

# 承認書

## APPROVAL SHEET

承認書編號:

SHEET NO: NDJF1926040901

客 戶

CUSTOMER

品 名

PARTNAME

JF19-801TMR TBS

訂 單 號

PURCHASE ORDER

客 戶 料 號

CUSTOMER'S PART NO.

日 期

DATE

2026/4/9

客戶承認

Customer Approved by

供應商經辦

Supplier Handle by

發行章

\* 承認後請回簽一份 Please sign back after approval. THANKS!

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霍尔摇杆规格书  
Houle, Joystick specs

适用机型：JF19（软板）系列

日期：2026年4月10日

1. General 一般事项

1.1 Scope 适用范围

This specification is applicable to electromagnetic joystick used in electronic equipment. The device produces a linear response when the output voltage is within the specified voltage range. Outside this range, sensitivity is reduced and nonlinear

本规格书适用于电子设备使用之电磁摇杆。当输出电压在规定的电压范围内时，该装置产生线性响应。

在这个范围之外，灵敏度会降低，并且是非线性的

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 : 15°C ~ 35°C

温度

Relative humidity : 25% ~ 85%

相对湿度

Air pressure : 86 KPa~ 106 KPa

气压

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 : 20°C ± 1°C

温度

Relative humidity : 63% ~ 67%

相对湿度

Air pressure : 86 KPa~ 106 KPa

气压

1.3 Operating temperature range : -10°C ~ +70°C

适用温度范围

1.4 Storage temperature range : -30°C ~ +80°C

保存温度范围

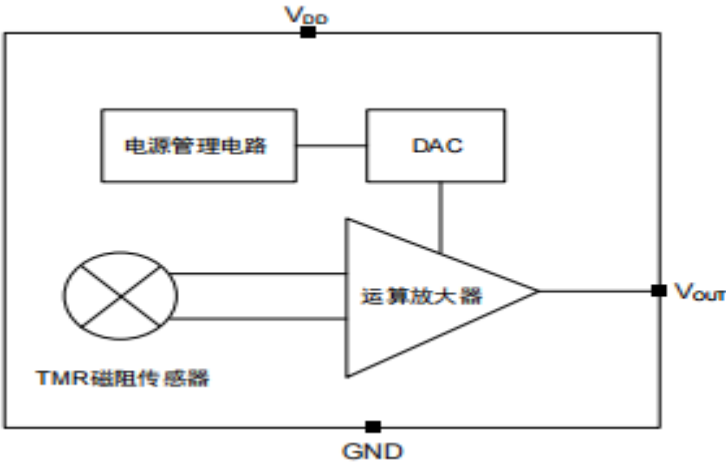
1.5 Operators shall wear electrostatic bracelets during operation

作业员操作时需戴静电手环

1.6 Construction 构造

Dimension 尺寸 : Refer to attached drawing 参见成品图

| <b>2.Mechanical characteristics 机械性能</b>  |   |   |   |
|---|---|---|---|
| 序号<br>NO.                                 | 项目<br>ITEM  | 条件<br>CONDITIONS  | 规格<br>SPECIFICATION                                     |
| 2.1                                       | Figure of lever<br>Operation<br>摇杆动作形式              | /   | Circular operating<br>圆形式                               |
| 2.2                                       | Operation<br>angle of lever<br>摇杆使用有效<br>角度         | Add a fit force on the lever top to push it to max.<br>angle of each direction when lever is released and<br>reset position<br>当摇杆处于自由复归位置时,在摇杆顶部施加一定<br>力将摇杆推向任意方向最大角度。  | 20°±3°  |
| 2.3                                       | Operating<br>force of lever<br>摇杆作用力                | Test position is at more than 10 degrees deflection of<br>lever.<br>摇杆偏斜 10 度以上之位置测定。   | 50±30 gf  |
| 2.4                                       | The stopper<br>strength of the<br>lever<br>摇杆止动强度   | Apply side force on the lever perpendicular to the<br>lever's axial direction.<br>垂直於摇杆的力作用于摇杆上。  | More than 3Kgf<br>3 seconds min<br>大于 3Kgf, 至少 3 秒钟     |
| 2.5                                       | Accuracy of<br>reset position<br>of lever<br>摇杆复归精度 | Measure the angle between the lever and the axial<br>center line after the lever pushed to the direction of<br>X-X(Y-Y) and resets.<br>摇杆推向 X-X(Y-Y)方向自由复归后测摇杆与垂直<br>中心线的角度。  | ±3°   |
| 2.6                                       | Push strength<br>of lever<br>摇杆拉拔强度                 | Crust without damage, lever without abnormality.<br>Electrical characteristics shall be satisfied with<br>specification.<br>外壳无破损,摇杆无异常,电气性能符合规定要求。   | More than 5.0 Kgf<br>3 seconds min<br>大于 5.0Kgf,至少 3 秒钟 |
|   | Push strength<br>of lever<br>摇杆推强度                  |   | More than 3.0 Kgf<br>3 seconds min<br>大于 3.0Kgf,至少 3 秒钟 |
| <b>3.Electrical characteristics 电气特性.</b> |   |   |   |
| 序号<br>NO.                                 | 项目<br>ITEM  | 条件<br>CONDITIONS  | 规格<br>SPECIFICATION                                     |
| 3.1                                       | Rated voltage<br>额定电压                               | $E=\sqrt{PR}$<br>E:额定电压 Rated voltage(V)<br>P:额定功率 Rated power(W)<br>R:公称全阻值 Nominal total resistance(Ω)<br>The rated voltage is calculated by above formula.<br>When the rated voltage exceeds the maximum<br>operating voltage, the maximum operating voltage<br>should be the rated voltage.<br>额定电压按以上公式计算,当额定电压超过最大工<br>作电压时,最大工作电压即为额定电压。 | DC 1.6V&5.0V  |

| 序号<br>NO. | 项目<br>ITEM                           | 条件<br>CONDITIONS  | 规格<br>SPECIFICATION  |
|-----------|--------------------------------------|---|--|
| 3.2       | Temperature characteristic<br>阻抗温度特征 | The without electrical load V.R should be stored at temperature of $70\pm 3^{\circ}\text{C}$ for 5hrs and measure immediately.<br>将产品置于在 $70\pm 3^{\circ}\text{C}$ 的恒温槽内以无负荷的条件下放置 5 小时后马上测量  | Without damage and lever deformation, Without the looseness and failing function of witch.<br>无不良性能产生, 无松动及开关性能损坏。 |
| 3.3       | Voltage Divider Error<br>分压误差值       | Voltage Divider error is defined the ratio of the voltage terminals AD-GND to terminals VCC-GND after the drive arm rested. 5V 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.(Terminal AD-GND/Terminal VCC-GND $\times 100\%$ )<br>分压误差值是摇杆自由复位后端子 AD-GND 与端子 VCC-GND 电压比例。将 5V 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 方向到底复位后测试。(端子 AD-GND/端子 VCC-GND $\times 100\%$ )          | 42%~58%  |
| 3.4       | Insulation resistance<br>绝缘阻抗值       | /   | More than 10M $\Omega$<br>10 M $\Omega$ 以上   |
| 3.5       | Functional Block Diagram<br>功能图      |  <p>The diagram illustrates the functional block diagram of the device. It features a central operational amplifier (运算放大器) connected to a DAC (数模转换器) and a power management circuit (电源管理电路). The operational amplifier's input is connected to a TMR magnetic resistance sensor (TMR磁阻传感器). The entire circuit is powered by VDD and grounded to GND. The output of the operational amplifier is labeled Vout.</p> |  |

| 3.6 | Electrical Specificati<br>电气规格                     | 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       |
|-----|--|------------------------------------|-----------------------------------|--|------------|------------|------------|------------------|
|     |  | V <sub>cc</sub>                    | Supply Voltage<br>电源电压            | Operating                              | 1.6        | 3.3        | 5.0        | V                |
|     |  | I <sub>cc</sub>                    | Supply Current<br>供电电流            | V <sub>cc</sub> =1.8V                  | -          | 0.2        | -          | mA               |
|     |  |                                    |                                   | V <sub>cc</sub> =3.3V                  | -          | 0.24       | -          | mA               |
|     |  | T <sub>po</sub>                    | Power on Time<br>开机时间             | d <sub>vcc</sub> /dt≥5v/us             | -          | -          | 100        | us               |
|     |  | BW                                 | Bandwidth<br>-3dB 带宽              | -                                      | -          | -          | 50         | KHz              |
|     |  | R <sub>L</sub>                     | Load resistanc<br>负载电阻            | -                                      | 10         | -          | -          | kΩ               |
|     |  | C <sub>L</sub>                     | Load<br>capacitance<br>负载电容       | -                                      | -          | -          | 10         | nF               |
|     |  | V <sub>N</sub>                     | NOISE<br>噪声                       | V <sub>DD</sub> = 3.3 V,<br>BW = 5 kHz | -          | -          | 10         | mV <sub>PP</sub> |
|     |  | SEN                                | Sensitivity<br>performance<br>灵敏度 | -                                      | 标定         |            |            | mV/V/Gs          |
| TCS | Sensitivity<br>temperature<br>drift<br>灵敏度温度漂<br>移 | T <sub>A</sub> = -40 °C ~<br>85 °C | -                                 | 1000                                   | -          | PPM/°C     |            |                  |

|  |  |                     |   |                                 |    |      |   |       |
|--|--|---------------------|---|---------------------------------|----|------|---|-------|
|  |  | V <sub>OFFSET</sub> | Zero point output voltage<br>零点输出电压                       | -                               | 标定 |      |   | mV/V  |
|  |  | TCO                 | Zero point output voltage temperature drift<br>零点输出电压温度漂移 | T <sub>A</sub> = -40 °C ~ 85 °C | -  | 0.12 | - | mV/°C |
|  |  | NONL                | Nonlinearity<br>非线性度                                      | 在 ±500 Gs 范围拟合                  | -  | 2    | - | %FS   |
|  |  | HYS                 | Hysteresis<br>磁滞  | 在 ±500 Gs 范围拟合                  | -  | 2    | - | %FS   |

|     |              |                  |            |            |            |
|-----|--------------|------------------|------------|------------|------------|
| 3.7 | V ESD<br>耐静电 | Symbol<br>符号     | Min<br>最小值 | Max<br>最大值 | Unit<br>单位 |
|     |              | V <sub>ESD</sub> | -          | 4000       | V          |

#### 4.Endurance characteristics 耐久性能

| 序号<br>NO. | 项目<br>ITEM       | 条件<br>CONDITIONS   | 规格<br>SPECIFICATION  |
|-----------|------------------|--|--|
| 4.1       | Dry heat<br>耐热性  | Temperature:80±2°C<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°C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。  | Without damage and lever deformation,Without the looseness and failing function of witch<br>无不良性能产生，无松动及开关性能损坏 |
| 4.2       | Damp heat<br>耐湿性 | Temperature: 60±2°C<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>温度 60±2°C 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。 | Without damage and lever deformation,Without the looseness and failing function of witch<br>无不良性能产生，无松动及开关性能损坏 |

| 序号<br>NO. | 项目<br>ITEM                            | 条件<br>CONDITIONS  | 规格<br>SPECIFICATION  |
|-----------|---------------------------------------|---|--|
| 4.3       | Cold<br>耐寒性                           | Temperature : $-30\pm 2^{\circ}\text{C}$<br>Time : 96 hours<br>Surface moisture shall be removed ,and then controller shall be subjected to standard atmospheric conditions for 2 hours,after which measurement shall be made .<br>在温度 $-30\pm 2^{\circ}\text{C}$ 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。   | Without damage and lever deformation,Without the looseness and failing function of witch<br>无不良性能产生，无松动及开关性能损坏   |
| 4.4       | Temperature<br>cycling test<br>温度循环测试 | Low temperature : $-20 \pm 3^{\circ}\text{C}$ 30 minutes<br>High temperature: $+60\pm 3^{\circ}\text{C}$ 30 minutes<br>Number of cycles: 5<br>Surface moisture shall be removed, and then the controller shall be subjected to standard atmospheric condition for 2 hours, after which measurement shall be made.<br>在低温为 $-20\pm 3^{\circ}\text{C}$ 放置 30 分钟,高温 $60\pm 3^{\circ}\text{C}$ 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。 | Without damage and lever deformation,Without the looseness and failing function of witch<br>无不良性能产生，无松动及开关性能损坏   |
| 4.5       | Free falling<br>自由落下试验                | Height: 75cm<br>Number of falls: 3 times<br>从高度为 75 厘米落下测试 3 次后   | Without damage and lever deformation, but deformations of terminals and molded parts are allowed. Without the looseness and failing function of witch.<br>无不良性能产生，无松动及开关性能损坏，端子变形除外。 |
| 4.6       | Number of<br>cycles<br>耐久寿命           | Mechanical life should be tested 2000000 cycles at the speed of one cycle per second without electrical load when joystick rotate $360^{\circ}$ at $20^{\circ}$ position.<br>无负载状态下以 1 个来回/秒速度将摇杆推至 $20.0^{\circ}$ 位置进行 $360^{\circ}$ 旋转测试，寿命 2000000 圈。  | Without damage and lever deformation,Without the looseness and failing function of witch<br>无不良性能产生，无松动及开关性能损坏   |

## 5.Switch characteristics 开关规格（适用于带开关機種）

| 序号<br>NO. | 项目<br>ITEM                      | 条件<br>CONDITIONS  | 规格<br>SPECIFICATION   |
|-----------|---------------------------------|---|---|
| 5.1       | Operating force<br>作动力          | Apply side force perpendicular to the lever's axial direction on the lever until the lever stops, measure the max force value.<br>将一个轴向力施加於摇杆上直到其不动为止，量取施力期间之最大值  | 700 ± 200gf   |
| 5.2       | 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（摇杆）置於静止位置，并在操作柄中央施加两倍於作动力之静负荷测量柄被压到不动时之移动距离。   | 0.4 mm+0.4/-0.2   |
| 5.3       | Maximum Ratings<br>最大定格电压       | Within 70°C<br>70°C以内   | 5 V DC  |
| 5.4       | Contact resistance<br>接触阻抗      | Apply 2 times of the operating fore 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於操作柄之中央以（1KHZ, 20mV,5-50mA）微电流接触阻抗计测定。                          | Less than 200Ω<br>低于 200Ω   |
| 5.5       | Switch number of cycles<br>开关寿命 | Under electrical load DC5V/5mA, compress 7.1N force to the lever which is released and reset to vertical position. Switch life should be tested more than 1000000 cycles at the per second. 负载状态下（DC5V/5mA），在摇杆自由复归后的垂直方向施加 7.1N（720gf）的按压力，以 2-3 次/秒的速度对开关进行测试，寿命 1000000 次以上。 | Contact resistance 200Ω Max, No mechanical malfunction Be satisfied with 5.1 and 5.2<br>接触阻抗最大 200Ω，机械方面能动作（符合第 5.1 条和第 5.2 条）。 |

日期：2026-4-10

印 章

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