用重载的双列滚柱轴承的轴承箱结构。

5) 轴

风机轴采用特制钢经粗加工、调质处理及磨削精加工制成,严格控制轴径尺寸公差及形位公差,每根轴均经过涂覆防锈处理。

6) 出风口法兰

法兰采用热镀锌钢板制造,法兰与壳体的连接采用TOX免焊工艺或螺栓连接,外观精美,并具有足够的刚度与强度。法兰口形式参照下页图2所示。

The major components of the LKQ Series ventilators include the scroll, impeller, frame, bearings, shaft, and outlet flange. (Outlet flange should be indicated when placing order)

1) Scroll

The scroll is made of hot galvanized steel sheet, and it is designed to provide an aerodynamically efficient flow path. The inlet is formed in one piece. The scroll is fixed to the side plates by "spot welding" or "seam locking".

2) Impeller

The LKQ impeller is made of high grade cold-rolled steel sheet. It is to provide a highly efficient and low noise and specially-designed blades, are welded on the center disc, and painted with polyester coatings. The impellers are dynamic balanced testing balanced before assembly in accordance with national standards.

3) Frame

The frames of LKQ made of angle flat steel to assure sufficient frame rigidity and intensity they are painted with polyester coatings.

4) Bearings

Out-spherical ball bearings are used LKQ Series ventilators. They are high quality with low noise ventilator. The bearing are supplied with lubrication fittings, they are pre-lubricated, sealed and self centering. For type L、R、K ventilators, self-aligning ball bearings are used, for type Z ventilators, heavy duty bearings housings are used.

5) Shaft

The shafts are made of 40 Cr or C45 carbon steel bars. The shafts are rough machined and then stress relieved before final machining. The shaft diameters are machined to very accurate tolerance levels and they are fully checked to assure precision fits. They are coated after assembly in order to provide corrosion resistance.

6) Outlet Flange

The outlet flange is made of galvanized steel sheet. The connections of the flange to the scroll is made using a TOX non-welding process. This maintains a good flange appearance while also providing sufficient strength and rigidity. The outlet flange dimensions are provided in Figure 2.



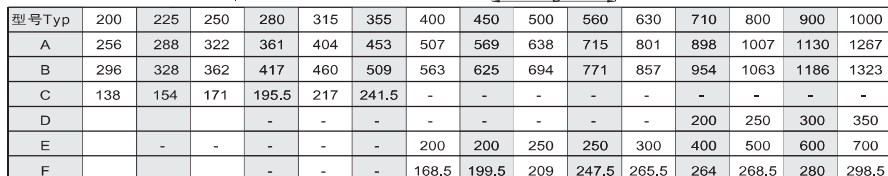


图2 (Fig 2)

风机性能

1. 该样本中风机性能均指在标准状态下的性能, 即风机进气状态为:

进气压力	$P_a = 101.325 \text{ KPa}$
进气温度	$t = 20^\circ \text{C}$
进气气体密度	$\rho = 1.2 \text{ Kg/m}^3$

若用户实际使用的气体进气状态或使用的风机转速改变时则可按下列关系式换算：

$$\begin{aligned} \frac{Q_2'}{Q_2} &= \frac{n'}{n} \\ \frac{P_2'}{P_2} &= \frac{n'^2}{n^2} \cdot \frac{\rho'}{\rho} & \frac{P_2'}{P_2} &= \frac{n'^2}{n^2} \cdot \frac{Pa'}{Pa} \cdot \frac{273+t}{273+t'} \\ \frac{Nin_2'}{Nin_2} &= \frac{n'^3}{n^3} \cdot \frac{\rho'}{\rho} & \frac{Nin_2'}{Nin_2} &= \frac{n'^3}{n^3} \cdot \frac{Pa'}{Pa} \cdot \frac{273+t}{273+t'} \end{aligned}$$

上述式中

- 流量 $Q_0(\text{m}^3/\text{h})$ 、全压 $P_0(\text{Pa})$ 、转速 $n(\text{r}/\text{min})$ 、内功率 $N_{i0}(\text{Kw})$ 由性能曲线图上查得。
- 右上角加符号“x”的则为用户实际使用气体进气状态下所需的性能参数。
- 上式中略去了相对湿度的差别。

1. The ventilator performance in this catalogue denotes the performance in standard conditions. It denotes air inlet conditions of ventilator as follows:

Air inlet pressure	$P_a = 101.325 \text{ KPa}$
Air temperature	$t = 20^\circ \text{C}$
Inlet gas density	$\rho = 1.2 \text{ Kg/m}^3$

If the practical air inlet conditions of customer or the speed of the operating ventilator changes, the conversion can be carried out according to the following expression:

$$\begin{aligned} \frac{Q_o'}{Q_o} &= \frac{n'}{n} \\ \frac{P_o'}{P_o} &= \frac{n'^2}{n^2} \cdot \frac{\rho'}{\rho} & \frac{P_o'}{P_o} &= \frac{n'^2}{n^2} \cdot \frac{Pa'}{Pa} \cdot \frac{273+t}{273+t'} \\ \frac{Nin_o'}{Nin_o} &= \frac{n'^3}{n^3} \cdot \frac{\rho'}{\rho} & \frac{Nin_o'}{Nin_o} &= \frac{n'^3}{n^3} \cdot \frac{Pa'}{Pa} \cdot \frac{273+t}{273+t'} \end{aligned}$$

where:

- Volume Q_0 (m³/h), total pressure P_0 (Pa), speed n (r/min) can be obtained from Performance chart.
- Asterisk (*) on the upper right corner denotes the performance parameter needed by the customers in practical gas inlet conditions.
- The difference in relative humidity is omitted from the above-mentioned formulas.



2. 性能曲线图上的功率 N_{in} 是指风机的内功率。

- 风机轴功率: $N_s = N_{in} / \eta_m$
 式中: N_s —风机轴功率
 η_m —风机机械效率
 风机机械效率的取值方法可参照表 1。

风机传动方式Way of ventilator driving	η_m
电机直联传动electric motor directly driven	1
联轴器直联传动Coupling directly driven	0.98
三角皮带传动V-belt driven	0.95

表1 (Table1)

(2) 配套电机的功率: $N = N_s \cdot K$
式中: N -配套电机的功率
 K -电机容量安全系数

电机容量安全系数的取值方法可参照表2。

2. The power (N_{inO}) on the performance chart the internal power of the ventilator.

- Shaft power of ventilator: $N_s = N_{in_o} / \eta_m$
 where: N_s —Shaft power of ventilator
 η_m —Mechanical efficiency of ventilator
 The value of mechanical efficiency of ventilator can be obtained from Table 1.

(2)The rated power of the drive motor equals the total required shaft input power multiplied by the safety factor:

$$N = N_s \cdot K$$
where: N = rated power of drive motor
K = required safety factor
The required safety factor is provided in Table 2.

电机功率Power of electric motor(Kw)	K值Value k
≤2.2Kw	1.2
≤ 7.5Kw	1.15
≥ 11Kw	1.1

表2 (Table2)

3. 噪声：噪声等级显示在每个性能表上。

L_{wiA}为总声功率级的A计权声级。计算所得的总声功率级用表3中倍频谱的A计权衰减
值换算至A声功率级。

中心频率 Center Frequency Hz	63	125	250	500	1000	2000	4000	8000
调整为A-Weighted Adjustment dB(A)	-25.5	-12.5	-8.5	-3	0	+1	+1	-1

表3 (Table3)

总声压级L_pA能利用总声能等级按如下公式计算:

无边界状态: $L_{pA} = L_{wA} - (20 \log_{10} d) - 11$

室内状态: $L_{pA} = L_{wA} - (20 \log_{10} d) - 7$

式中: d = 离风机距离(m)

4. L2型、R2型、K2型双联风机性能与L型、R型、K型风机曲线上所示性能比较，在压力相同情况下，双联风机性能如下：

风量	x 2
转速	x 1.05
内功率	x 2.15
噪声	+3

双联风机的性能未获AMCA International 授权。

3. Noise: The noise levels shown on each performance chart, L_{wA} , refer to the overall sound power "A-Weighted" levels. The computed sound power levels were converted into A-Weighted levels using adjustments to the octave band spectrum as follows:

The overall sound pressure levels, L_{pIA} , can be computed from the overall sound power levels as follows:

Free Field Conditions: $L_{pIA} = L_{wIA} - (20 \log_{10} d) - 11$

Room Conditions: $L_{pIA} = L_{wIA} - (20 \log_{10} d) - 7$

Where: d = distance from fan in meters.

4. Comparing the performance of the twin ventilator 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 ventilators' performance is as the following.

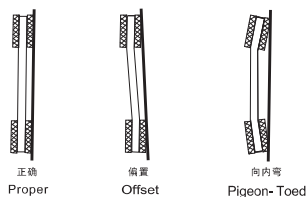
Volume	x 2
Speed	x 1.05
Inner Power	x 2.15
Noise	+3

Performance of twin ventilators are not licensed by AMCA International.



皮带传动安装

1. 拆除风机轴端的保护并检查有无缺口和毛刺；
2. 检查风机和电机轴之间的平行度；
3. 中心距应控制在 $0.7(d_1+d_2) < a < 2(d_1+d_2)$ ，前向风机皮带速度应控制在10~15m/s；后向风机皮带速度应控制在25~35m/s；
4. 将皮带轮套在轴上滑进去，不要敲击，以免损伤轴承；
5. 用一根直尺把风机和电机上的带轮对齐并紧固；
6. 把皮带套进皮带轮，不要撬、挤压，以免损伤皮带；
7. 调整张紧度直至皮带看起来松紧适度，风机运行几分钟后，再调整皮带至合适的张紧度；
8. 关掉风机，移动电机座以调整张紧度，当风机工作时，皮带紧的一边应是两个皮带轮连成的一直线，松的一边有轻微弧形。



皮带松紧度

合适的皮带松紧度对使用寿命来说很重要太紧会给皮带和轴承带来额外的负载，降低它们的使用寿命，太松会出现皮带打滑现象而产生热能并降低使用寿命。皮带松紧度量具可用于判断皮带是否松紧合适。量具本身带有一个尺表，根据皮带轮中心距和皮带横截面确定皮带张紧力的大小，如图4和表3。

V-BELT DRIVE INSTALLATION

1. Remove the protective coating from the ends of the fan shaft and assure that the shaft ends are free of nicks and burrs.
2. Check fan and motor shafts for parallel and angular alignment.
3. The center distance must be controlled as $0.7(d_1+d_2) < 2(d_1+d_2)$; the belt speed of forward fan should be more than 10m/s, but less than 15m/s, (10<v<15m/s); the belt speed of backward fan should be more than 25m/s, but less than 35m/s, (25<v<35m/s);
4. Slide sheaves on to the shafts—do not drive the sheaves on to the shafts as this may result in bearing damage.
5. Align fan and motor sheaves with a straight-edge or string, and tighten.
6. Place belts over the sheaves with carefull, otherwise the belts will be 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.



如没有皮带张紧度量具，应调节皮带松紧至风机启动时皮带不发出尖叫声为止，如发出短促的叫声是允许的。
拉紧皮带后、开动风机之前，重新检查皮带轮的对齐情况，如有必要则重新调整对齐。新皮带在开始使用时可能有点拉伸，则应在运行几天后重新检查皮带张紧度。

与中心距有关的皮带张紧度指示
Belt tension indicator applied to mid centre distance.

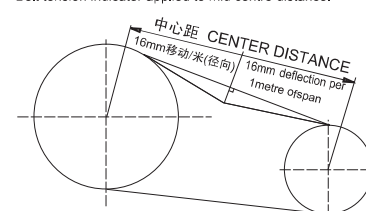


图4 (Fig4)



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 ventilator is started. A very short period of noise during the starting of a ventilator is allowable, but a squeal lasting several seconds or longer is not acceptable. After tensioning the belts and before starting the ventilator, check to make sure that the sheaves are 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 day of operation.

皮带截面 Belt Section	使皮带向下移动16mm径向距离1米所需的力 Force required to deflect belt 16mm per metre of span		
	张紧力 (小皮带轮直径) Small Pulley Diameter (mm)	牛顿	千克力 Kilogram force (kgf)
SPZ	56-95	13-20	1.3-2.0
	100-140	20-25	2.0-2.5
SPA	80-132	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	80-140	10-15	1.1-1.5
B	125-200	20-30	2.0-3.1

表3 (Table3)

轴承润滑

风机使用带座轴承，可通过加油嘴注入润滑油。润滑油有效期取决于油脂类型、轴承的转速和工作温度。判断是否加油的最好办法是当加新油时观察清除下来的旧油脂，如果清除下来的油脂看起来还象是新的，可延长换油脂的间隔，如果清除下来的油脂比新的黑得多表明油脂已氧化，应缩短换油脂的间隔。

Bearing Lubrication

The ventilator bearings are filled with lubricant when they come from the factory, so the bearings do not require any additional grease to be supplied before starting the ventilator. The ventilator that are equipped with pillow block bearings are provided with lubrication fittings, and these fittings allow for additional lubrication to be 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 grease used. The best way to determine the required frequency of lubrication is to inspect the condition of the grease that is discharged from the seals 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, then this indicates that the grease is being oxidized and more frequent lubrications of the bearings are required.

说明

1) . 订货时须注明风机型号、转速、风量、风压、出风口方向和旋转方向。若需配套皮带、皮带轮、电机、安装底座等配件及它特殊要求可在订货时提出。

Instructions

1) . During ordering it is necessary to state the type of ventilator, speed, air volume, air pressure, direction of air outlet, rotating direction, type of electric motor and its specifications.

