



LJ DEVICE CO., LTD.

力臻股份有限公司

LJ DEVICE CO., LTD.

零件規格書 / 承認書

SPECIFICATION FOR APPROVAL

CUSTOMER : _____

DESCRIPTION : VIBRATOR

MODEL : FG-T41023A5K1060B

CUSTOMER PART NO : _____

APPROVED SIGNATURES

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Rev	Date	Description	Designed	Checked	Approved
A	2021/3/17	Release		Kevin	

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1. 范围 SCOPE

此文件包含产品电气性能、关键特性、信赖性试验、包装条件、品质控制及回流焊曲线要求等资料。

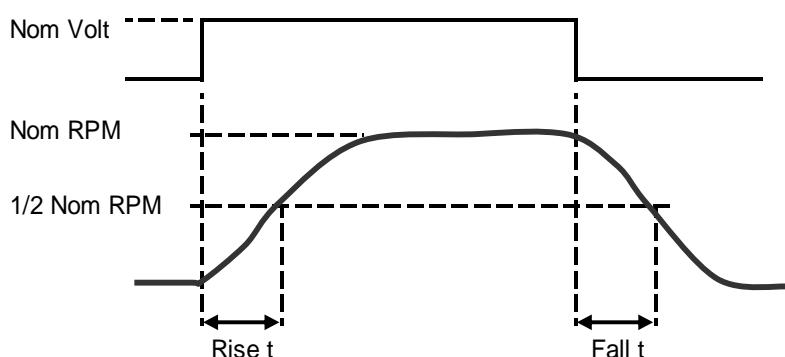
This document contains specific electrical and mechanical characters, critical characteristics, reliability tests, packaging condition, quality assurance, reflow profile and etc...

2. 机械特征 MECHANICAL CHARACTERISTIC

- | | |
|--|-------------------------|
| 2.1. 马达外观图纸/Mechanical drawing | See appendix 2 |
| 2.2. 轴向间隙/Axial play of shaft | 0.3 mm Max |
| 2.3. 平衡块密度及重量/Counter weight density and weight: | 17.0 g / cc Min (0.63g) |
| 2.4. 机械噪音/Mechanical noise of motor operating at rated speed: 50 dB Max A-weighting
背景噪音 26dB(测试距离 10 cm, 见附 1)
Background noise 26dB.(Measured distance 10 cm, see appendix 1). | |

3. 电气特性 ELECTRICAL CHARACTERISTICS

- | | |
|---|------------------------------|
| 3.1. 马达摆放位置/Vibrator positioning: | 水平摆放/ Horizontal |
| 3.2. 额定电压/Operating voltage: | DC 1.3 V |
| 3.3. 使用电压范围/Operating voltage range: | 1.1– 1.7V |
| 3.4. 负荷电流/Load current at operating voltage: | 105 mA Max |
| 3.5. 锁住电流/Starting current at operating voltage: | 130 mA Max |
| 3.6. 绝缘强度/Insulation resistance and voltage break down: | at 50V DC, 1MΩ Min and above |
| 3.7. 马达阻抗/Terminal resistance: | 10.6±2.0Ω |
| 3.8. 额定转速/Load speed: | 9000±2000 rpm |
| 3.9. 旋转方向/Rotation direction: | C.W. & C.C.W |
| 3.10. 起动时间/RPM Rise time (see picture 1) | 80ms Max |
| 3.11. 停止时间/RPM Fall time (see picture 1) | 100ms Max |



Picture 1 起动时间和停止时间/RPM rise and fall time

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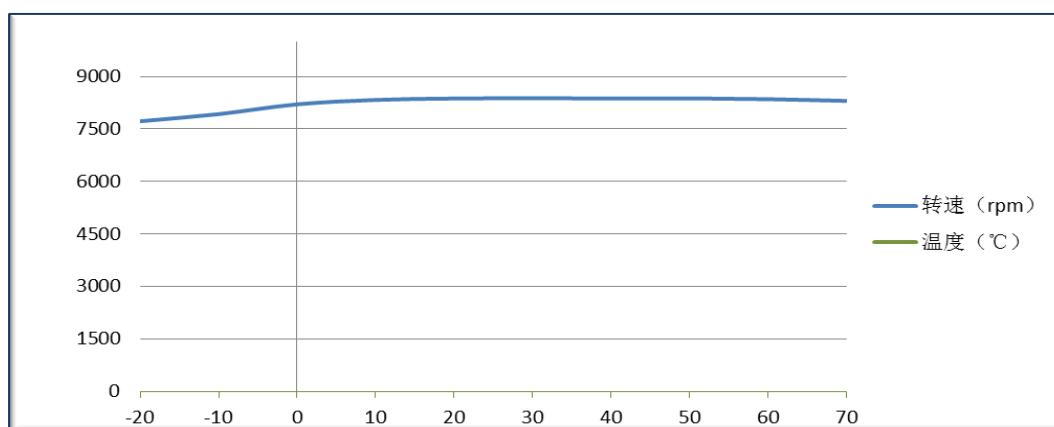
3.12 起动电压: 标准使用状态下, 电压 1.1V 时各位置点应无停止。 (振子缓慢运转 360°)
Standard loaded starting voltage: Under standard loaded condition, towards C.W. rotor shall move in all position at 1.1V (counterweight should be turned slowly at 360°)

所有尺寸及电性能测试应在室温和普通湿度下进行

All mechanical and electrical measurements should measured at room temperature and ordinary humidity.

4. 附加信息 ADDITIONAL INFORMATION

- 4.1. 马达重量/Vibrator weight 1.5g
4.2. 振子推出力/Pull out strength of counter weight and shaft 50N Min
4.3. 振动量测试要求 测试治具需悬浮在半空中
Acceleration level at nominal RPM (Grms) (test jig mounted in freely suspended)
4.4. 回转数和电流会随温度而变化(功能温度 -20°C 至 +70°C 之间)
Speed and current variation (function of temperature, -20°C to +70°C)
4.5. 安装瞬间压力: /Installation/Pressing force : <20N
4.6. 组合状态/连续压力: /Assembled state/Continuous force: <5N



5. 关键特性 CRITICAL CHARACTERISTICS

- 5.1. 主要尺寸/Functional dimensions
5.2. 负载电流/Rated current at specified rotating speed
5.3. 负载转速/Operating speed at operating voltage
5.4. 堵转电流/Starting current at operating voltage
5.5. 起动电压/Min. starting Voltage

6. 环境特性 ENVIRONMENTAL CHARACTERISTICS

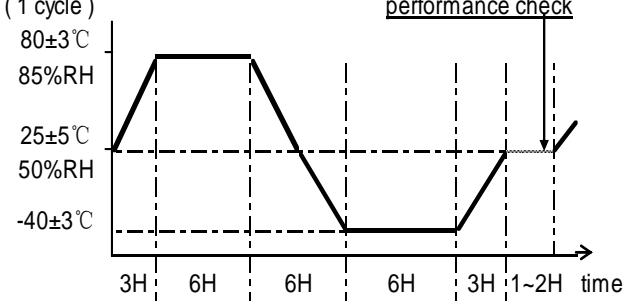
- 6.1. 使用温度/Operating temperature ranges: -20°C to +70°C
6.2. 储存温度/Storage temperature ranges: -40°C to +85°C

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7. 可靠性试验 RELIABILITY TESTS

7.1 我们的产品已通过以下信赖性试验，试验前后均对产品的回转数、负荷电流、锁住电流、起动电压、绝缘内阻进行检测（试验品：10pcs）

We have already performed reliability tests and measure nom rotation speed, nom load current, nom resistance, nom starting currents and nom starting voltage before and after tests, please check following table1 for detail reliability test information. Each test we use at least 10 samples for verification.

	项目/Items	试验条件/Test conditions	判断基准/Judgment
7.2	低温保存试验 Low temperature storage test	低温测试/ Storage test, $-40\pm3^{\circ}\text{C}/96\text{h}$, 常温放置 1-2h , 使用测试治具/ recovery 1~2h, Measurements with test jig.	
7.3	高温保存试验 High temperature storage test	高温测试/ Storage test $80\pm3^{\circ}\text{C}/96\text{h}$, 常温放置 1-2h , 使用测试治具/ recovery 1~2h, Measurements with test jig.	
7.4	温湿度循环测试 Temperature cyclic test	<p>温度循环测试/ Storage test 温湿度条件/ Temperature & humidity: $+80\pm3^{\circ}\text{C}/6\text{h}(\text{RH}85\%)$; $-40\pm3^{\circ}\text{C}/6\text{h}$ 间转换, 温度转换时间 6 小时, 共 24 小时一个循环, 共进行 6 个循环/-$40\pm3^{\circ}\text{C}/6\text{h}$ with 6h maximum transition time between temperatures. 24h/cycles, totally 6 cycles. 常温放置 1 ~ 2h , 使用测试治具./ Recovery 1~2h. Measurements with test jig.</p> 	无机械损伤. 无出现外观异常. (转速变化范围 : Max +/-30%) No mechanical damage. Normal performance of vibrator. (Max +/-30% variation of nom RPM)

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7.5	温度冲击试验 Thermal shock test	<p>温度冲击测试/ Storage test 温湿度条件/ Temperature & humidity: $-40 \pm 3^\circ\text{C}$/30分钟; $+85 \pm 3^\circ\text{C}$/30分钟, 温度转换时间为 20 秒内. 每小时为一个循环, 共运行 50 个循环/ 1h/cycle, totally 50cycles.</p> <p>常温放置 1 ~ 2h. 使用测试治具 Recovery 1~2h. Measurements with test jig.</p>													
7.6	常温寿命试验 Room temperature lifetime test	<p>测试条件/ Operational test: 标准使用电压/ apply operating voltage 温湿度/ Temperature & humidity: $25 \pm 3^\circ\text{C}$, RH 50% 运行条件/ On/off time: 2s on/off, 300,000 cycles. 性能检测/ Performance check: 每 20,000 次后进行. 常温放置 1-2h. 使用测试治具. Recovery 1-2h. Measurements with test jig.</p>	<p>试 100,000 次后无机械损伤 / No mechanical damage <u>After 100,000cycles:</u> (转速变化范围: Max +/-30%) 试 300,000 次后马达能正常运转/(Max +/-30% variation of nom RPM) <u>After 300,000cycles:</u> The vibrator should perate.</p>												
7.7	跌落试验 Free Fall	<p>马达固定在试验盒内.(试验盒重 100g), 跌落高度 1.5 m 于钢板或混凝土上, 每个面各 3 回. 使用测试治具. Mount the vibrator in the dummy box.(dummy box weight 100g), Drop height 1.5 m onto concrete. 3 times in each 6 directions. Measurements with test jig.</p>													
7.8	自由震荡试验 Random vibration test	<table border="1"> <tr> <td colspan="2">3axes, 10minutes per axis, 6.06Grms</td> </tr> <tr> <td>Frequency (Hz)</td> <td>A.S.D.(G²/Hz)</td> </tr> <tr> <td>20</td> <td>0.0098</td> </tr> <tr> <td>80</td> <td>0.04</td> </tr> <tr> <td>350</td> <td>0.04</td> </tr> <tr> <td>2000</td> <td>0.0069</td> </tr> </table> <p>Measurements with test jig.</p>	3axes, 10minutes per axis, 6.06Grms		Frequency (Hz)	A.S.D.(G ² /Hz)	20	0.0098	80	0.04	350	0.04	2000	0.0069	
3axes, 10minutes per axis, 6.06Grms															
Frequency (Hz)	A.S.D.(G ² /Hz)														
20	0.0098														
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7.9	冲击试验 Shock test	试验时间及方向/ Time of test and direction: 6 个方向，每个方向三次，共 18 次/3times in each 6 direction. Total 18 times. 加速度/ Acceleration: 半个正弦曲线 500G/ Half-sinusoidal 500G 持续时间/ Duration:2ms	
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Table1 Reliability test

8. 理想出货及储存状态 EXPECTED SHIPPING AND STORAGE CONDITIONS

8.1. 相对湿度/Relative humidity	15%~70%
8.2. 温度/Temperature	-5°C~40°C
8.3. 二氧化硫平均值/Sulphur dioxide average	0.3 mg/m ³
8.4. 硫化氢平均值/Sulphuretted hydrogen average	0.1 mg/ m ³

9. 品质保证 QUALITY ASSURANCE

所有关键参数须 100% 控制。◆ 符号在整个工序中用于鉴别关键参数。量产产品正式承认前我们使用工序能力分析对量产中所有关键参数进行管控，基于之前的工作，产品的最终品质控制精益求精。

All critical parameters are 100% in control. The symbols "◆" apply to all parameters identified as critical parameters in all process. And before mass production approval, we use Process Capability Study (PCS) to conduct all critical parameters in mass production. Based on PCS the final quality controls will be agreed.

量产控制项目/Quality assurance for mass production:

- 批合格率/Lot acceptance rate (LAR)
- 直通率/First pass yield (FPY)
- 出货质量控制基准/Outgoing quality level

每批出货产品均包含出货检测数据/Each final packing containing Out-going inspection data sheet (n=35pcs)

检测项目/Inspection item: 负荷转速/Load speed

 负荷电流/Load current
 堵转电流/Starting current
 起动电压/Starting voltage
 阻抗值/Coil resistance

- 客户返品率/Customer reject material rate
- 客户满意度/Customer satisfaction
- Cpk/Cp

10. 材料 MATERIALS

- 平衡块/Counterweight
- 电刷/Brush

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检测项目/Inspection item: 负荷转速/Load speed
负荷电流/Load current
堵转电流/Starting current
起动电压/Starting voltage
阻抗值/Coil resistance

- 客户返品率/Customer reject material rate
- 客户满意度/Customer satisfaction
- Cpk/Cp

10. 材料 MATERIALS

- 平衡块/Counterweight
- 电刷/Brush
- 换向器/Commutator
- 外壳/Case
- 端子/Terminal
- 支架/Bracket
- 垫圈/Washer
- 端盖/End cover
- 轴承/Bearing
- 磁铁/Magnet
- 铜线/Copper wire
- 轴/Shaft
- 铁芯/Core
- 变阻/Varistor (optional)

P.S.: 所有产品材料均能满足 2002/95/EC 和 公司有害物质管控要求 JinXin-III-TD-001.

All the materials included in vibrator can meet 2002/95/EC & JinXin RoHS requirement

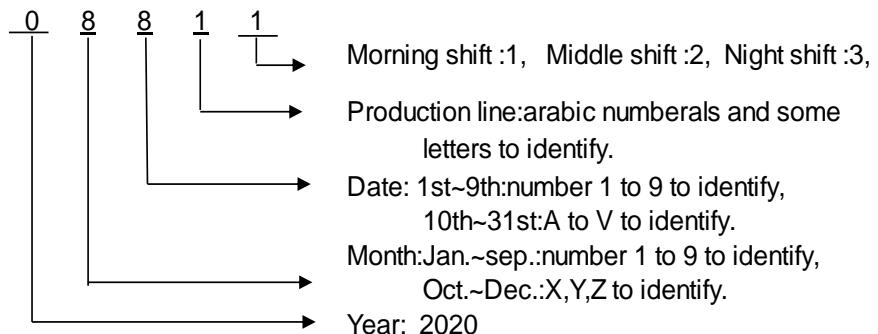
JinXin-III-TD-001.

11. 打印 LOT NO. INDICATION ON THE VIBRATOR

产品打印信息如下，其中包括产品代码和生产日期，详见图 2:

Following markings are the definition of lot no. indication on the vibrator, which including production code and date code; please see picture 2 as below for detail information:

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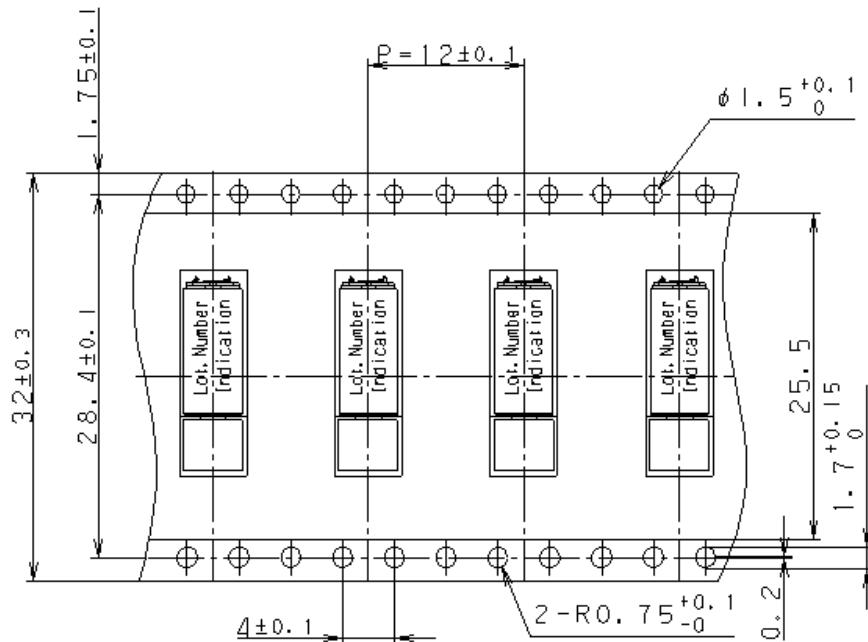


Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Lot No. Insication	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	H	I	J	K
Date	21	22	23	24	25	26	27	28	29	30	31									
Lot No. Insication	L	M	N	O	P	Q	R	S	T	U	V									
Date	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20
Production line code	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	H	I	J	K

Picture 2 Lot No. indication

12. 包装 PACKAGING CONDITION

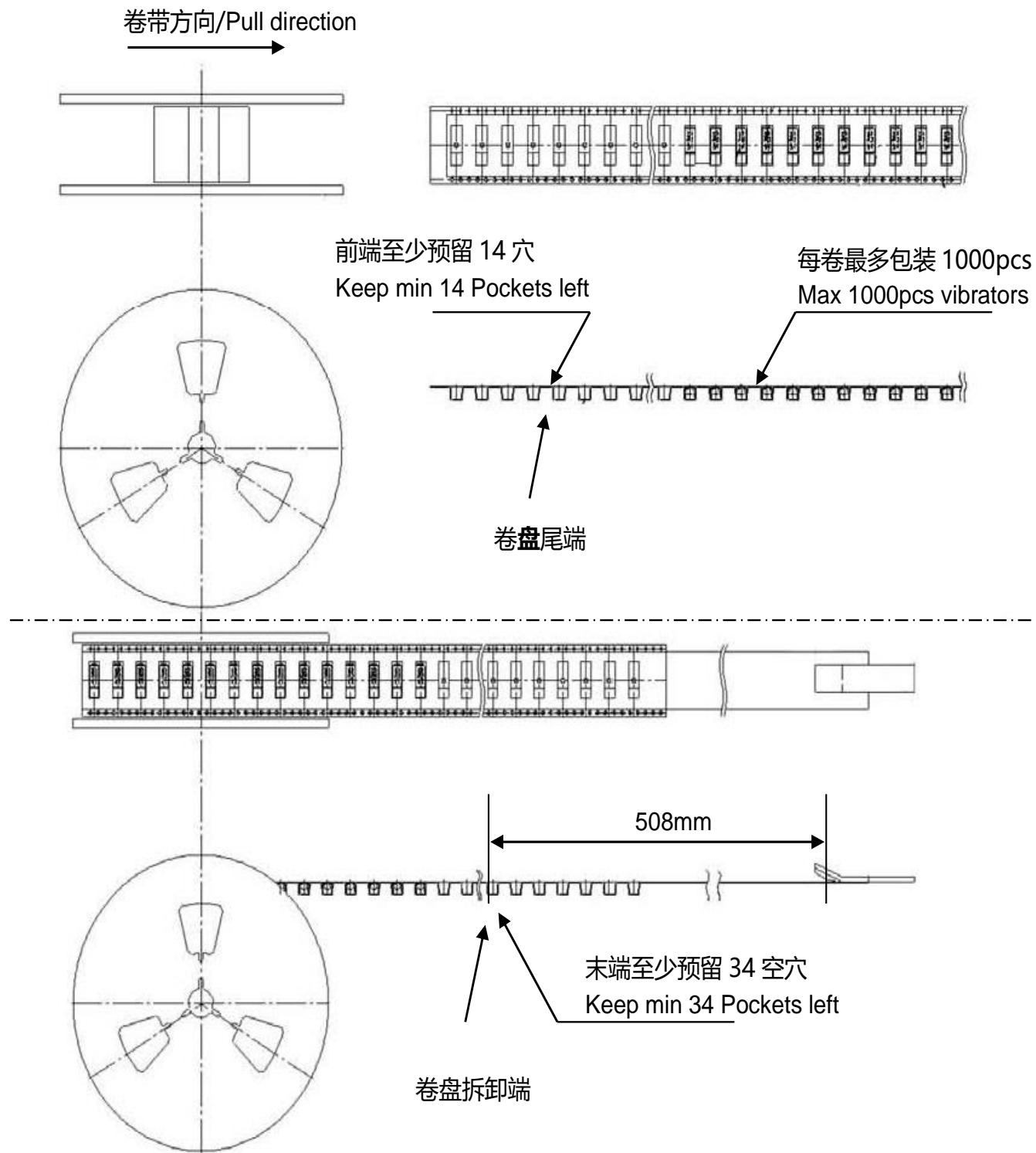
12.1 最小包装要求/Smallest packing



Picture 3 最小包装状态示意/Smallest packing condition

12.2 卷盘包装要求/Reel packing condition

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 张工 20.03.25	 陈国伟 20.03.25	 徐旭 20.03.25					

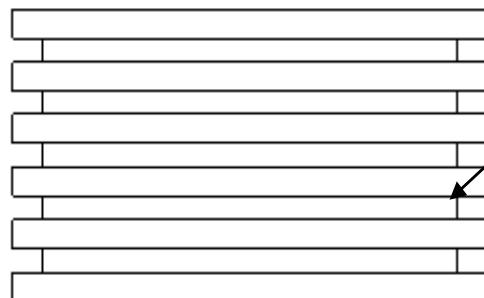


Picture 4 卷盘包装条件示意/Reel packing condition

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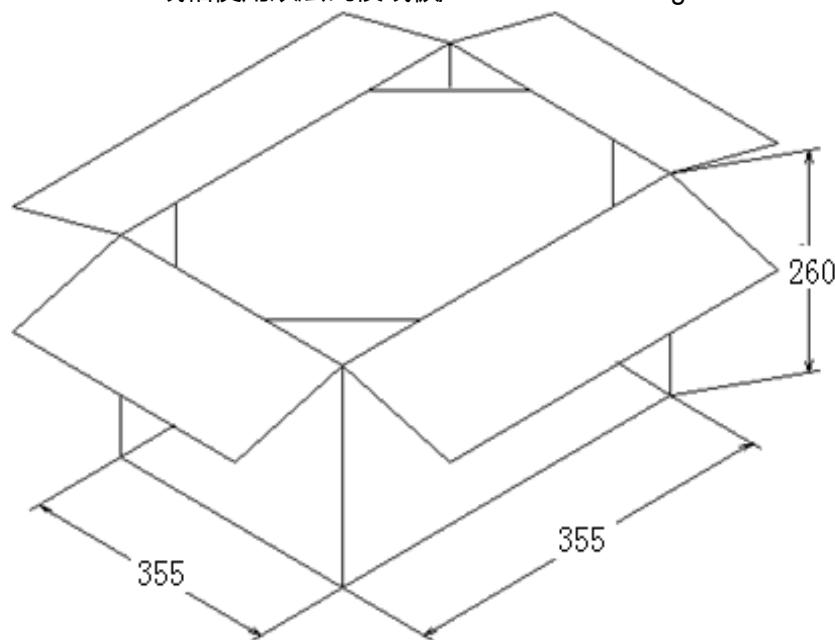
12.3 最终包装条件/Final packing condition

1000pcs/reel X 6reel= total 6000pcs



包装及运输过程中, 保持马达振子朝上放置.

纸箱使用双层瓦棱纸板/Double wall corrugated cardboard



Picture 5 纸箱包装示意/Final packing condition

13. 建议马达的 Reflow 条件 RECOMMENDED REFLOW PROFILE FOR VIBRATOR

13.1 定义/Definitions

Reflow Profile = 回流时间与温度的对应曲线图/Reflow Profile = Time vs. temperature plot

Peak temperature = 元件所能承受的最大温度/Peak temperature = Maximum temperature reached on the component

Convection = 对流/Convection = Forced air heating

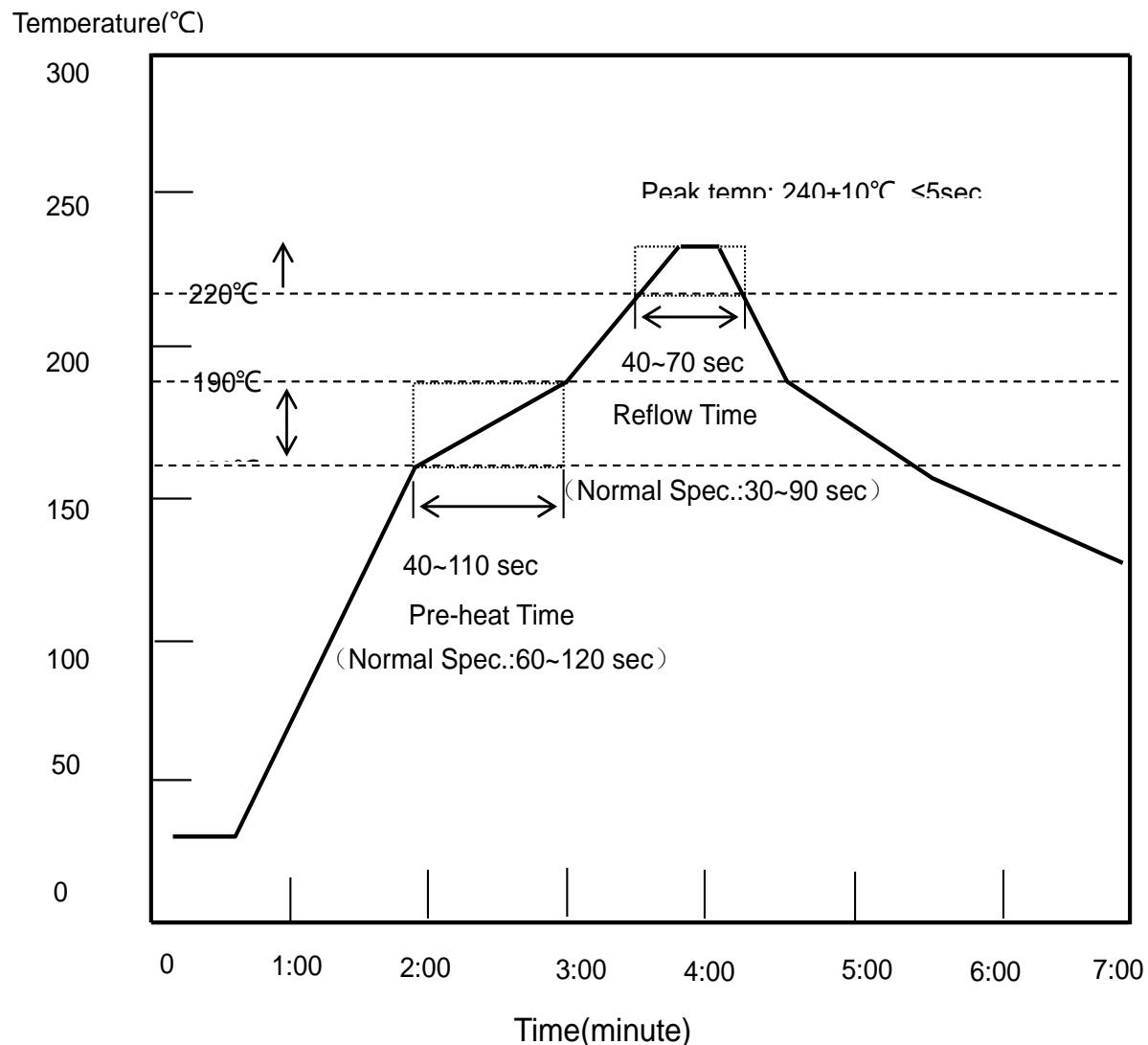
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13.2 建议回流焊炉温度检查方法/Recommended temperature check method of reflow furnace

回流焊炉100%通过气流循环进行热传递，热电偶应放置在马达表面，以确保能够达到所需温度，曲线图使用温度探测计记录。

The reflow furnace used should be 100% convection reflow. Thermocouples should be securely attached to the top surface of vibrator to insure the temperature exposure is met. Profile should be recorded by data acquisition for future reference.

13.3 建议的无铅焊炉温图/Recommended reflow Profile for Pb-Free soldering



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14. 使用须知 NOTES ON USE

14.1 请留意施加于马达本身的电压及电流范围勿超过产品规格，否则将导致产品性能减低或寿命短。

Pay attention to the voltage and current ranges which applied to the vibrator, and use the vibrator in accordance with this specification, otherwise, it will reduce the life and performance of the vibrator.

14.2 从 PCB 上折取马达时请勿使用热风枪直接在马达表面加热。

Do not use hot gun to puff the surface of vibrator from PCB directly.

14.3 当马达运转时请勿长时间堵转马达，该操作可能导致马达过热及短路。

Do not locking the motor with current applied for long time, which may cause the motor to overheat and short circuit.

14.4 作业时请勿对马达端子大力加压，容易导致马达接电端子变形。

Do not exert pressure the terminals, otherwise, it will result in terminal deformation.

14.5 请勿将强磁性物体靠近马达表面，那可能会导致马达退磁或其它异常。

Do not bring magnetized objects near or contact with the surface of vibrator, which will demagnetize the magnetism of vibrator and result in noise failure.

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Appendix 1

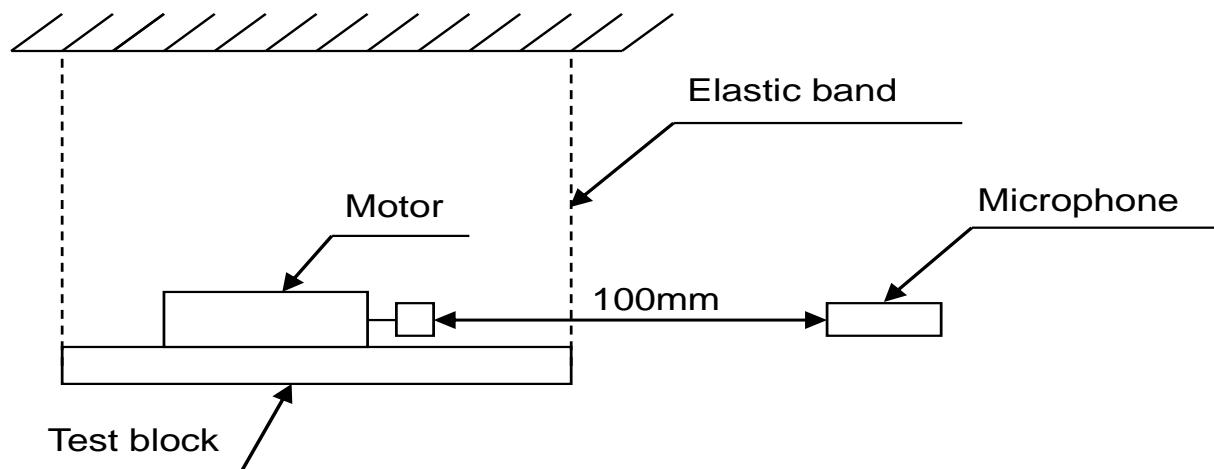


Figure 1.

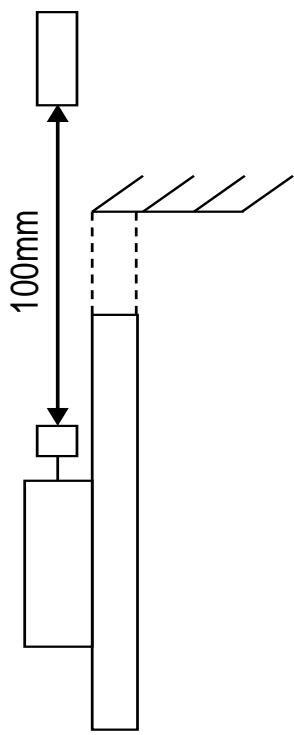


Figure 2.

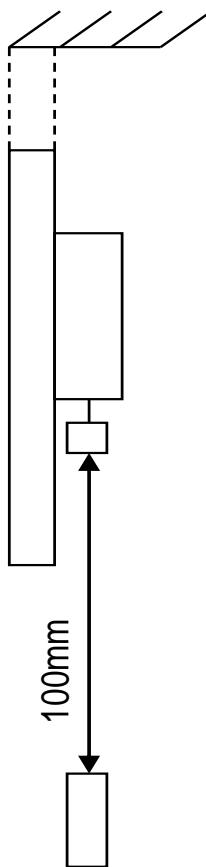


Figure 3.

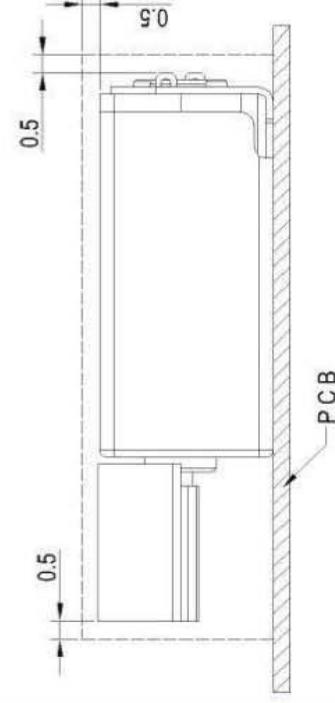
Dsgd 设计	Chkd 审核	Appd 批准	Part No: FG-T41023A5K1060B 料号				
 20.03.25	 20.03.25	 20.03.25	Document No 文件编号: FUGE-1060B Spec .Doc 规格书文档			Edition 版本: A	14/15

Appendix 2

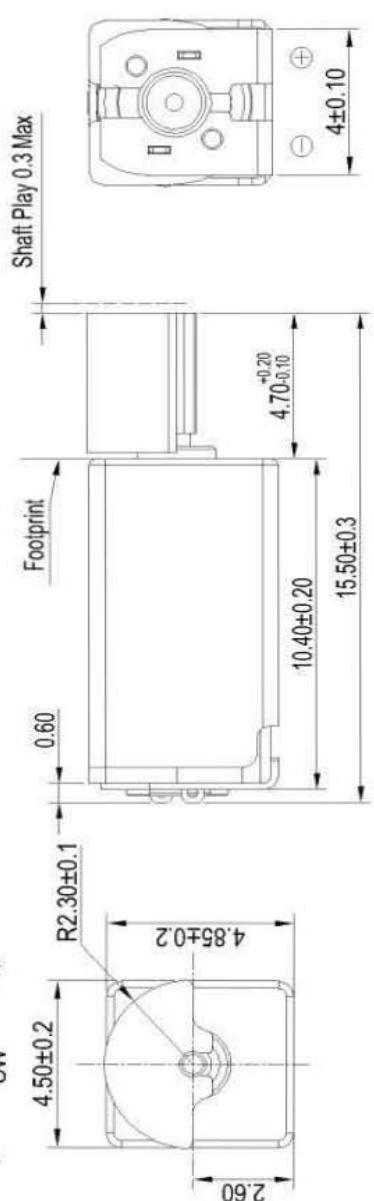
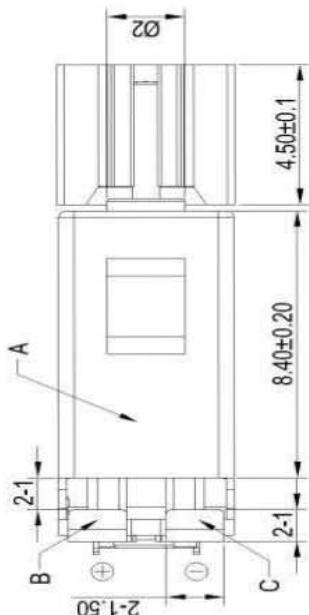
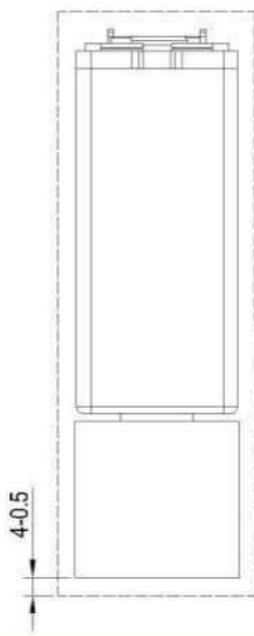
2020.03.25 说明书/Specification 编号/N0. FUGE-1060B

代码/code: 0

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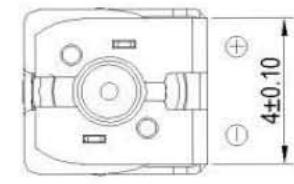


Minimum clearance between motor and housing walls is 0.5mm



Shaft Play 0.3 Max

Footprint

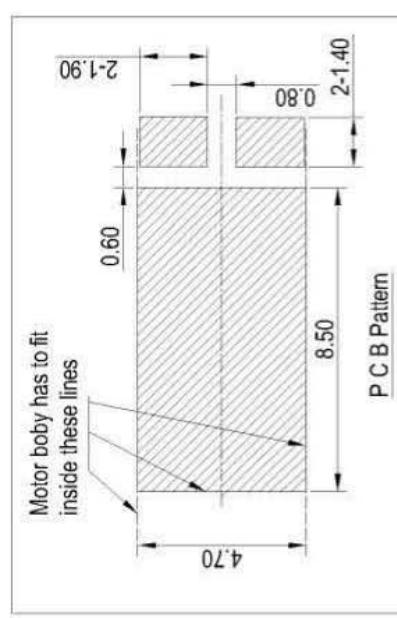


标记处数	分区	更改文件号
设计	2020.03.25	
校对	2020.03.25	

标记处数	分区	更改文件号
审核	2020.03.25	
工艺		

FG-T41023A5K1060B

外形图



Motor body has to fit
inside these lines