

CUSTOMER NO. :

FM MODEL: FMD04010B12SP002

* History

REV.	DESCRIPTION/描述	DATE/日期
A.0	ISSUE SPEC.	2021.12.24

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SPECIFICATION FOR APPROVAL/规格承认书

1. SCOPE/适用范围:

THIS SPECIFICATION DEFINES THE ELECTRICAL AND MECHANICAL CHARACTERISTICS OF THE DC BRUSHLESS FAN.

本规范规定了直流无刷风扇的电气与机械特性

2. CHARACTERS/特征:

	ITEM/项目	SPEC/规格.
2-1.	RATED VOLTAGE/额定电压	12.0 VDC
2-2.	OPERATION VOLTAGE/操作电压	7.0 ~ 13.2 VDC
2-3.	RATED CURRENT/额定电流	0.3A (AVERAGE/平均值) 0.45A(MAX/最大值)
2-4.	RATED POWER/额定功率	0.36 (0.54MAX.) W
2-5.	SPEED/转速	13000±10%RPM
2-6.	SPEED CONTROL TYPE/转速控制类型	PWM/占空比
2-7.	SIGNAL OUTPUT/信号输出	FREQUENCY GENERATOR /FG信号
2-8.	MAX. AIR FLOW /最大风量	0.408 m ³ /min
	(AT ZERO STATIC PRESSURE/在零静压状态下)	14.42CFM
2-9.	MAX. AIR PRESSURE/最大风压	15.99mmH ₂ O
	(AT ZERO FLOW/在零风量状态下)	0.629nchH ₂ O
2-10.	ACOUSTICAL NOISE/声学噪音	43.7(MAX : 46.7) dBA @1M

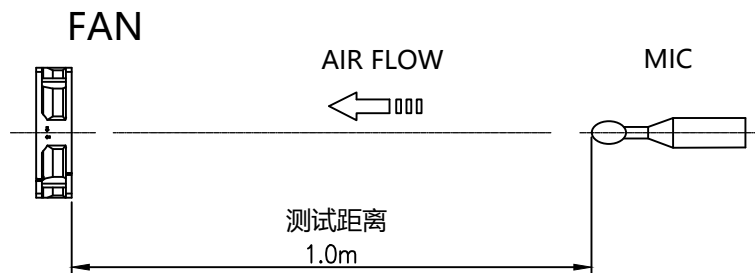
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ITEM/项目	SPEC/规格.
2-11. INSULATION RESISTANCE 绝缘阻抗	10 MEGA OHM MIN. AT 500 VDC (BETWEEN FRAME AND (+) TERMINAL) 在风扇外框与导线正极之间输入直流500V, 绝缘阻值不小于10兆欧
2-12. DIELECTRIC STRENGTH 绝缘耐压强度	5 mA MAX. AT 500 VDC ONE MINUTE, (BETWEEN FRAME AND (+) TERMINAL) 在风扇外框与导线正极之间输入交流500V, 测试电流不大于5mA
2-13. LIFE EXPECTANCE 预期寿命	70,000 HOURS AT 40°C ROOM, AMBIENT 15%~65%RH 环境温度40°C, 湿度15%~65%,预期寿命为70000小时
2-14. ROTATION/旋转方向	COUNTER-CLOCKWISE VIEWED FROM INLET/从进风口看为逆时针方向
2-15. AIR FLOW DIRECTION/风量方向	AIR EXHAUST OVER STRUT
2-16. INSULATION CLASS/绝缘等级	UL: CLASS A
2-17. LEAD WIRE/导线	UL:1061 AWG# 28 , -: BLACK +: RED FG: YELLOW PWM: BLUE

NOTES/说明:

- A. THE VALUES WRITTEN IN PARENTHESIS, ARE LIMITED SPEC/括号内数值为限制规格.
B. ACOUSTICAL NOISE MEASURING CONDITION/噪音测试规范如下:



NOISE IS MEASURED AT RATED VOLTAGE IN FREE AIR IN ACOUSTICAL CHAMBER WITH LARSON DAVIS TYPE 824S SOUND LEVEL METER.

噪音测试在额定电压下, 自由大气中进行

- C. THE AIR FLOW AND AIR PRESSURE MEASURED AT RATED VOLTAGE IN DOUBLE CHAMBER IS MEASURED ACCORDING TO STANDARD AMCA210-2017.

风量和风压在额定电压下于风洞中进行量测, 量测标准依照AMCA210-2017.

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3. MECHANICAL/结构

- 3-1. DIMENSION/尺寸 ----- SEE DIMENSION DRAWING/查看尺寸
- 3-2. FRAME/扇框----- THERMOPLASTIC PBT OF UL 94V-0/UL 94V-0 热塑材料
- 3-3. FAN BLADE/扇叶-----THERMOPLASTIC PBT OF UL 94V-0/UL 94V-0 热塑材料
- 3-4. BEARING SYSTEM/轴承类型 ----- TWO BALL BEARING/双滚珠轴承
- 3-5. WEIGHT /重量-----15 g (REF 参考值)

4. ENVIRONMENTAL/环境

- 4-1. OPERATING TEMPERATURE/工作温度 ----- -10 TO +70 °C
- 4-2. STORAGE TEMPERATURE /储藏温度 ----- -40 TO +75 °C
- 4-3. OPERATING HUMIDITY/工作湿度 ----- 5 TO 90 % RH
- 4-4. STORAGE HUMIDITY /储藏湿度----- 5 TO 95 % RH
- 4-5. DROP TEST/跌落测试

IN MINIMUM PACKAGING CONDITION FAN WITHSTAND EACH ONE DROP OF THREE FACES FROM 30CM DISTANCE HEIGHT ONTO 10MM THICKNESS OF WOODEN BOARD.

在最低限度的包装条件下，每一个风扇都能承受三个面从30CM距离高度下跌落的力

4-6. VIBRATION TEST/振动测试

SINEWAVE/正弦波

DISPLACEMENT AMPLITUDE/位移振幅: 0.75 MM (EQUIVALENT 10G)

FREQUENCY RANGE/频率范围: 10Hz - 55 Hz / 30 SEC. 55Hz - 10 Hz / 30 SEC.

LINEAR SCANNING 120 CYCLE/线性扫描120个周期

ENDURANCE TIMER PER AXIS/每个轴向持续时间: 2 HOURS/小时

ORIENTATION/方向: X,Y,Z

4-7. SHOCK TEST/机械冲击测试

APPLY PEAK ACCELERATION 50 G AND KEEP DURATION OF THE

PLUSES FOR 11MS (HALF SINE WAVE)/加速度50g作用11ms (半正弦波)

4-8. ROHS COMPLIANCE-----SEE ROHS STANDARD/ ROHS 标准

5. PROTECTION/防护方式

5-1. LOCKED ROTOR PROTECTION/锁固保护

72 HOURS OF LOCKED ROTOR CONDITION AT THE RATED VOLTAGE.

马达绕线阻抗保护马达在额定电压下进行72小时锁固测试中不受损

5-2. POLARITY PROTECTION/极性保护

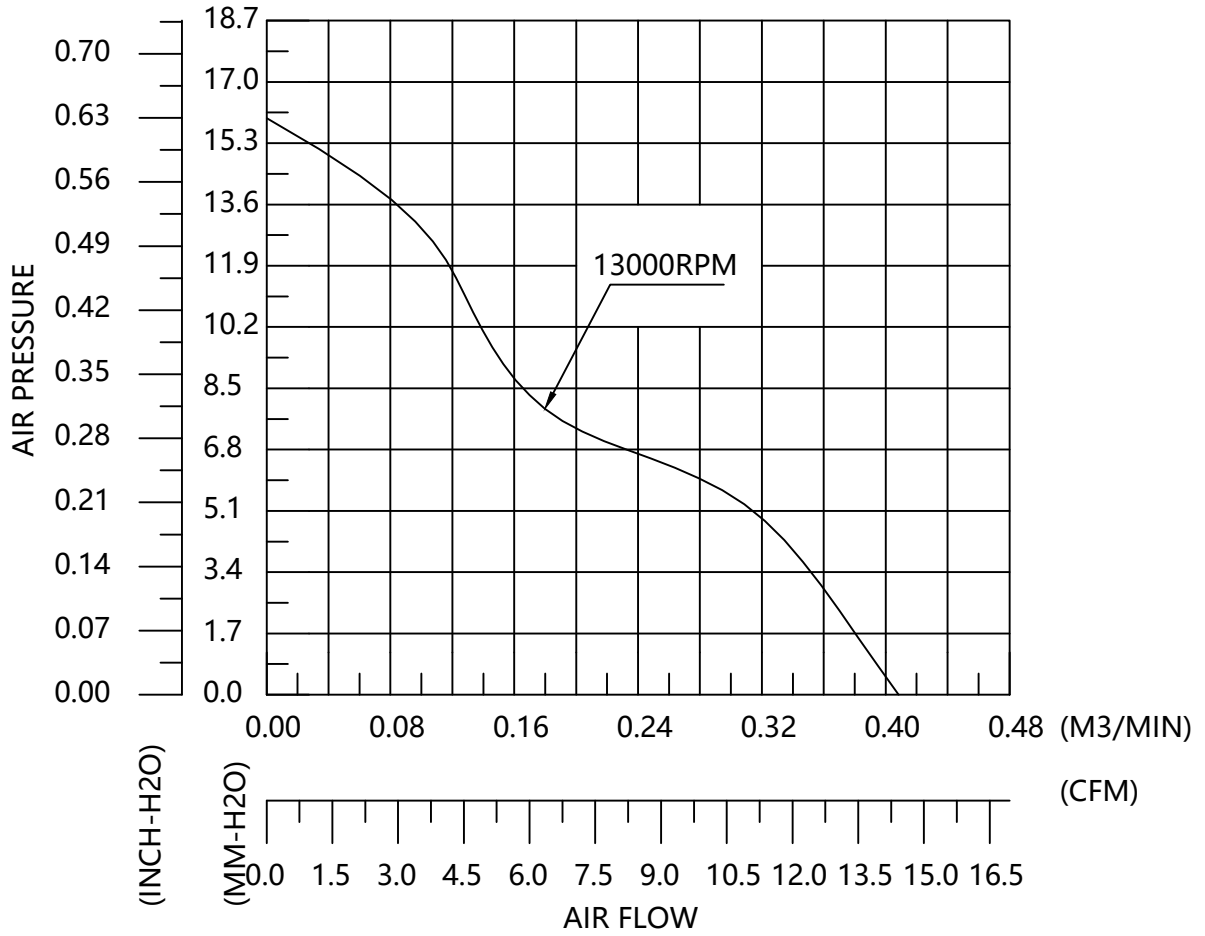
POSITIVE AND NEGATIVE POLES REVERSED, THE FAN NOT TO SWITCH.

风扇可以承受正负极反接

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6. P & Q CURVE/P&Q曲线



* TEST CONDITION/测试条件:

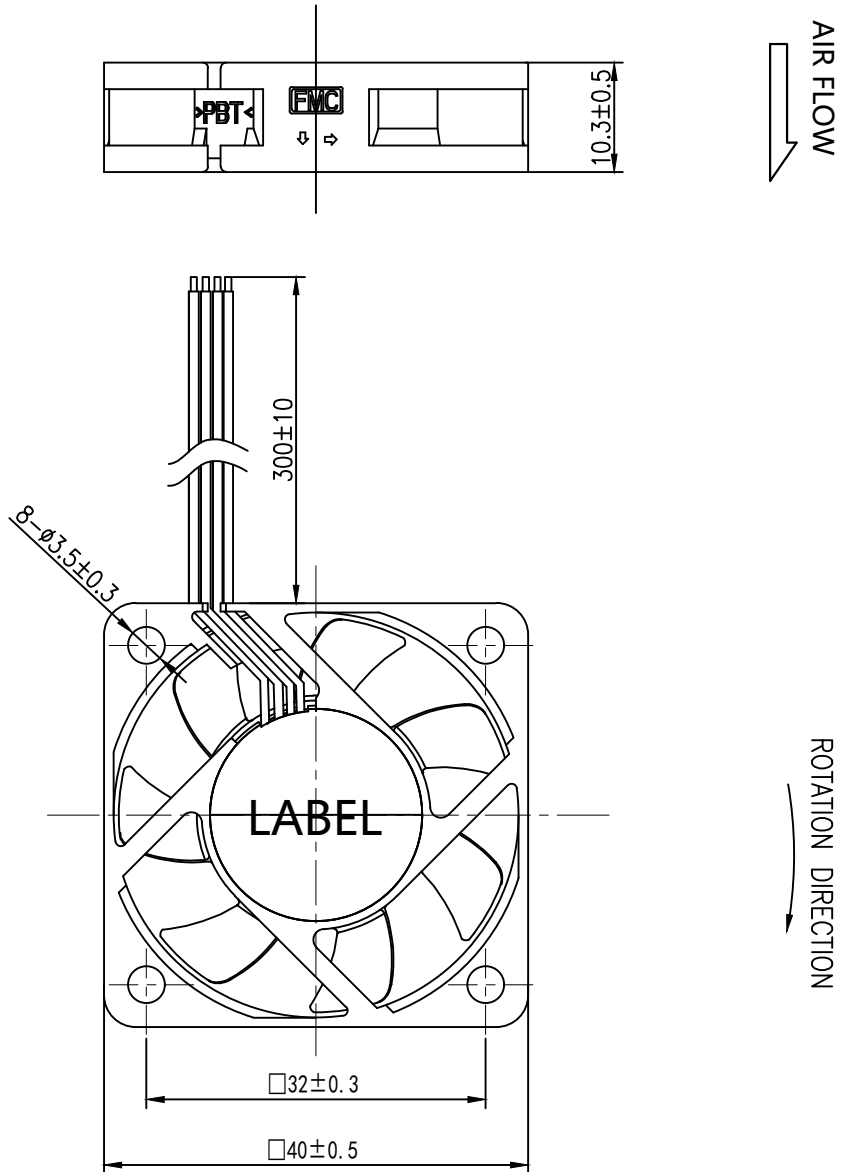
INPUT VOLTAGE/输入电压 — OPERATION VOLTAGE/操作电压

TEMPERATURE/温度 — ROOM TEMPERATURE/室温

HUMIDITY/湿度 — 65%RH

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7.DIMENSION DRAWING/外形尺寸图



NOTES:

- LEAD WIRES: UL1061 AWG #28
 - PIN1:BLACK WIRE (-)
 - PIN2:RED WIRE (+)
 - PIN3:YELLOW WIRE (FG)
 - PIN4:BLUE WIRE (PWM)

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8. SPEED CONTROL FUNCTION/速度控制功能

8-1. PWM SIGNAL DESCRIPTION/信号描述 :PWM

1. CONTROL SIGNAL/控制信号: PWM CONTROL/PWM控制
2. THE RANGE OF SIGNAL VOLTAGE/电压范围:
LOW LEVEL VOLTAGE: MAX. <0.4V /低阶电压小于0.4V
HIGH LEVEL VOLTAGE: MIN. >2.6V , MAX.<12V/ 高阶电压大于2.6V, 小于12V
3. THE FREQUENCY OF PWM SINGAL SHALL BE ACCEPTED AT 21KHz~28KHz
/PWM频率在21KHz~28KHz
4. MAX. SINK CURRENT: 8mA/最大吸收电流8mA
5. INPUT IMPEDANCE : 10K OHM MIN./输入阻抗值: 最小10K OHM

8-2. FAN SPEED CONTROL DESCRIPTION/风扇转速控制描述

1. FAN INPUT VOLTAGE (POSITIVE)风扇输入电压 (正极) : 12VDC
2. PWM FREQUENCY/PWM频率 : 25KHz
3. THE FAN SPEED WILL SPIN AT MAXIMUM WHEN THE DUTY CYCLE IS 100%/
当占空比为100%时, 风扇转速将以最大转速旋转.
4. THE FAN SPEED WILL SPIN AT MINIMUM WHEN THE DUTY CYCLE IS 0%/
当占空比为0%时, 风扇转速将以最低转速旋转.
5. THE FAN SPEED WILL SPIN AT 0~13000 RPM WHEN THE DUTY CYCLE IS 0~100%/
当占空比为0~100%时, 风扇转速区间为0~13000 RPM.
6. THE FAN SPEED WILL SPIN AT MAXIMUM WHEN THE LEAD WIRE OF PWM SIGNAL
DISCONNECTED/PWM信号线未连接时风扇运转至最大转速.
7. THE FAN WILL BE ABLE TO START WHEN THE DUTY CYCLE IS 0% /占空比为0%时风扇开始运转.

8-3. PWM DUTY CYCLE VS RPM/PWM占空比VS转速

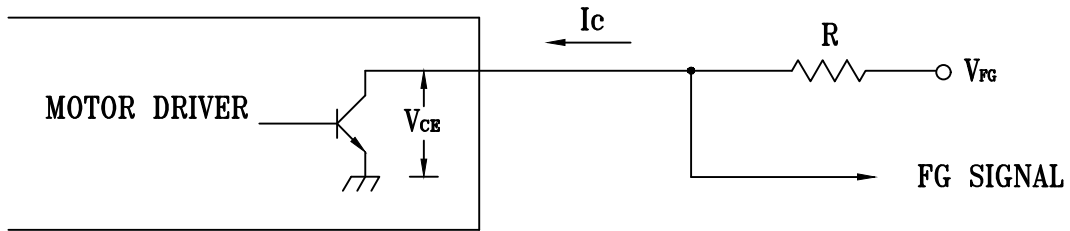
TEMPERATURE:25°C	
DUTY CYCLE %	R.P.M
0	0
100	13000±10%

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9. FREQUENCY GENERATOR (FG) SIGNAL/FG信号

9-1. SCHEMATIC/电路图:



CAUTION/注意:

THE LEAD WIRE OF FG SIGNAL CAN NOT TOUCH THE LEAD WIRE OF POSITIVE OR NEGATIVE/
FG信号线不能接触正/负极.

9-2. SIGNAL SPECIFICATION/信号说明:

OUTPUT TYPE/输出类型: OPEN COLLECT/开环

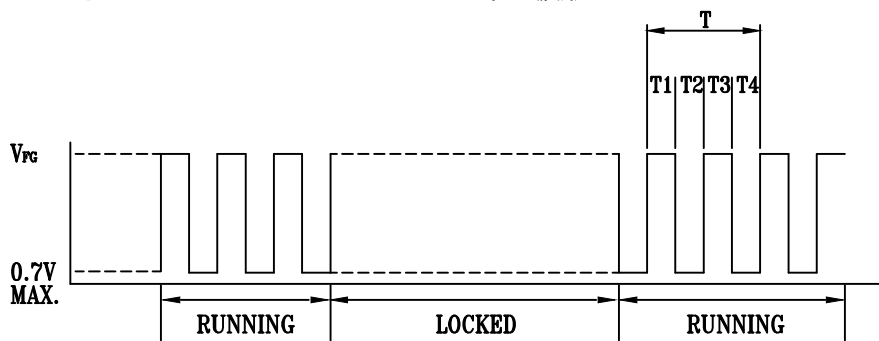
V_{FG} MAXIMUM VOLTAGE = 13.2V/最大电压13.2V

I_c MAXIMUM CURRENT = 5mA /最大电流5毫安

LOW LEVEL VOLTAGE = 0.7V MAX/低阶电压最大0.7V.

$$R \geq V_{FG} / I_c$$

9-3. FREQUENCY GENERATOR WAVEFORM/FG波形:



$$T = T_1 + T_2 + T_3 + T_4 = 60/N \text{ (Sec)}$$

N: SPEED (RPM)

RoHS STANDARD/RoHS标准

HAZARDOUS SUBSTANCES		ALLOWABLE CONTENT(WT%)	REMARK
BROMINATED FLAME RETARDANTS	POLYBROMINATED BIPHENYLS (PBBs)	<0.1 WT% (<1000PPM)	DIRECTIVE 2015/863
	POLYBROMINATED DIPHENYL ETHERS(PBDEs)	<0.1 WT% (<1000PPM)	DIRECTIVE 2015/863
PHTHALATE ESTERS	BIS (2-ETHYLHEXYL) PHTHALATE (DEHP)	<0.1 WT% (<1000PPM)	DIRECTIVE 2015/863
	BUTYL BENZYL PHTHALATE (BBP)	<0.1 WT% (<1000PPM)	DIRECTIVE 2015/863
	DIBUTYL PHTHALATE (DBP)	<0.1 WT% (<1000PPM)	DIRECTIVE 2015/863
	DIISO-BUTYL PHTHALATE (DIBP)	<0.1 WT% (<1000PPM)	DIRECTIVE 2015/863
HEAVY METALS	LEAD(Pb) AND ITS COMPOUNDS	<0.1 WT% (<1000PPM)	DIRECTIVE 2015/863
	MERCURY(Hg) AND ITS COMPOUNDS	<0.1 WT% (<1000PPM)	DIRECTIVE 2015/863
	HEXAVALENT CHROMIUM (CHROMIUM VI)(Cr ⁺⁶) AND ITS COMPOUNDS	<0.1 WT% (<1000PPM)	DIRECTIVE 2015/863
	CADMIUM(Cd) AND ITS COMPOUNDS	<0.01 WT% (<100PPM)	DIRECTIVE 2015/863

DESCRIPTION/描述:

1. PLEASE BE CAUTIOUS WHEN MOUNTING THE FAN . INCORRECT MOUNTING OF FANS MAY CAUSE EXCESS RESONANCE, VIBRATION AND SUBSEQUENT NOISE, EVEN SCREW HOLE BROKEN. (请正确安装风扇,不正确安装的风扇可能会导致系统共振, 振动和由于振动产生的噪音,甚至会使螺丝安装孔破裂).
2. PLEASE EXERCISE CAUTION WHEN HANDLING FANS. DAMAGE MAY BE CAUSED BY OUTSIDE ABNORMAL PRESSURE OR ENVIRONMENT STRESS DURING MOVING. (请谨慎使用风扇,避免移动过程中可能会受到的外界异常压力或环境应力的损伤).
3. All THE FANS SHALL MEET THE QUALITY INSPECTION UNDER SAMPLING PLANGB/T2828.1-2012 AS FOLLOW, EXCEPT AS PERTAINS TO SOME SPECIAL,DESIGNS,THERE IS NO GUARANTEE THAT THE PRODUCTS WILL BE FREE FROM ANY SUCH SAFETY PROBLEMS OR FAILURES AS CASSED BY THE INVADING OF POWDER, DROP LOTS OF WATER OR ENCROACHMENT OF INSECT INTO THE HUB(所有的风扇应满足 GB/T2828.1-2012 下的质量抽样检验, 除非特殊的设说明, 由于粉尘的侵入, 水分的侵入或昆虫进入风扇内部,产品将无法保证风扇的安全性或故障).
4. CUSTOMER SHALL CONFIRM THE MATCHING AND RELIABILITY OF FAN ON ACTUAL SET OR UNITAPPLICATION.THIS INCLUDE CONFIRMATION ON SET OR UNIT LIFE, ELECTRICAL NOISE,MECHANICAL NOISE, VIBRATION, STATIC ELECTRICITY, ELECTRIC POWER NOISE,DRIFT, ELECTRIC RESONANCE BETWEEN MOTOR AND CONTROL CIRCUIT, MECHANICAL RESONANCE BETWEEN MOTOR AND CHASSIS,IRREGULAR MOVEMENT OF SET DUE TO MOTOR NOISE, IRREGULAR MOVEMENT OF SET IN STRONG ELECTROMAGNETIC FIELD,DAMAGED BY LIGHTNING SURGE EARTHING METHOD ETC(客户应确认风扇的可用性和可靠性,这包括确认机组的寿命要求, 电气噪声,机械噪声, 振动, 静电防护, 电气噪声, 频率波动, 风扇和控制电路之间的系统共振, 风扇和机箱之间的机械共振, 电机噪声和强电磁场导致不规则运转, 雷击浪涌和接地方法不当等都易造成风扇的损坏).
5. ANY REVISIONS ON THE SPECIFICATION SHALL BE DONE BASED ON MUTUAL DISCUSSION AND AGREEMENT(规格书的任何修改须基于双方相互讨论并达成一致).
6. IN ORDER TO IMPROVE THE PERFORMANCE WITHIN THE SCOPE OF SPECIFICATION, PARTS OR MATERIAL CHANGES ARE SUBJECT TO PRIOR NOTICE TO CUSTOMER(为了在规格范围内提高性能, 零件或材料的更改须事先通知客户).
7. ANY ITEM WHICH IS NEEDED TO ADD INTO SPECIFICATION SHALL BE DETERMINED ON CUSTOMER' S PRIOR WRITTEN REQUEST. IF NO INFORMATION GIVEN, FAN WILL BE BASED ON OUR STANDARD JUDGMENT(任何需要加入到规范中的项目都应确定客户的书面请求, 如果没有给出信息, 将根据我们的标准提供风扇).
8. WHEN ANY TROUBLE OCCURS, BOTH PARTIES SHALL DISCUSS ON THIS SPECIFICATION TO SOLVE THE MATTERS.IN THIS CASE, OUR GUARANTEE IS ONLY LIMITED TO FANS(发生任何问题时, 双方应根据本规格书来讨论解决问题, 在这种情况下, 我们的保证只限于风扇样本).