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



浙江莱恩克风机有限公司
ZHEJIANG LION KING VENTILATOR CO., LTD.

地址：浙江省台州市椒江区章安杨司公路688号
电话：0576-88789123 传真：0576-88893593

Add: No. 688, Yangsi Road, Zhang'an, Jiaojiang district, Taizhou City, Zhejiang Province, China
Tel: 0086-576-8878933/82781228 Fax: 0086-576-82713889
Website: <http://www.lkfan.com>



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ZHEJIANG LION KING VENTILATOR CO., LTD.

企业理念

Qualification Certificate

诚信立足，创新发展，共赢致远……

Based on Honesty, Innovation to Promote Development, Mutual Benefits Lead to Great Future

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Honesty is the foundation of LION KING. We consistently pursue good faith as our principle. We advocate our managers and employees operating honestly, and we advocate to develop with society, customers and partners in harmony to make our company to exist more than one hundred years.

Innovation is the source of vitality of LION KING. We advocate innovation, and actively create good atmosphere for innovation, such as respecting talents, respecting knowledge, respecting hardworking, respecting creation. And in practice, we continue to promote innovation of our system, mechanism, technologies and products.

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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概述

LKQS 系列后向单进风离心风机采用国际同类产品先进技术自行开发,通过了 AMCA 国际认证并取得 AMCA 印章,该样本列出的 15 种规格风机,流量范围从 700m³/h-120000m³/h,全压从 200Pa-3000Pa,产品具有效率高、噪声低、耗电少、通用性强、安全性好等特点,广泛应用于各类中央空调机组及其他暖通空调、净化、通风等空调系统。

命名方式

LKQS—560 R

产品型式

1. 旋向

LKQS 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。

Summary

The LKQS Series of centrifugal fans with backward blade were developed with advanced technologies. They are licensed to bear the AMCA Seal for air performance, sound, and FEG. The LKQS Series includes 15 models as described in this catalogue. The volume flow of the LKQS Series ranges from 1,000 m³/h to 120,000 m³/h, the total pressure ranges from 200Pa to 3,000 Pa. 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.

Nomenclature

结构型式 Construction type

R 型(基本型) Type R (Basic Model)

E 型(加强型) Type E (Heavy Duty Model)

C 型(悬臂型) Type C (Hanging Model)

叶轮名义直径(mm)

Nominal diameter of Wheel (mm)

后向单进风离心风机系列代号

Series fan of single inlet with backward blades

Product Features

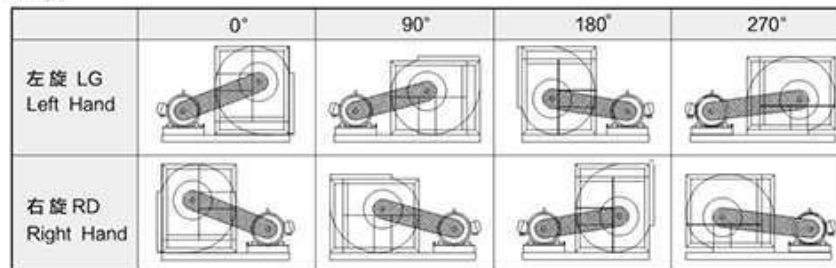
1. Rotation

LKQS 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).

2. 出风口方向

LKQS 系列出风口可按图 1 所示制成 0°、90°、180°、270° 四种出风方向。

图 1 (Fig 1)



2. Discharge Direction

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

3. 结构形式

LKQS 系列风机可按图 2 所示制成 R 型、E 型、C 型。

图 2 (Fig 2)

风机类型 Fan Type	机号 Fan Size	风机示意图 Fan Diagram	轴承实物图 Bearing Type
R 型 TYPE R	280-710		
E 型 TYPE E	280-1000		
C 型 TYPE C	280-1400		

3. Type of Construction

As shown in Fig 2, LKQS series fans can be divided into category R, E, C.



产品结构

LKQS系列风机主要由机壳、叶轮、框架、轴承及轴构成。
出口法兰(为可选件)。

1. 机壳

机壳采用热镀锌钢板制造,侧板具有符合空气动力学的外形,进风口整体拉伸成型,蜗板采用点焊或“Pittsburg seam locking”的连接方式与侧板连成一体。

2. 叶轮

后向叶轮采用优质冷轧钢板制成,按三元流理论设计的机翼型叶片焊接在高精度激光切割机加工的中盘和端圈上,整体喷塑。所有叶轮进行静平衡和动平衡测试,内控精度达到 G2.5 级 (ANSI/AMCA 204-05)。

3. 框架

R 型风机框架采用热镀锌钢板剪切、折弯制成,TOX 连接保证了所需的尺寸精度和应有的刚度;E 型、C 型风机框架由角钢和扁钢冷弯焊接制成表面喷塑处理,以保证足够的刚度和强度。

4. 轴承

LKQS 系列风机均采用优质滚珠轴承,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;R 型风机的轴承安装在轴承支架上,并设有防振垫圈;E 型、C 型风机则采用带座向心球轴承;轴承寿命为 $L_{10} \geq 100000$ 小时。

5. 轴

风机轴采用 40Cr 低合金钢,经车、调质热处理、磨削制成,强度高,挠度小,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。轴尺寸设计应满足第一临界转速至少为风机最大运行转速的 1.4 倍。

6. 出风口法兰

进风口法兰采用优质冷轧板制成,整体喷塑。出风口法兰采用热镀锌钢板制成,出风口法兰与蜗板的连接采用 TOX 免焊工艺,外观精美,并具有足够的刚度与强度。

Construction of Product

LKQS 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

Backwards curved airfoil Wheel is constructed of high-grade cold-roll steel sheets, according to the three-dimensional flow theory, the Wheel is fixed on the center plate and on the end ring with welding by high precision laser cutting machine. The unity of the Wheel is spraying by plastic. 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 construction 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 frames for E and C constructions are welded by angle steel and flat steel with polyester coating in order to ensure sufficient rigidity and strength.

4. Bearings

Ball bearings are used in all of the SYQS Series fans. These are high-quality bearings and selected to minimize the fan noise levels. The bearings are pre-lubricated, sealed, and self-centering. For type R constructions, the bearings are supplied with lubrication fittings. For type E and C constructions, the bearings are supplied with radial bearing. Yilida bearing service life (L_{10}) are over 100,000 hours ($L_{10} \geq 100000$ 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 inlet flange is made of high-grade cold-rolling sheet with polyester coating. 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.

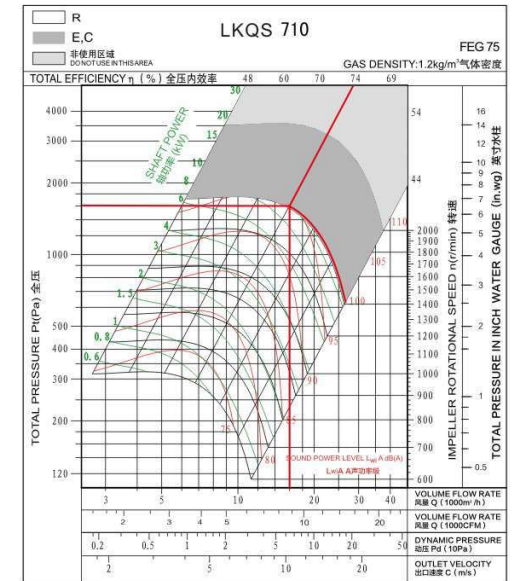
风机性能

1、风机选型示意图例

型号 Type	LKQS710K
风量 Volume	$q_v=16000\text{m}^3/\text{h}$
全压 Total Pressure	$P_{\text{TP}}=1600\text{Pa}$
动压 Dynamic Pressure	$P_{\text{DP}}=64\text{Pa}$
出口速度 Outlet Velocity	$C=10.35\text{m/s}$
风机转速 Fan Speed	$n=1430\text{r/min}$
轴功率 Shaft Power	$P_{\text{sh}}=9.5\text{KW}$
A声功率级 A Sound Power Level	$L_{\text{WA}}=94\text{dB(A)}$
全压效率 Total Efficiency	$\eta_{\text{F}}=74\%$

Performance Chart

1. Fan Performance Curve





2、电机的选配

性能曲线图上的功率 P_{sh} 是指风机的轴功率。

配套电机的功率： $P_{motor}=P_{sh} \times K \div \eta_{me}$

风机传动效率的取值方法可参照表 1；

电机容量安全系数的取值方法可参照表 2。

表 1 (Table 1)

风机传动方式	Drive Type	η_{me}
电机直联传动	Motor Direct Drive	1
联轴器直联传动	Coupling Direct Drive	0.98
三角皮带传动	V-Belt Drive	0.95

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 required shaft input multiplied by the safety factor: $P_{motor}=P_{sh} \times K \div \eta_{me}$
The value of mechanical drive efficiency can be obtained from Table 1.

The required safety factors is provided in Table 2.

表 2 (Table 2)

电机功率	Power of electric motor (kW)	K值 Value k
$\leq 0.75\text{kW}$		1.3
$\leq 2.2\text{kW}$		1.2
$\leq 7.5\text{kW}$		1.15
$\geq 11\text{kW}$		1.1

安装与维护

A) 皮带传动安装

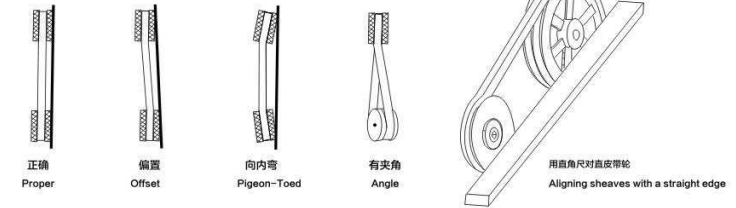
1. 拆除风机轴端的保护并检查有无缺口和毛刺；
2. 检查风机和电机轴之间的平行度；
3. 中心距控制在 $0.7(d_1+d_2) < a < 2(d_1+d_2)$ ，前向风机皮带速度应控制在 $10 \sim 15\text{m/s}$ ；后向风机皮带速度应控制在 $25 \sim 35\text{m/s}$ ；
4. 将皮带轮套在轴上滑进去，不要敲击，以免损伤轴承；
5. 用一根直尺把风机和电机上的带轮对齐并紧固；
6. 把皮带套进皮带轮，不要撬、挤压，以免损伤皮带；
7. 调整张紧度直至皮带看起来松紧适度，风机运行几分钟后，再调整皮带至合适的张紧度；
8. 关掉风机，移动电机座以调整张紧度，当风机工作时，皮带紧的一边是两个皮带轮连成的一条直线，松的一边有轻微弧形。

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 $0.7(d_1+d_2) < a < 2(d_1+d_2)$. The belt speed of forward curve fan should be more than 10m/s , but less than 15m/s , ($10 < v < 15\text{m/s}$). The belt speed of backward curve fan should be more 25m/s , but less than 35m/s ($25 < v < 35\text{m/s}$).
4. Slide 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.



图 3 (Fig3)



B) 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来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。

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生尖叫为止，如发生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，如右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。

B) Belt Tension

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 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 fan, 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 days of operation.

表 4 (Fig4)

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

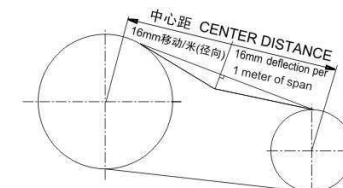
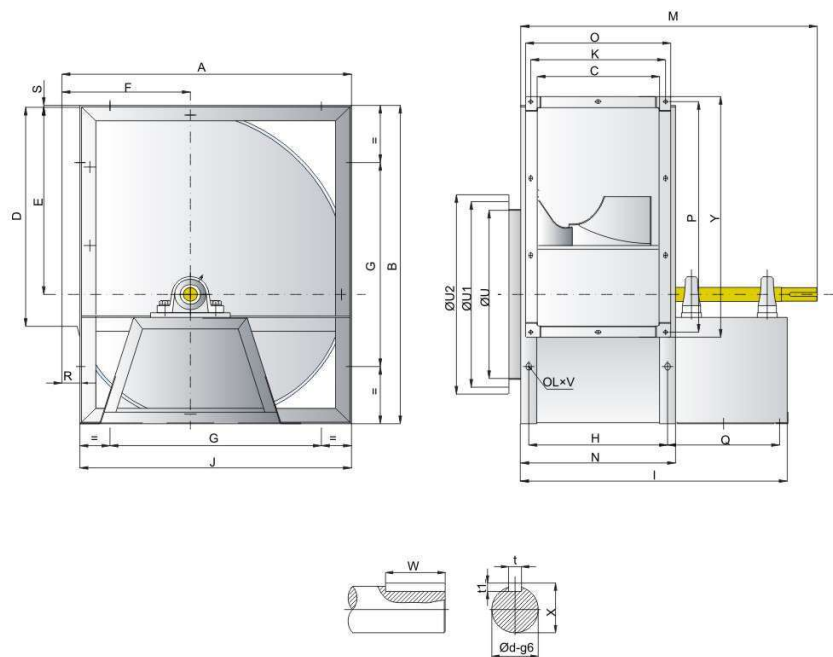


表 3 (Table3)

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 Newtonian (N)	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



LKQS-C

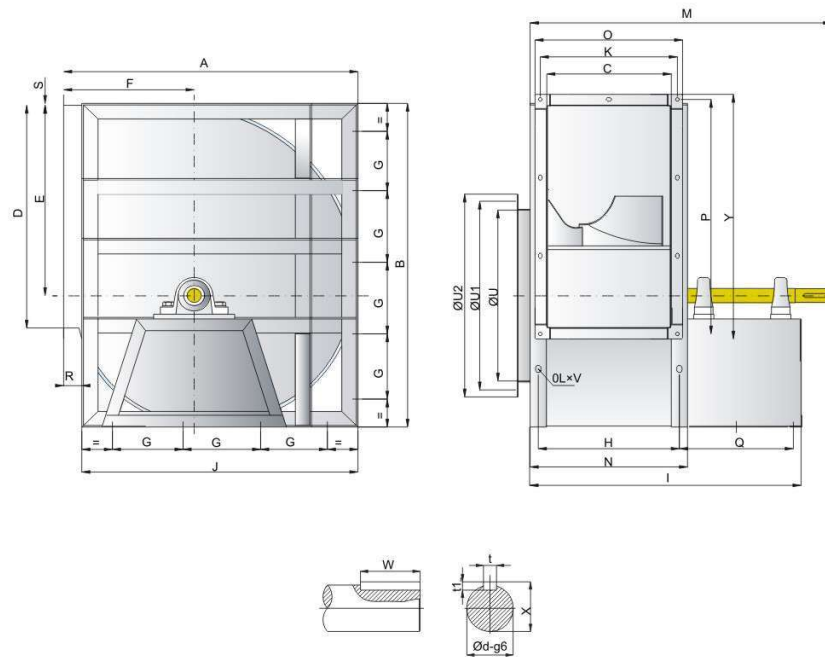


单位: mm

	A	B	C	D	E	F	G	H	I	J	K	M	N	O	P	Q	R	S	t	t1	U	U1	U2	W	X	Y	Φd	LxV
280	466	518	197	361	302	215	280	227	530	432	213	590	257	239	391	274	34	5	8	7	292	325	355	40	28	417	25	13x18
315	518	578	223	404	340	236	290	253	556	480	233	612	283	259	434	274	36	3	8	7	322	344	383	40	28	460	25	13x18
355	578	655	247	453	383	261	355	287	627	548	260	697	327	286	483	300	30	6	8	7	362	386	423	50	33	509	30	13x18
400	651	736	274	507	432	290	355	314	654	613	290	724	354	316	537	300	38	4.5	8	7	404	432	466	50	33	563	30	13x18
450	726	827	308	569	486	322	530	348	728	681	318	816	388	344	599	340	45	5	10	8	448	485	515	70	38	625	35	13x18
500	800	918	344	638	538	352	530	384	764	750	350	850	424	376	668	340	50	5	10	8	510	544	570	70	38	694	35	13x18
560	893	1030	383	715	603	390	530	433	855	845	366	945	483	414	745	378	48	8	12	8	570	605	635	90	43	771	40	13x18
630	999	1157	432	801	679	434	530	482	904	946	434	994	532	460	831	378	53	7	12	8	635	670	700	90	43	857	40	13x18
710	1121	1303	478	898	765	485	630	528	1005	1058	483	1115	578	512	928	436	63	7	14	9	722	750	778	90	48.5	954	45	17x22
800	1250	1468	533	1107	862	535	710	583	1060	1181	541	1170	633	567	1039	440	69	7	14	9	808	844	875	90	48.5	1063	45	17x22
900	1408	1648	595	1130	971	604	800	655	1191	1319	602	1313	715	613	1160	510	89	7	16	10	896	945	980	100	58.5	1186	45	17x22
1000	1541	1810	663	1267	1066	657	900	713	1259	1462	668	1381	783	694	1297	510	79	9	16	10	996	1044	1080	100	58.5	1323	45	17x22



LKQS-C



单位: mm

	A	B	C	D	E	F	G	H	I	J	K	M	N	O	P	Q	R	S	t	t1	U	U1	U2	W	X	Y	Φd	LxV
1120	1748	2033	722	1421	1192	758	400	782	1397	1630	777	1583	842	825	1478	572	118	11	18	11	1130	1180	1266	120	69	1526	65	17x22
1250	1950	2270	800	1588	1333	840	450	880	1565	1825	850	1740	950	900	1638	600	125	12	20	12	1265	1310	1361	140	74.5	1688	70	17x22
1400	2160	2535	900	1744	1492	920	500	980	1760	2050	952	1910	1050	1002	1826	695	110	10	22	14	1402	1450	1500	140	85	1876	80	17x22