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LION KING

LKT系列离心式空调风机技术手册
The LKTSeries Centrifugal Fan

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

企业理念
Quallfication Certificate

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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.

产品简介
Productd introduction

前向多翼离心式空调风机

风机流量：1000m³/h~40000m³/h

性能：达到国家1级能效要求

Forward curved multi-blades centrifugal fan

Air Volume Range:1000m3/h

National standard of energy efficiency:

reach to grade 1 energy efficiency

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概述 Outline

1

LKT 系列离心式空调风机流量从1000m³/h~40000m³/h，具有结构紧凑、效率高、噪声低等特点，是各类柜式中央空调机组、管道式机组及其它暖通、空调、净化、通风设备理想的配套产品。

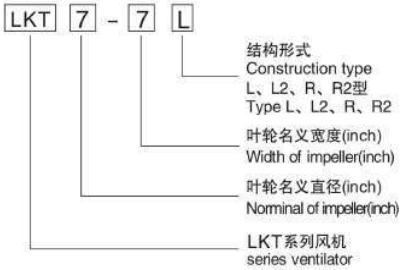
LKT series centrifugal ari-conditioning ventilators volum ranging from 1000m³/h~40000m³/h, they are characterized by compact construction. high efficiency and low noise. They are the ideal subsidiary equipment for various cabinet central air-conditioning units, tube units and heating, air-conditioning, cleansing and ventilating equipments.

产品命名方式 Designation of Products

2

LKT系列风机命名方式由风机系列代号、叶轮名义直径、叶轮名义宽度、结构形式组成。

The nomenclature of LKT series is composed of nominal diameter of imper and nominal width of impeller.



产品型式 Type of Product

3

1. 旋向

LKT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。

2. 出风口方向

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

1. Direction of Rotation

Series ventilator can be devided 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 impellerrotates 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. Direction of Air Outlet

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

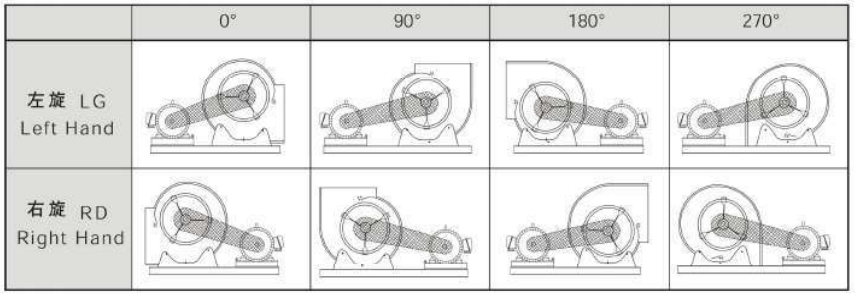


图1 (Fig1)

3. 结构形式

LKT 系列风机可按图2所示制成L 型、LK型、R型、RK型、L2型、R2型。

3. Type of structure

According to Fig 2, LKT series ventilators can be divided into Category L . LK . R . RK Category L2 . R2.

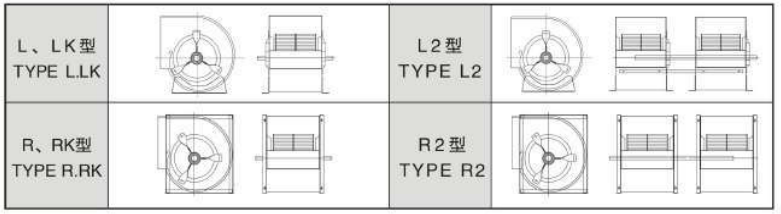


图2 (Fig2)

产品结构 Construction of Product

4

LKT系列风机主要由机壳、叶轮、框架、轴承、轴构成。

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，蜗板采用点焊的方式与侧板连成一体。

机壳侧板上预设了一系列的孔，以便按用户要求的出风口方向进行安装。

2. 叶轮

叶轮采用优质热镀锌钢板制成，叶片设计成符合空气动力的特定形状，使得效率最高、噪声最低。叶片用铆爪固定在中盘及端圈上，在最大功率连续运转时，叶轮将具备足够的刚度。叶轮出厂前按高于国家标准的内控动平衡等级全检合格。

3. 框架

R型风机框架采用热镀锌钢板剪切、折弯制成，TOX免焊连接保证了所需的尺寸精度和应有的刚度；

LKT series ventilators are mainly consisted of scroll, impeller, frame bearing and shaft.

1). Scroll

The scroll is made of hot galvanizing steel sheet. Its side plate has an outline complying with aerodynamics. The scroll plat fixed to the side plates by means of "electric spot welding".

On the side plate of the scroll there are a series of holes drilled in advance for riveting nuts to carry out installation according to air outlet direction needed by the customer.

2. Impeller

The impeller is made of high grade hot galvanizing steel sheet and is designed to a special configuration according to aerodynamics to make the efficiency highest and the noise lowest. The impeller is fixed on the middle disk plate and on the end ring with riveting grippers. The impeller has enough rigidity during continous rotation with maximum power. Before leaving factory, all impellers have passed all-round dynamic balance test according to the Company Standard which is higher level than National Standard.

3. Frame

The frames for type R ventilators are made of galvanized steel angle iron bars. Thecutting and bending of the frame parts, as well as the TOX connections, are formed with the use of molds to assure their high accuracy and the rigidity of the frames.

4. 轴承

LKT系列风机均采用优质滚珠轴承，并根据噪声最低来选择，该轴承预先加润滑油并自动对中。轴承安装在轴承支架上，并设有防振垫圈。

5. 轴

风机轴采用40Cr或45#钢经粗加工、调质处理及磨削加工制成，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。

4. Bearing

LKT series ventilators are made of ball bearings of high quality, which are chosen according to the lowest noise produced. These bearingsare air-sealed, with preset lubricating oil, and of automatically alignment.The bearings are assembled on the support and vibration-proof rings arealso provided.

5. Shaft

The shafts are made of 40Cr of 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.

5 风机性能 Performance of Ventilator

1. 该技术手册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 = 101.325KPa
进气温度	t = 20 ℃
进气气体密度	ρ= 1.2Kg/m³

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：

$$\frac{Q_0'}{Q_0}=\frac{n'}{n}$$

$$\frac{P_0'}{P_0}=\frac{n'^2}{n^2}\cdot\frac{\rho'}{\rho}\qquad \frac{P_0'}{P_0}=\frac{n'^2}{n^2}\cdot\frac{Pa'}{Pa}\cdot\frac{273+t}{273+t'}$$

$$\frac{Nin_0'}{Nin_0}=\frac{n'^3}{n^3}\cdot\frac{\rho'}{\rho}\qquad \frac{Nin_0'}{Nin_0}=\frac{n'^3}{n^3}\cdot\frac{Pa'}{Pa}\cdot\frac{273+t}{273+t'}$$

上述式中

- 流量Q_0(m³/h)、全压P_0(Pa)、转速n(r/min)、内功率Nin_0(Kw)由性能曲线图上查得。
- 右上角加符号“*”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。

2. 性能曲线图上的功率Nin_0是指风机的内功率。

- 风机轴功率：$Ns = Nin_0/\eta m$

  式中：Ns- 风机轴功率

  ηm- 风机机械效率

  风机机械效率的取值方法可参照表1。

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 = 101.325KPa
Air temperature	t = 20 ℃
Inlet gas density	ρ= 1.2Kg/m³

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

$$\frac{Q_0'}{Q_0}=\frac{n'}{n}$$

$$\frac{P_0'}{P_0}=\frac{n'^2}{n^2}\cdot\frac{\rho'}{\rho}\qquad \frac{P_0'}{P_0}=\frac{n'^2}{n^2}\cdot\frac{Pa'}{Pa}\cdot\frac{273+t}{273+t'}$$

$$\frac{Nin_0'}{Nin_0}=\frac{n'^3}{n^3}\cdot\frac{\rho'}{\rho}\qquad \frac{Nin_0'}{Nin_0}=\frac{n'^3}{n^3}\cdot\frac{Pa'}{Pa}\cdot\frac{273+t}{273+t'}$$

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-mentionedformulas.

2. The power (Nin_0) on the performance chart the internal power of the ventilator.

- Shaft power of ventilator: $Ns = Nin_0/\eta m$

  where: Ns-Shaft power of ventilator

  ηm-Mechanical efficiency of ventilator

  The value of mechanical efficiency of ventilator can be obtained from Table 1.

风机传动方式 Way of ventilator driving	ηm
电机直联传动 Electric motor directiy 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)

- 配套电机的功率：N = Ns · 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。

3. L2 型、R2型双联风机性能与 L型 、R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

4. 本样本中的风机性能按 GB/T 1236-2000 标准检测，风机噪声指标是按GB/T 2888-2008 标准在离进风口1米处测定的声压级指标。

- Power of matching electric motor: N = Ns · K

  here: N-Power of matching electric motor

  K-Safety coefficient of electric motor capacity

  The value of safety coefficient of electric motor capacity can be obtained from Table 2.

3. Comparing the performance of the twin ventilator of Category L2 and Category R2 with the performance of Category L and Category R 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

4. The performance of the sample ventilator is tested in accordance with GB/T 1236-2000 . Its noise index is measured according to GB/T 2888-2008 at the point 1 metre from the inlet.

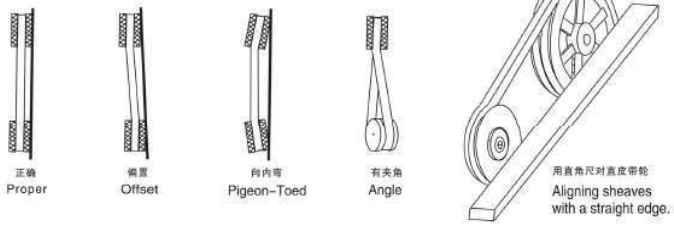
电动机功率power of electric motor(Kw)	K 值 value k
≤ 2.2	1.2
≤ 11	1.15
> 11	1.1

表2 (Table2)

6 皮带传动安装 V-Belt drive installation

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(d1+d2)<a<2(d1+d2)，前倾风机皮带速度应控制在10~15m/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。

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(d1+d2)<2(d1+d2); the belt speed of fan should be more han 10m/s,but less than 15m/s, (10<v<15m/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.



皮带张紧度 Belt tenstion

7

合适的皮带张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；太松则会出现打滑现象而产生热能并严重降低皮带的寿命。

皮带张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横截面确定皮带张紧力的大小。

如果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异常叫声为止，如发出短促的叫声也是允许的。

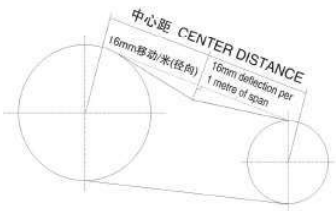
拉紧皮带后、开动风机之前，须重新检查皮带轮的对齐情况，如有必要则重新调整对齐。新皮带在刚开始使用时可能会有点拉伸，应在运行几天后重新检查皮带张紧度。

注意：风机长期停车应把皮带放松，在使用时重新调整皮带的张紧度。风机长期停车转子每隔一定时间，旋转180^0，以防主轴静态变形弯曲。

A proper level of belt tension is required in order to obtain a satisfactory belt life. If the belt tension levelis too high, then excessive loads will be imposed on the bearings, and this will reduce the lives of both of these components. If the belt tension level is too low, then the belt will slip. Belt slippage generates a large amount of heat, and this beat 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 rangees 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. 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 days of operation. Note: The belt should be released if the ventilator do not run in a long time, and until the fan is to be used over again, the belt tension level must to be just again. The rotor should be turned 180 degree at regular intervals when the ventilar don't use in a long time to avoid the static static state distortion of the shaft.

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



皮带截面 Belt Section	使皮带向下移动16mm经向距离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 Pulle Diamter (mm)	牛顿 Newton(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

轴承润滑 Bearing lubrication

8

风机轴承配有支架和减震橡胶圈，轴承已预先润滑，不必在开动前涂润滑油。带座轴承在油脂超过有效期时，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。判断是否需要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像是新的，可延长换油脂的间隔。如果清除下来的油脂比新的黑得多那表明油脂已氧化，应缩短换油脂的间隔。

The ventilator bearings are filled with lubricant 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, the this indicates that the grease is being oxidized and more frequent lubrications of the bearings are required.

说明 Instructions

9

1. 在安装前应对风机各部件进行检查，对叶轮、轴和轴承等主要部件应重点细致检查，若有损伤应修复后再安装使用。

2. 风机安装后应检查机壳内是否有遗留的工具、杂物等。

3. 风机安装后用手或杠杆拨动叶轮，检查是否有过紧或碰撞现象，确认无这些现象时方可进行试转。

4. 风机配用电机功率是指在特定工况下，风机内功率加上机械损失与电机容量安全系数而言，并非出风口全敞开时所需的功率，因此为防止电机超功率运转而烧毁，严禁风机出风口及进风口不接管路或未加外界任何阻力进行空运转。

5. 风管与风机出风口之间应采用软连接，接头不得拉得过紧。

6. 风机正式运转前，需检查电机的转向是否符合风机转向的要求。

7. 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以及电机型号规格。标准型风机不带法兰，如需法兰在订货时注明。

8. 若需配套皮带、皮带轮、电机、安装底座等配件或其它特殊要求可在订货时提出。

1. Prior to installation, all parts of the ventilator should be inspected. Greatand careful attention should be taken to shaft, bearings and main parts for checking. If there is some damage, recovery should be made, then to install again for use.

2. Check the internal space of the scroll and other casings, tools and other extra matters should not be left inside.

3. After installation, turn its impeller by hand or by means of lever to check for tightness or shock. Make sure that there is no such phenomenon over there, trial operation can be carried out.

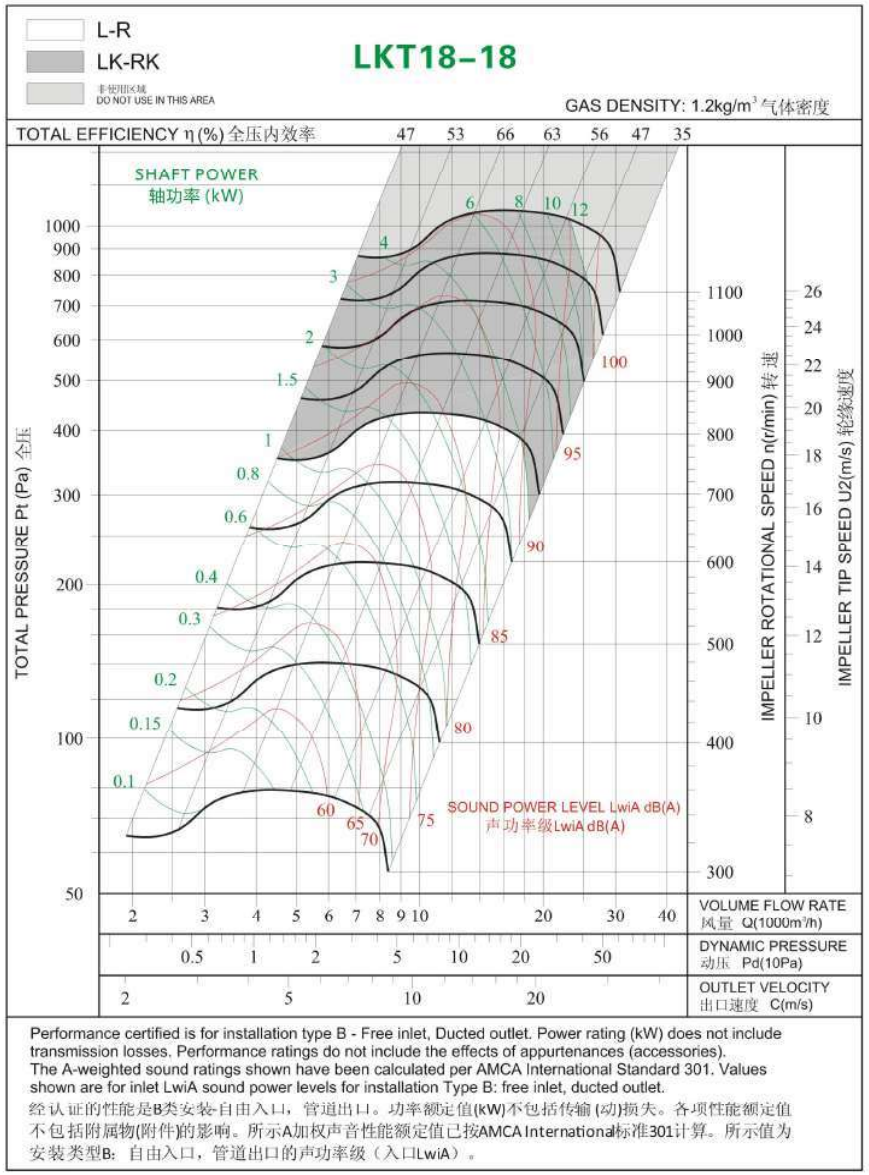
4. Matching electric motor power of ventilator denotes internal power plus mechanical loss during driving and safety coefficient of electric motor capacity in special operating condition, it does not denote the power required during full opening of air outlet. Therefore no-load running of ventilator without any applied resistance including connecting pipelines on air-inlet or aor-outlet is strictly prohibited in order to avoid burning out of the motor caused by its operation at over rated power.

5. Soft connection between air pipe and ventilator air-outlet should be made.The joints should not be tightened too much.

6. Prior to official operation of ventilator, it is necessary to check the rolating direction of both motor and ventilator for their coordination.

7. 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.

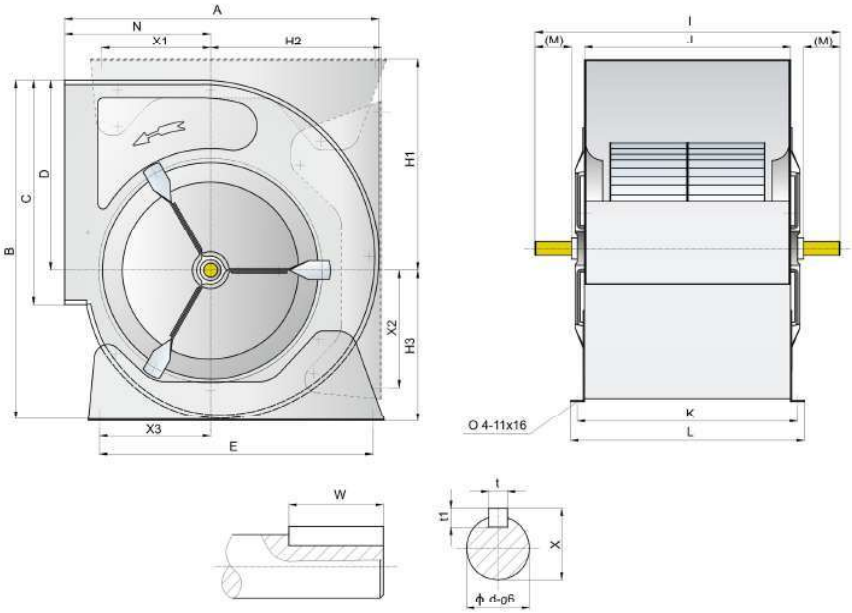
8. If the customer needs matching belts, pulley, electric motor, mountingframe and other parts and requirements, please state at that time.



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 LwiA sound power levels for installation Type B: free inlet, ducted outlet.

经认证的性能是B类安装-自由入口，管道出口。功率额定值(kW)不包括传输(动)损失。各项性能额定值不包括附属物(附件)的影响。所示A加权声音性能额定值已按AMCA International标准301计算。所示值为安装类型B：自由入口，管道出口的声功率级（入口LwiA）。

LKT-L（LK）



注：尺寸单位为毫米　Note:the size unit the form is mm

Modle \ Dim	A	B	C	D	E	I	J	K	L	M	N	X	t	t1	W	d	H1	H2	H3	X1	X2	X3
LKT7-7L	312	327.5	228	192	160	360	259	289	319	35.5	152	22.5	6	6	30	20	215	185	155	80	80	80
LKT8-8L	345	364	256	216	190	400	287	317	347	41.5	164	22.5	6	6	30	20	239	204	175	95	80	95
LKT9-7L	380	387	262	215	260	360	232	262	292	49	185	22.5	8	6	30	20	236	195	173	127.5	100	90
LKT9-9L	380	387	262	215	260	430	298	328	358	51	185	22.5	8	6	30	20	236	195	173	127.5	100	90
LKT10-8L	425	444	289	249	300	400	265	295	325	52.5	203	28	8	7	40	25	273	225	198	143	150	100
LKT10-10L	425	444	289	249	300	480	331	361	391	59.5	203	28	8	7	40	25	273	225	198	143	150	100
LKT12-9L	491.5	521.5	341	294	370	470	309	339	369	57	230	28	8	7	50	25	314.5	275	241	190	150.5	163
LKT12-12L	491.5	521.5	341	294	370	550	395	425	455	54	230	28	8	7	54	25	314.5	275	241	190	150.5	163
LKT15-11L	569	622	404	342	430	540	373	403	433	64	264	28	8	7	50	25	363	324	280	214	182	204
LKT15-11LK	569	622	404	342	430	540	373	403	433	72	264	33	8	7	40	30	363	324	280	214	182	204
LKT15-15L	569	622	404	342	430	640	471	501	531	65	264	28	8	7	50	25	363	324	280	214	182	204
LKT15-15LK	569	622	404	342	430	640	471	501	531	65	264	33	8	7	65	30	363	324	280	214	182	204
LKT18-13L	683	739	478	415	540	600	430	460	490	61.5	314	28	8	7	55	25	440	385	340	270	270	270
LKT18-13LK	683	739	478	415	540	600	430	460	490	61	314	38	10	8	60	35	440	385	340	270	270	270
LKT18-18L	683	739	478	415	540	720	557	587	617	58	314	28	8	7	55	25	440	385	340	270	270	270
LKT18-18LK	683	739	478	415	540	720	557	587	617	87	314	38	10	8	70	35	440	385	340	270	270	270