



承认书

APPROVAL SHEET

版本号: A0

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| 客户信息 | 客户 Customer | |
| | 客户代码 Customer code | |
| | 项目名称 Project | |
| | 料号 Part No. | |
| | 客户承认签章 Customer's Approval & Signatures | |

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|------|--------------------|------------------------------------|------------------|-------------------|-------------------|-----------------|
| 宝龙公司 | 产品名称 Product Name | 圆柱振动电机 Cylindrical vibration motor | | | | |
| | 产品型号 Product Model | BL4I2J4-C100N | | | | |
| | 设计 Designed by | 马续强 Ma Xuqiang | 审核 Checked by | 徐建辉 Xu Jianhui | 批准 Approved by | 兰德福 Lan Defu |

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ROHS/HF

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更改记录/ Revision history

| 版本 Version | 编制 Originator | 批准 Approval | 更改详情 Detail spec changes | 日期 Date |
|---------------|------------------|----------------|-----------------------------|------------|
| A0 | 马续强 | 兰德福 | 初始规格/Preliminary spec | 2018-04-17 |
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1. 结构形式/Construction Form

本规格书适用于宝龙电子集团有限公司制造的应用于移动电话的振动电机。
This specification sheet is stipulated for vibration motor, which is manufactured by Baolong Electronic Group Co., Ltd. for mobile phone.

| NO. | 项目/Item | 规格/Specifications |
|-----|-------------------------------|---------------------------------------------------|
| 1-1 | 电机结构 Motor construction | Φ4 圆柱形无铁芯直流电机 Φ4 cylindrical DC coreless motor |
| 1-2 | 换向片数 Number of phases | 3 组换向片 3-phases |
| 1-3 | 磁极数 Number of magnet poles | 两极 (内置磁极型式) 2-poles (Inner magnet type) |
| 1-4 | 线圈 Coil construction | 空心杯式线圈 Columnar coil |
| 1-5 | 整流技术 Rectifying method | 采用高精度电刷和换向器 Precious brush and commutator |

2. 使用条件/Standard operating condition

| NO. | 项目/Item | 规格/Specifications |
|-----|---------------------------------------|-------------------|
| 2-1 | 额定电压 Rated voltage | DC3.0V |
| 2-2 | 使用电压范围 Operating voltage range | DC 2.5~3.6V |
| 2-3 | 旋转方向 Rotating direction | CW / CCW |
| 2-4 | 使用温度范围 Operating temperature range | -30℃~+70℃ |

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3. 测试条件/Testing condition

| NO. | 项目/Item | 规格/Specifications |
|-----|--------------------------------------|-------------------------------------------------|
| 3-1 | 温度 Temperature | 20℃ ±3 |
| 3-2 | 湿度 Humidity | 45% ~85%RH |
| 3-3 | 电源电压 Power supply, voltage source | 直流电源或电池 3.0V DC power supply or battery 3.0V |
| 3-4 | 电机安放状态 Posture of motor | 水平/竖直 Horizontal / vertical |

4. 贮存环境/Storage environment

| NO. | 项目/Item | 规格/Specifications |
|-----|---------------------------|-------------------|
| 4-1 | 贮存温度 Storage temp | 20℃ ±3 |
| 4-2 | 相对湿度 Relative humidity | 65 ±5% RH |

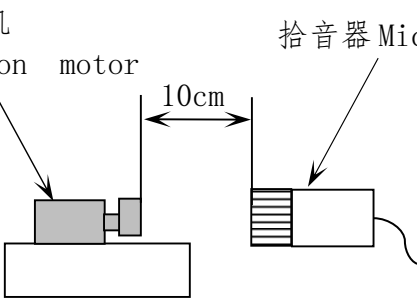
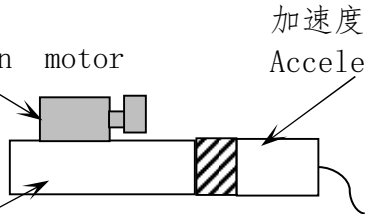
5. 电气特性/Electrical characteristic

| NO. | 项目/Item | 单位 /Unit | 规格/Spec | 条件/Condition |
|-----|--------------------------|-------------|-------------|---------------------------------------------------------------------------------------|
| 5-1 | 额定转速 Rated speed | rpm | 14000 ±2500 | 额定电压/Rated voltage: DC 3.0V |
| 5-2 | 额定电流 Rated current | mA | 80Max | 额定电压/Rated voltage: DC 3.0V |
| 5-3 | 启动电流 Starting current | mA | 100Max | 在额定电压下锁定振动轮, 测 电机电流/Measure current at locked counterweight in rated voltage |
| 5-4 | 启动电压 Starting voltage | V | 2.3Max | 在额定负荷下电机的任一位置 都能转动/The motor can be rotated at any position under rated load |

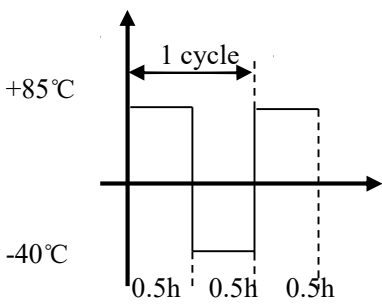
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|-----|----------------------------------|----|--------------|----------------------------------------------------------------------------------------------------------------------|
| 5-5 | 端子阻抗 Terminal resistance | Ω | 37 (1±20%) Ω | 正极和负极之间/ Between positive and negative |
| 5-6 | 绝缘电阻 Insulation resistance | MΩ | 10Min | 测量机壳和引线之间,测试电 压直流100V。/ Measuring between case and lead wire.Test voltage DC 100V . |
| 5-7 | 耐电压 Dielectric voltage | mA | 1Max | 在电机的机壳和引线间施加交 流电 110V, 历时 1 分钟。/ Supply with AC 110V between a lead wire and motor case during 1 minute. |

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| 6. 机械特性/Mechanical characteristics | | | | |
|------------------------------------|------------------------------|---------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NO | 项目/Item | 单位/Unit | 规格/Spec | 条件/Condition |
| 6-1 | 外观 Appearance | / | 无划痕、 锈蚀、污 迹等不良现象 /No scar, rust, stain and dent | 目测/Visual |
| 6-2 | 尺寸 Size | mm | 详见外形 图 /See outline drawing | 使用游标卡尺和千分尺测量/ Use vernier caliper and micrometer to measure |
| 6-3 | 电机重量 Motor Weight | g | 0.85± 10% | 用天平测量/Use scale |
| 6-4 | 机械噪音 Mechanical Noise | dB | 50 Max | 振动电机 Vibration motor 拾音器 Microphone  额定电压/Rated voltage : DC 3.0V 背景噪音/Back ground noise: 30dB Max. 拾音器沿轴向正对电机平面/Microphone faces the plane of motor along the shaft |
| 6-5 | 振动量 Vibration Strength | Gms | 0.7 Min | 振动电机 Vibration motor 加速度传感器 Accelerometer  |
| | | Gp | 0.98 Min | 测试夹具 (100g) Test Fixture 额定电压/Rated voltage : DC 3.0V |

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| 7. 环境试验/Environmental test | | |
|----------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NO | 项目/Item | 条件/Condition |
| 7-1 | 高温贮存试验 High temperature storage test | 在+80℃的环境下放置96小时，然后在常温常湿下恢复2小时后测试。/Exposed at +80℃ for 96hours, then return to normal temperature and humidity for 2 hours before test. |
| 7-2 | 低温贮存试验 Low temperature storage test | 在-30℃的环境下放置96小时，然后在常温常湿下恢复2小时后测试。/Exposed at -30℃ for 96 hours, then return to normal temperature and humidity for 2 hours before test. |
| 7-3 | 湿热试验 Humidity test | 将电机置于50℃、95%R.H.的环境下96小时，然后在室温下放置2小时，进行恢复，而后进行测试。/Expose the motor under the environment of 50℃, 95%R.H. for 96 hours and then return to normal temperature and humidity for 2 hours before test. |
| 7-4 | 高低温试验 Heat cycle test | <p>确保电机在下图所示的条件下放置12个周期，在室温下恢复2小时后，进行测试。/Assure the motor be placed under below testing conditions for 12 cycles, and then put the motor at normal temperature and humidity for 2 hours until further test.</p>  |
| 7-5 | 振动量试验 Vibration test | <p>将电机固定在100g的塑料夹具上，按以下要求进行试验/Fix the motor on a 100g jig (plastic housing),and then make test according to below requirements:</p> <ol style="list-style-type: none"> 1) 振频范围/Vibration frequency range:10-55Hz 2) 全振幅/Total amplitude:1.5mm 3) 振频变化/Sweep ratio:10~55~10Hz 约2分钟/approximate 2 min 4) 振动方向/Direction of vibration:三个垂直方向/Three |

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| | | perpendicular directions 5)持续时间/Duration: 每个方向10分钟 (共30分钟) / 10 minutes in each direction (30 minutes each) |
| 7-6 | 跌落试验 Drop test | 电机放在大约100g (包括电机) 重的物体上自由落下到水泥地板上。/Set the motor on the heavy block about 100g weight (include the motor) and drop the motor onto the concrete floor. 高度/Height: 1.5m 方向/Direction: $\pm X, \pm Y, \pm Z$ 次数/Times: 每一平面下落2次, 共计12次。/Two drops per plane for a total of 12 drops. |

▶ 判定标准/Judgment standard

试验后, 测试数据必须符合以下规格:

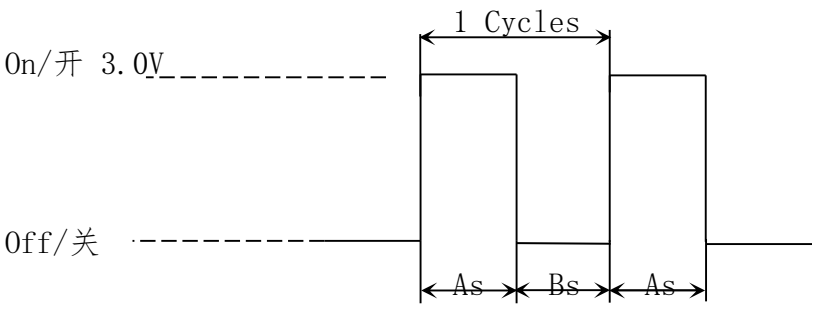
After test, measured data must be satisfied as following specifications;

- 启动电压/Starting voltage: DC 2.0V Max.
- 额定转速/Rated speed: 变化率在初始值的+50%~-30%以内/ changing rate must be within +50%~-30% of initial value.
- 额定电流/Rated current: 变化率在初始值的+50%~-30%以内。/changing rate must be within +50%~-30% of initial value.
- 端子阻抗/Terminal resistance: 变化率在初始值的 $\pm 15\%$ 以内。/changing rate must be within $\pm 15\%$ of initial value.

外形结构无异常。/There should be no abnormalities in appearance and structure.

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8. 寿命试验/Life test

| NO | 项目/Item | 条件/Condition |
|-----|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8-1 | 寿命试验 | <p>在常温、常湿下，将 DC 3.0V 不断地施加在电机的正负极上，按 A 秒开、B 秒关为一个周期，运行 S 个周期（如下图所示）。 /At room temperature in ambient humidity, the DC 3.0V will continue to be applied to the positive and negative electrode, according to A seconds, B seconds off for a cycle, run S cycle (as shown below).</p> <p>模式/mode A=1, B=1, S=100,000</p>  |

▶ 判定标准/Judgment standard

① 试验后，测试数据必须符合以下规格：

After test, measured data must be satisfied as following specifications;

- 额定转速/Rated speed: 变化率在初始值的+50%~-30%以内/ changing rate must be within +50%~-30% of initial value.
- 额定电流/Rated current: 变化率在初始值的+50%~-30%以内。/changing rate must be within +50%~-30% of initial value.
- 噪音/noise: 电机应能正常启动，无异常机械噪音。/Should not fail in starting, Should not be unusual mechanical noise.

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9. 环保要求/Environment Protections

本产品所有零部件符合欧盟RoHS2.0/无卤/REACH指令要求，具体环境有害物质管控限制如下/This product conforms to the EU ROHS2.0, halogen-free and REACH certification, Specific content as follows:

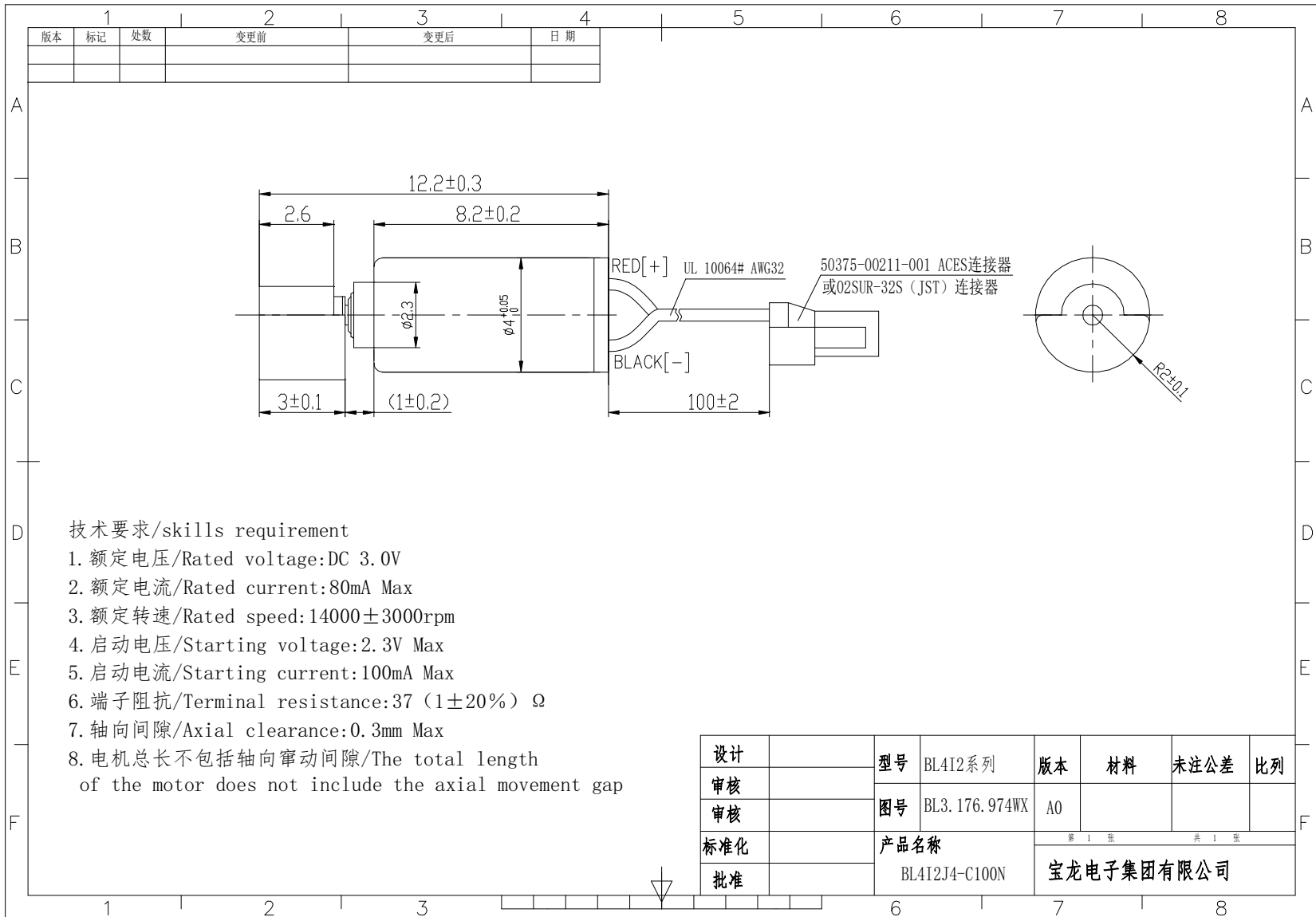
- 铅及其化合物最大允许含量为1000ppm/Lead and Lead compounds \leq 1000ppm
 - 镉及其化合物最大允许含量为1000ppm/Cadmium and cadmium compounds \leq 1000ppm
 - 汞及其化合物最大允许含量为1000ppm/Mercury and Mercury compounds \leq 1000ppm
 - 六价铬化物最大允许含量为1000ppm/Hexavalent chromium compounds \leq 1000ppm
 - 多溴联苯 (PBB) 最大允许含量为1000ppm/Polybrominated biphenylethers \leq 1000ppm
 - 多溴联苯醚 (PBDE) 最大允许含量为1000ppm/Polybrominated diphenylethers \leq 1000ppm
 - 邻苯二甲酸二正丁酯 (DBP) 最大允许含量为1000ppm /DBP \leq 1000ppm
 - 邻苯二甲酸正丁基苄酯 (BBP) 最大允许含量为1000ppm/BBP \leq 1000ppm
 - 邻苯二甲酸 (2-己基) 己酯 (DEHP) 最大允许含量为1000ppm/DEHP \leq 1000ppm
 - 六溴环十二烷 (HBCDD) 最大允许含量为1000ppm/HBCDD \leq 1000ppm
 - 溴Br最大允许含量为900ppm/Br \leq 900ppm
 - 氯Cl最大允许含量为900ppm/Cl \leq 900ppm
 - 溴加氯之和最大允许含量为1500ppm/Br+Cl \leq 1500ppm
- REACH指令按最新法规内容管控执行
 包装材料环保管控要求：Pb, Cd, Hg, Cr+6 : 4种物质总和 $<$ 100ppm (其中, Cd $<$ 50ppm)

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10. 注意事项/CAUTION FOR USE

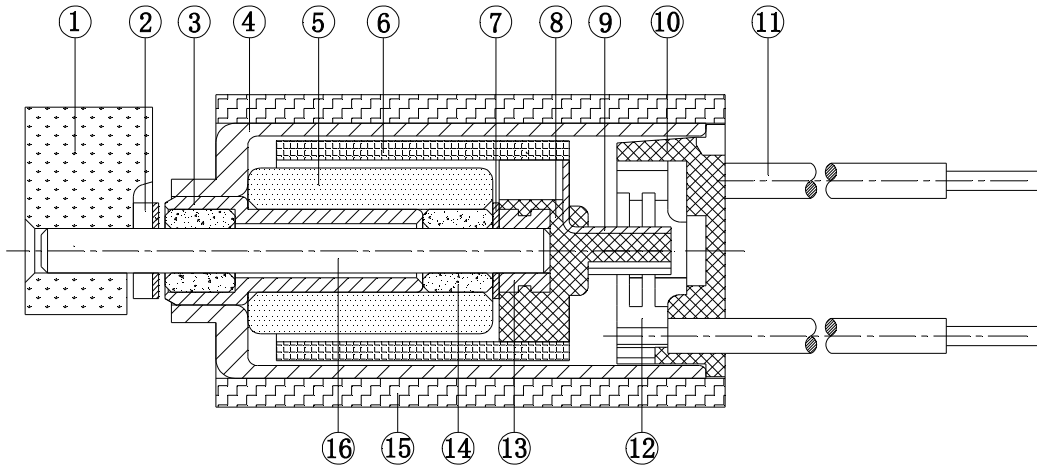
- (1) 该马达是微型精密产品，在运输过程中不要承受超过0.5 kgf的力，否则会引起外形或性能的变化。/As this motor is small and precise, do not press it over 0.5kgf force or while transportation, otherwise it will cause the transformation of performance or external appearance.
- (2) 请注意马达不要接触到液体性物质（比如：水，酒精等）。/ Please keep the motor away from liquid substance (such as water, alcohol, etc.)
- (3) 不要在高温下长时间放置，否则有可能导致电机的性能下降。/Do not expose the motor to high temperature for long time, it may cause a decline in performance.
- (4) 马达不要在以下环境中使用。/Avoid using the motor in the following environment:
 - 高温和高湿的场所/High temperature and high humidity area.
 - 腐蚀性气体如H₂S、SO₂、NO₂等/Corrosive gas such as H₂S、SO₂、NO₂ etc.
- (5) 请不要在靠近磁铁或带有磁场的仪器旁边使用或存放马达。/Please do not operate or store the motor adjacent to magnet or apparatus which has a magnetic field.
- (6) 请注意底盖的表面存在漏磁通量。/Please be careful that there exists a leaking magnetic flux on the surface of bracket.
- (7) 电刷和换向器的相互作用，有可能产生轻微的电噪音。/Due to interaction between brush and commutator, there is a possibility to occur electrical noise slightly.
- (8) 如有任何问题，宝龙和客户双方应共同努力解决。/If any problems occur, both the user and Baolong side shall try to solve the problem together.
- (9) 因测试设备有误差，允许有±5%偏差。/ Due to the measurement equipment error, there is a ± 5 % difference tolerance.
- (10) 马达通过ROHS认证。/This motor pass the system of ROHS certification.

11. 外形图/Outside view



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12. 结构图及物料清单/Structure drawing & BOM



| NO. | 部件名称/Part name | 材料名称/Material name |
|-----|----------------------|----------------------|
| 1 | 振动轮/weight | 钨合金/Tungsten alloy |
| 2 | 定位片/Lock washer | 聚酯薄膜/Polyester film |
| 3 | 套管/Housing | 易切钢/Steel alloy |
| 4 | 机壳/Case | 冷轧钢板/Steel board |
| 5 | 磁钢/Magnet | 钕铁硼/Nd-iron-boron |
| 6 | 线圈/Coil | 铜/Copper |
| 7 | 垫片/washer | 聚酯薄膜/Polyester film |
| 8 | 塑料/Plastic | PBT |
| 9 | 换向片/Commutator slice | CDF-2 |
| 10 | 端盖/Top Cover | PBT |
| 11 | 引线/Power line | AWM3302 |
| 12 | 电刷/Brush | AgPd50/MX215 |
| 13 | 轴套/Bushing ring | 铍青铜/Beryllium bronze |
| 14 | 含油轴承/Bearing | 铜粉/Copper powder |
| 15 | 胶套/Build in sheath | 硅橡胶/Silica gel |
| 16 | 钢轴/Shaft | SUS420J2 |

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13. 包装要求/Packaging require

- (1) 每个吸塑盒里放100个电机。/100 vibrators in each plastic capsule.
- (2) 每30个吸塑盒上盖一个吸塑盒盖，用胶带捆做一捆。/Every 30 capsules as a group put a plastic cover on the group and wrap it in tape.
- (3) 每2捆按图中的叠放方式放入一个外包箱（440×220×160）。/Every 2 bundle are put into an outer case with a size of（440×220×160）by the ways stipulated as the drawing.
- (4) 数量、生产批号均写在外包装箱上。/Quantity and batch number are written on the surface of the outer case.

