深圳市亚特联科技有限公司
SHENZHEN YATELIAN TECHNOLOGY CO., LTD

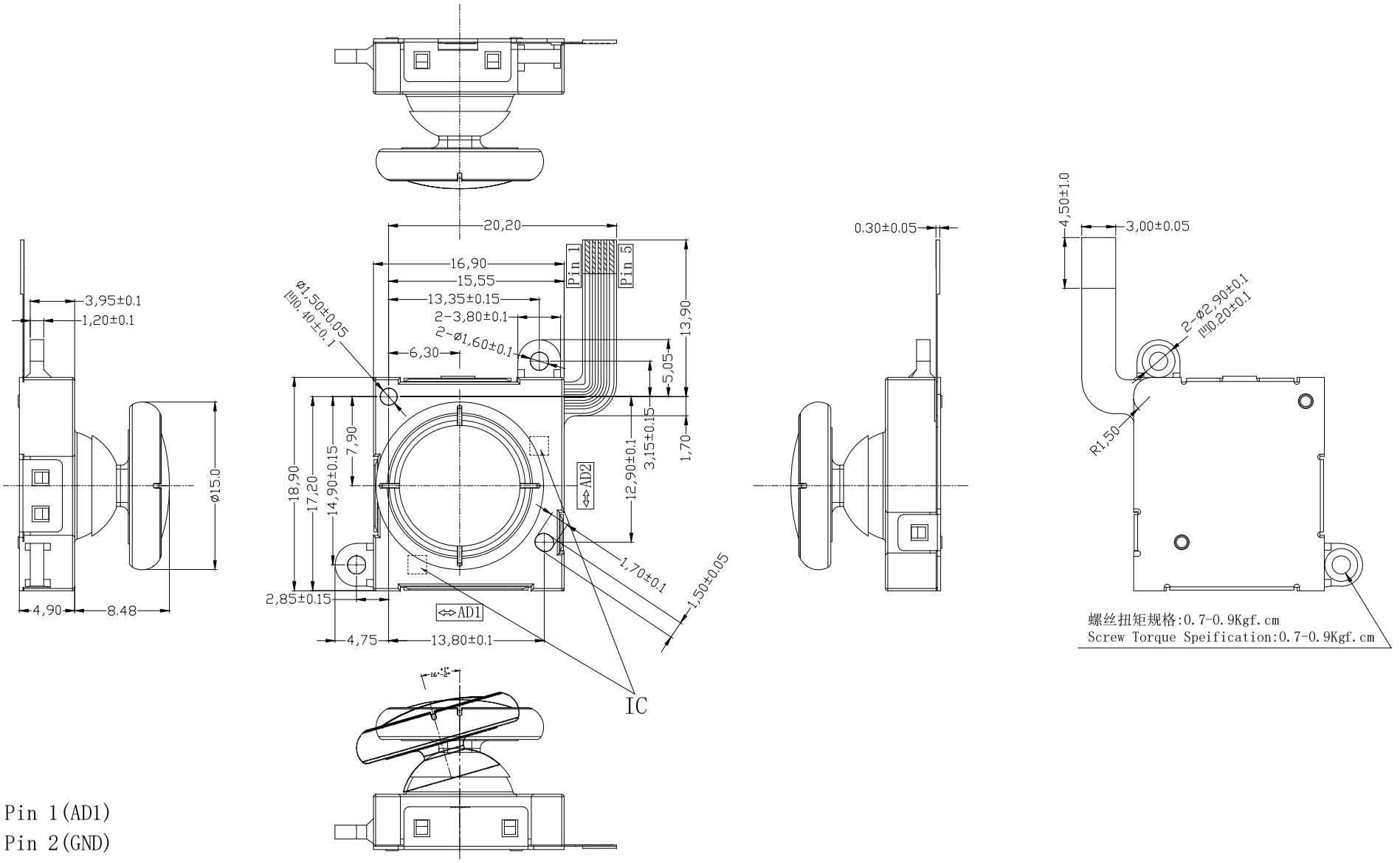
# 承认书
# FOR APPROVAL

| | |
|---|---|
| 客户名称：<br>Customer： | |
| 客户机型：<br>Product： | |
| 客户料号：<br>Customer's Name： | |
| 产品名称：<br>Product： | TMR摇杆 |
| 产品型号：<br>Product Model： | YTMR-YG19-612SR6B179A4 |
| 日期：<br>Date： | 2026-09-07 |
| 摘要<br>Product： | |

外形图：
Outline drawing：

| 经办<br>Designed | 审 核<br>Check | 批准<br>Approved |
|---|---|---|
| 宋工 | / | 张工 |

| 客户承认<br>Approved | | |
|---|---|---|
| | | |




Pin 1(AD1)
Pin 2(GND)
Pin 3(Switch)
Pin 4(AD2)
Pin 5(VCC)

| | | | | | | |
|---|---|---|---|---|---|---|
| 深圳市亚特联科技有限公司 SHENZHEN YATELIAN TECHNOLOGY CO., LTD | | MODEL: YTMR-YG19-612 SR6B179A4 | | | DRAW | SCALE |
| | | DRAWING NO: KY-3-JS19-612 | | | 周工 | 1:10 |
| DATE | REVISION | Design | TOL. UNLESS OTHERWISE SPEC. | | CHKD | UNIT |
| 2026.09.05 | 初始发行 | 周工 | BASIC DIMENSIONS | TOL. | 宋工 | mm |
| | | | L≤10 | ±0.3 | | |
| | | | 10<L | ±0.5 | APPD | |
| | | | 100≤L | ±0.8 | 张工 | |
| | | | ANGLE | ±5° | | 第 1 页 |

深圳市亚特联科技有限公司
SHENZHEN YATELIAN TECHNOLOGY CO., LTD

# YG19 系列规格书

# YG19 SERIES SPECIFICATION

**适用机型：YG19 软板系列(179)　　编号：SPEC-YG19-003　　日期:2026 年 9 月 7 日**

## 1.General　一般事项

1-1 Scope　适用范围

This specification applies toTMR joysticks used in electronic devices.

本规格书适用于电子设备使用之 TMR 摇杆。

1-2 Standard atmospheric conditions　标准大气状态

Unless otherwise specified, the standard range of atmospheric conditions for making measurements

and tests is as follows:

除另有规定外，量测应在以下大气条件下进行:

| | | |
|---|---|---|
| Ambient temperature | 温度 | : 15℃ ~ 35℃ |
| Relative humidity | 相对湿度 | : 25% ~ 85% |
| Air pressure | 气压 | : 86 KPa~ 106 KPa |

If there is any doubt about the results, measurements should be made within the following limits:

如有任何疑虑时，量测应在以下条件下进行:

| | | |
|---|---|---|
| Ambient temperature | 温度 | : 20℃ ± 1℃ |
| Relative humidity | 相对湿度 | : 63% ~ 67% |
| Air pressure | 气压 | : 86 KPa~ 106 KPa |

1-3 Operating temperature range　: -10℃ ~ +70℃

适用温度范围

1-4 Storage temperature range　: -30℃ ~+80℃

保存温度范围

1-5 Operators shall wear electrostatic bracelets during operation

作业员操作时需戴静电手环

## 2. Construction　构造

2-1 Dimension　尺寸　: Refer to attached drawing　参见成品图

**3.Mechanical characteristics**
**机械性能**

| NO.<br>序号 | ITEM<br>项　目 | CONDITIONS<br>条件 | SPECIFICATION<br>规格 |
|---|---|---|---|
| 1 | Figure of lever operation<br>摇杆动作形式 | / | Circular operating<br>圆形式 |
| 2 | Operation angle of shaft<br>摇杆移动角度 | Add a fit force on the lever top to push it to max. angle of each direction when lever is released and reset position.<br>当摇杆处于自由复归位置时,在摇杆顶部施加一定力将摇杆推向任意方向最大角度。 | 16° +1° /-2° |
| 3 | Operating force of lever<br>摇杆作用力 | Test position is at more than 10 degrees deflection of lever.<br>摇杆偏斜 10 度以上之位置测定。 | 5.5±3mN.m(55±30gf.cm) |
| 4 | Accuracy of reset position of lever<br>摇杆复归垂直度 | Measure the angle between the lever and the axial center line after the lever pushed to the direction of X-X(Y-Y) and resets.<br>摇杆推向 X-X(Y-Y)方向自由复归后测量摇杆与垂直中心线的角度。 | 90° ±5° |

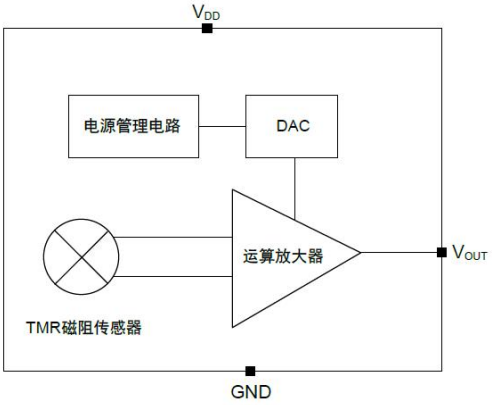
| | | | |
|---|---|---|---|
| 5 | Shaft torsional strength<br>摇杆扭曲强度 | Hold the Shaft controller.<br>And then reset the shaft to vertical position.<br>The torsion moment shall be applied to the shaft.<br>握住摇杆，然后将摇杆复位到垂直位置，扭力应作用在摇杆上。 | More than 0.15N.m（1Kgf.cm ）10 seconds min<br>Tested to meet the following requirements:<br>Mechanical characteristics: in accordance with 3.3、6.1、6.2<br>Electrical characteristics: in accordance with 4.2、4.3、4.4、6.4<br>Feeling: Normal<br>大于 0.15N.m（1.5Kgf.cm），至少 10 秒钟。<br>测试后符合以下要求：<br>机械性能:符合 3.3、6.1、6.2<br>电气性能:符合 4.2、4.3、4.4、6.4<br>手感：正常 |
| 6 | Pull Shaft strength<br>摇杆拉拔强度 | Apply specified pull force on the lever upward.<br>作用于摇杆上，沿摇杆方向向上。 | More than 50N(5Kgf) 10 seconds min.<br>Tested to meet the following requirements:<br>Mechanical characteristics: in accordance with 3.3、6.1、6.2<br>Electrical characteristics: in accordance with 4.2、4.3、4.4、6.4<br>Feeling: Normal<br>Appearance: Normal<br>大于 50N(5Kgf),至少 10 秒钟<br>测试后符合以下要求：<br>机械性能:符合 3.3、6.1、6.2<br>电气性能:符合 4.2、4.3、4.4、6.4<br>手感：正常 |

| | | | |
|---|---|---|---|
| 7 | Push shaft strength<br>摇杆推强度 | When the Shaft is in the vertical position, the action is on the Shaft and downward in the direction of the rocker.<br>摇杆在垂直位置时，作用于摇杆上，沿摇杆方向向下。 | More than 100N（10Kgf） 10 seconds min.<br>Tested to meet the following requirements:<br>Mechanical characteristics: in accordance with 3.3、6.1、6.2<br>Electrical characteristics: in accordance with 4.2、4.3、4.4、6.4<br>Feeling: Normal<br>Appearance: Normal<br>大于 100N（10Kgf），至少 10 秒钟<br>测试后符合以下要求:<br>机械性能:符合 3.3、6.1、6.2<br>电气性能:符合 4.2、4.3、4.4、6.4<br>手感：正常 |

**4. Electrical characteristics**
**电气特性**

| NO.<br>序号 | ITEM<br>项　目 | CONDITIONS<br>条件 | SPECIFICATION<br>规格 |
|---|---|---|---|
| 1 | Rated voltage<br>额定电压 | / | DC 1.8V & 3.3V |
| 2 | Voltage Divider Error<br>分压误差值 | Voltage divider error is defined the ratio of the voltage terminals Output-GND to terminals VCC-GND after the drive arm rested. 1.8V & 3.3V D.C. shall be applied to the terminals between VCC and GND and then voltage divider error shall be measured with the drive arm operation on the line X-X and Y-Y.<br>分压误差值是摇杆自由复归后端子 Output-GND 与端子 VCC-GND 电压比例:将 1.8V & 3.3V D.C 电压加在端子 VCC-GND 之间，分压误差值在摇杆运作于 X-X 和 Y-Y 方向到底复归后测试。 | 40.3%～59.7% |

| | | | |
|---|---|---|---|
| 3 | Limit voltage value<br>极限电压值 | The joystick operates in the X-X and Y-Y directions and is tested when tilted to 16°.<br>摇杆运作于 X-X 和 Y-Y 方向，倾斜到 16° 时测试。 | Min: Within 30%<br>Max: More than 70%<br>最小值：30% 以下<br>最大值：70% 以上 |
| 4 | value of reset position<br>复归值 | The absolute value of difference between the partial voltage error value measured after the free reset of the rocker in the upward direction and the partial voltage error value measured after the free reset of the rocker in the downward direction. The absolute value of difference between the partial voltage error value measured after the free reset of the rocker in the left direction and the partial voltage error value measured after the free reset of the rocker in the right direction<br>摇杆推向上方向自由复位后测得分压误差值与摇杆推向下方向自由复位后测得分压误差值之差的绝对值。<br>摇杆推向左方向自由复位后测得分压误差值与摇杆推向右方向自由复位后测得分压误差值之差的绝对值。 | Within 6.3%.<br>6.3%以内 |
| 5 | Insulation resistance<br>绝缘阻抗值 | Apply DC 250V to the specified terminal and other terminals.<br>指定端子与其它端子间加DC 250V 电压。 | More than 100MΩ<br>100MΩ 以上 |
| 6 | Withstand voltage<br>耐电压特性 | Apply AC 250V(Current 2mA) between specified terminal and other terminals for 1 minute.<br>指定端子与其它端子间加 AC 250V(电流 2mA)电压 1 分钟。 | Without arcing or breakdown<br>无损坏或弧光 |

| | | |
|---|---|---|
| 7 | Functional Block Diagram<br>功能图 |  |

| | | Symbol<br>符号 | Parameters<br>参数 | Test Condition<br>实验条件 | Min<br>最小值 | Typ<br>标准值 | Max<br>最大值 | Unit<br>单位 |
|---|---|---|---|---|---|---|---|---|
| 8 | Electrical Specifications<br>电气规格 | Vcc | Supply Voltage<br>电源电压 | | 1.6 | 3.3 | 5 | V |
| | | Icc | Supply Current<br>供电电流 | Ta=25℃<br>VDD=1.8V | - | 200 | - | uA |
| | | Tpo | Power on Time<br>开机时间 | Ta=25℃ | - | - | 100 | us |
| | | Bw | Bandwidth<br>带宽 | -3dB, CL=1nF | - | - | 50 | KHz |
| | | Rout | Output Resistance<br>输出电阻 | Iout<1.5mA<br>Vcc=3V B=0Gs | - | 5 | 15 | Ω |
| | | Rl | Output Loading Resistance<br>输出负载电阻 | Pull to GND<br>下拉到 GND | 10 | - | - | KΩ |
| | | | | Pull to VCC<br>上拉到 VCC | 10 | - | - | KΩ |
| | | Cl | Output Loading Capacitance<br>输出负载电容 | Output to GND | - | - | 10 | nF |
| | | Rl | Output Loading Resistance<br>输出负载电阻 | Iout<=1.5 mA Output to GND or to Vcc | 3K | - | - | kohm |
| | | VOL | Linear output low voltage<br>线性输出低电压 | VCC=3V,RL>=4.7 KΩ | - | - | 0.1 | V |
| | | VOH | Linear output high voltage<br>线性输出高电压 | VCC=3V,RL>=4.7 KΩ | VCC-0.1 | - | - | V |

| | | Symbol<br>符号 | Parameters<br>参数 | Test Condition<br>实验条件 | Min<br>最小值 | Typ<br>标准值 | Max<br>最大值 | Unit<br>单位 |
|---|---|---|---|---|---|---|---|---|
| 9 | Magnetic Characteristics<br>磁特性 | ELin | Nonlinear error<br>非线性误差 | Ta=25℃ | -1.5 | - | 1.5 | % |
| | | VOE | Zero field output voltage error<br>零磁场输出电压误差 | Vcc=1.8V;B=0<br>Ta=25℃ | 0.855 | 0.9 | 0.945 | V |
| | | | | Vcc=3.3V;B=0<br>Ta=25℃ | 1.57 | 1.65 | 1.73 | V |
| | | SNST | Magnetic sensitivity<br>磁灵敏度 | Ta=25℃,<br>Vcc=1.8V | 1.5 | 1676 | 1.84 | mV/Gs |
| | | | | Ta=25℃,<br>Vcc=3.3V | 2.76 | 3.06 | 3.36 | mV/Gs |
| | | VOQ_TC | Zero field voltage output drift in temperature range<br>温度范围内零磁场电压输出漂移 | - | -1.5 | - | 1.5 | % |
| | | SNST_TC | Magnetic sensitivity drift in temperature range 温度范围内磁灵敏度漂移 | TA=-40℃～125℃ | - | 1000 | - | ppm/℃ |
| | | ERAT_VOQ | Zero field output voltage proportional error<br>零磁场输出电压比例误差 | Ta=25℃ | -1.5 | - | 1.5 | % |
| | | | | Ta=25℃ | -1.5 | - | 1.5 | % |
| | | ERAT_SNST | Proportional error of magnetic sensitivity<br>磁灵敏度比例误差 | Ta=25℃ | -2 | - | 2 | % |
| | | | | Ta=25℃ | -2 | - | 2 | % |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | VN | Noise 噪声 | Ta=25℃,<br>Vcc=1.8V,<br>BW=800Hz | - | 0.5 | - | mVpp |
| 10 | VESD<br>耐静电 | TYPE<br>类型 | | | REFERENCE<br>参考 | | Grade<br>等级 | |
| | | HUMAN-BODY MODEL(HBM)<br>人体模型 | | | AEC-Q100-002 | | Class Ⅱ | |
| | | CHARGED-DEVICE MODEL(CDM)<br>带电器件模型 | | | AEC-Q100-011 | | Class C3 | |
| | | sealing effect (Latch up)<br>闭锁效应 | | | AEC-Q100-004 | | Class IA | |

**5. Endurance characteristics**
**耐久性能**

| NO.<br>序号 | ITEM<br>项 目 | CONDITIONS<br>条件 | SPECIFICATION<br>规格 |
|---|---|---|---|
| 1 | Dry heat<br>耐热性 | Temperature:+80±2℃<br>Time: 96 hours<br>The controller shall be subjected to standard atmospheric conditions for 2 hours , after which measurement shall be made.<br>在温度80±2℃恒温槽中放置96小时,取出后在正常状态下放置2小时后测试。 | Mechanical characteristics: in accordance with 3.3、6.1、6.2<br>Electrical characteristics: in accordance with 4.2、4.3、4.4、6.4<br>Feeling: Normal<br>Appearance: Normal<br>机械性能:符合3.3、6.1、6.2<br>电气性能:符合4.2、4.3、4.4、6.4<br>手感：正常 |
| 2 | Cold<br>耐寒性 | Temperature:-30 ±2℃<br>Time: 96 hours<br>Surface moisture shall be removed, and then the controller shall be subjected to standard atmospheric conditions for 2 hours, after which measurement shall be made.<br>在温度-30±2℃恒温槽中放置96小时,表面水份摄取后在正常状态下放置2小时后测试。 | Mechanical characteristics: in accordance with 3.3、6.1、6.2<br>Electrical characteristics: in accordance with 4.2、4.3、4.4、6.4<br>Feeling: Normal<br>Appearance: Normal<br>机械性能:符合3.3、6.1、6.2<br>电气性能:符合4.2、4.3、4.4、6.4<br>手感：正常 |

| | | | |
|---|---|---|---|
| 3 | Damp heat<br>耐湿性 | Temperature: +60 ± 2℃<br>Humidity: 90~95%RH<br>Time: 96 hours<br>Surface moisture shall be removed And then the controller shall be subjected to standard atmospheric conditions for 2hours, after which measurement shall be made.<br>在温度 60±2℃ 90%~95%RH 恒温槽中放置 96 小时，表面水份摄取后在正常状态下放置 2 小时后测试。 | Mechanical characteristics: in accordance with 3.3、6.1、6.2<br>Electrical characteristics: in accordance with 4.2、4.3、4.4、6.4<br>Feeling: Normal<br>Appearance: Normal<br>机械性能:符合 3.3、6.1、6.2<br>电气性能:符合 4.2、4.3、4.4、6.4<br>手感：正常 |
| 4 | Temperature cycling test<br>温度循环测试 | Low temperature : -20 ± 3℃ 30 minutes<br>High temperature: +60 ± 3℃ 30 minutes<br>Number of cycles: 5<br>Surface moisture shall be removed, and then the controller shall be subjected to standard atmospheric conditions for 2 hours , after which measurement shall be made.<br>在低温为-20±3℃恒温槽放置 30 分钟,高温 60±3℃放置 30 分钟,测试 5 次，表面水份摄取后在正常状态下放置 2 小时后测试。 | Mechanical characteristics: in accordance with 3.3、6.1、6.2<br>Electrical characteristics: in accordance with 4.2、4.3、4.4、6.4<br>Feeling: Normal<br>Appearance: Normal<br>机械性能:符合 3.3、6.1、6.2<br>电气性能:符合 4.2、4.3、4.4、6.4<br>手感：正常 |
| 5 | Drop test<br>跌落测试 | A 100g iron block is used as the drop weight, which falls freely from a height of 75 cm under a gravitational acceleration of 9.8 m/s² and impacts the joystick equipped with a thumb cap.<br>采用 100g 铁块作为跌落重物，从 75cm 高度以 9.8m/s² 重力加速度自由落下，跌落在加装拇指帽的摇杆上。 | Mechanical characteristics: in accordance with 3.3、6.1、6.2<br>Electrical characteristics: in accordance with 4.2、4.3、4.4、6.4<br>Feeling: Normal<br>Appearance: Normal<br>机械性能:符合 3.3、6.1、6.2<br>电气性能:符合 4.2、4.3、4.4、6.4<br>手感：正常<br>外观：正常 |

| | | | |
|---|---|---|---|
| 6 | Number of cycles<br>耐久寿命 | Mechanical life should be tested 5,000,000 cycles at the speed of one cycle per second without electrical load when joystick rotate 360° at 16° position.<br>无负载状态下以1圈/秒速度将摇杆推至16.0°位置进行360°旋转测试，寿命5,000,000圈。 | Mechanical characteristics: in accordance with 3.3<br>Electrical characteristics: in accordance with 4.2、4.3、4.4<br>Feeling: Normal<br>机械性能:符合3.3<br>电气性能:符合4.2、4.3、4.4<br>手感：正常 |

**6.Switch characteristics (FOR WITH-SWITCH TYPE)**

**开关规格(适用于带开关机种)**

| NO.<br>序号 | ITEM<br>项 目 | CONDITIONS<br>条件 | SPECIFICATION<br>规格 |
|---|---|---|---|
| 1 | Operating force<br>作动力 | Apply an axial force to the joystick until it stops moving, and measure the maximum force value during force application.<br>将一个轴向力施加于摇杆上直到其不动为止,量取施力期间之最大值。 | 7.0±3.0N（700±300gf） |
| 2 | Travel<br>移动量 | Put the switch lever upward, apply 2 times of the static operating force over the lever's axial direction of the lever, measure the variance of the switch stroke.<br>将开关操作部位(摇杆)置于静止位置,并在操作柄中央施加两倍于作动力之静负荷测量柄被压到不动时之移动距离。 | 0.35+0.5/-0.2mm |
| 3 | Maximum Ratings<br>最大定格电压 | Within 70℃<br>70℃以内。 | DC3.3V 1mA |

| | | | |
|---|---|---|---|
| 4 | Contact resistance<br>接触阻抗 | Apply 2 times of the operating force of the static load on the vertical direction of the lever, measure the resistance by using the Contact Resistance Tester with 1KHZ, 20mV, 5~50mA of current.<br>将两倍于作动力之静负荷加于操作柄之中央以(1KHZ,20mV, 5~50mA)微电流接触阻抗计测定。 | 200Ω Max<br>200Ω 以下 |
| 5 | Switch number of cycles<br>开关寿命 | Under electrical load DC3.3V/1mA, compress 10N (1kgf) force to the lever which is released and reset to vertical position. Switch life should be tested more than 1,000,000 cycles at the speed of 2 cycles per second.<br>负载状态下(DC3.3V/1mA),在摇杆自由复归后的垂直方向施加10N (1kgf)的按压力,以2次/秒的速度对开关进行测试,寿命1,000,000次以上。 | Mechanical characteristics: in accordance with 6.1、6.2<br>Electrical characteristics: in accordance with 6.4<br>Pressing feel: Normal<br>机械性能:符合6.1、6.2<br>电气性能:符合6.4<br>按压手感: 正常 |

| Version<br>版本 | Date.<br>修订日期 | Author.<br>修订人 | Content.<br>修订内容 |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

| Approved<br>核 准 | Check<br>审 查 | Design dept.<br>经 办 者 |
|---|---|---|
| 宋工 | / | 张工 |