



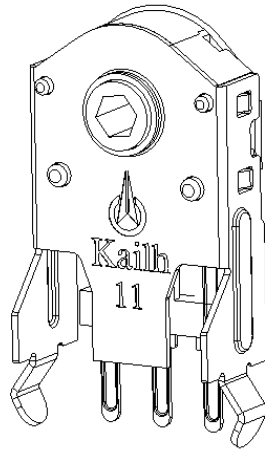
**凱華電子**  
KAIHUA EEELETRONICS

Document Number:

KH-PS1608-88

# 产品规格书

## Product Specification



P/N: <b>CEN981112R05</b>			Title : <b>Encoder Switch</b>		
Rev.	ECN	Release and Revision Description:	Prepared By/Date:	Checked By/Date:	Approved By/Date:
A	---	New releasing 初版发行	吴宇/2019/07/11	吕攀豪/2019/07/11	王锋/2019/07/11
B		升版	吴宇/2020/07/16	吕攀豪/2020/07/16	郑建军/2020/07/16



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## Product Specification

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### 1. Scope/範圍:

This Product Specification covers the requirement of Encoder switch on product performance, test methods and quality assurance provisions.  
本规格书内容涵盖编码器产品的要求，包括性能指标、测试方法及质量保证方面等。

### 2. Product Application/产品应用:

The Switch is applied in all types of Computer mouse. Please let us know before using any of the products in the application not described above.  
该编码器产品适用于所有类型的电脑鼠标，如果用于本文中未提及的领域请在使用前告知。

### 3. Technology Parameters/技术参数

Ambient Humidity 工作湿度:	≤85% R.H.;
Operating Temperature Range 使用温度范围:	-15℃~+70℃;
Storage Temperature Range 保存温度范围:	-20℃~+80℃;
Normal Condition:	
Ambient temperature 环境温度:	20±5℃
Relative humidity 相对湿度:	65%±5% R.H.;
Air pressure 气压:	86~101KPa;
Contact Resistance 接触阻抗:	5 Ω Max;
Torque Force 扭矩:	15-30gf.cm;
Solder Ability 可焊性:	350±5℃,3s(max);
Withstand Soldering Temperature 耐焊接热:	260+0/-5℃,3s(max);
Pulse/Rotation 脉冲数	12Pulse/360°
Numbers of detent 制动数	24

### 4. Ratings/额定性能要求

Rating 额定负荷:	DC5V / 各导线 1mA;
Insulation Resistance 绝缘电阻:	≥50MΩ/ DC 50V;
Withstand Voltage 耐电压:	50V AC 1 Minute;
Mechanical Life 机械寿命:	300,000 Cycles (Without load).

### 5. Profile Dimensions /外形尺寸

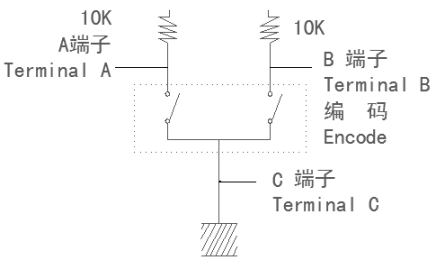
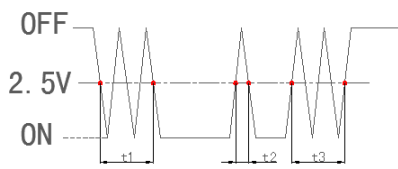
见成品图



**6. Electrical Performance/电气性能**

Item 项目	Description 项目描述	Test Condition 测试条件		Requirement 规格要求
6.1	Contact Resistance 接触电阻	Measured by a Voltage drop method at 1A , 5VDC. Any equipment with error not more than 5% can be used. Resistance after test in the average of 5 successive measurements(To measure after operated 5 to 10 times) 以1A,5V直流电, 采用误差不超过5%的仪器测量,实验后的电阻取5次测量的平均值。(转动5-10次测量)		5Ω Max 5Ω 以下
6.2	Insulation Resistance 绝缘电阻	Apply a Voltage of DC 50 V for 1 minute, according to the below method. (1) Between terminals. (2) Between terminal and Body. 输入 50V DC 电压 1 分钟, 按如下接触方法测试: (1) 端子与端子之间. (2) 端子与外壳之间.		50MΩ Min 50 兆欧以上
6.3	输出信号 Output signal Format	Shaft rotational Derection 轴的回转方向	Signal 信号	Output 输出波形
		C.W 顺时针方向	A(A-C 端子间 A(TerminalA-C B(B-C 端子间) B(TerminalB-C	
		C.C.W 逆时针方向	A(A-C 端子间 A(TerminalA-C B(B-C 端子间) B(TerminalB-C	



Item 项目	Description 项目描述	Test Condition 测试条件	Requirement 规格要求
6.4	Resolution 分析能力	Number of pulses in 360° rotation 回转一周的输出脉动数	12 pulses/360° for each phase 每 12 个脉动/360°
6.5	Switching Characteristics 开关特性	<p>Measurement shall be made under the condition as follows. Shaft rotational speed :360° /S 下图所示回路，轴以360° /S的速度回转测定。</p>   <p>(NOTE) Code-ON area : The area which the voltage is 2.5V or less Code-OFF area : The area which the voltage is 2.5V or more (注) 编码器 ON 指输出电压2.5V以下的状态。 编码器 OFF 指输出电压2.5V以上的状态。</p>	
6.6	Chattering 振荡	Specified by the signal's passage time from 2.5V of each switching position(code OFF→ON 或 ON→OFF) 编码器 OFF→ON 或 ON→OFF 时，输出 2.5V 的通过时间应符合规定。	$t1.t3 \leq 3ms$
6.7	Bounce 突跳	Specified by the time of voltage change exceed 2.5V in code-ON area. When the bounce has code-ON time less than 1ms between chattering(t1 or t3),the voltage change shall be regarded as a part of chattering. When the code-ON time between 2 bounces is less than 1ms. They are regarded as 1 linked bounce. 编码 ON 部分的 2.5V 以上的电压变动时间在振荡 t1.t3 之间会产生 1ms 以上 2.5V 以下的 ON 部分，另外，如果各突跳间 2.5V 以下的范围在 1ms 以上时，则判定为另一个突跳。	$t2 \leq 2ms$

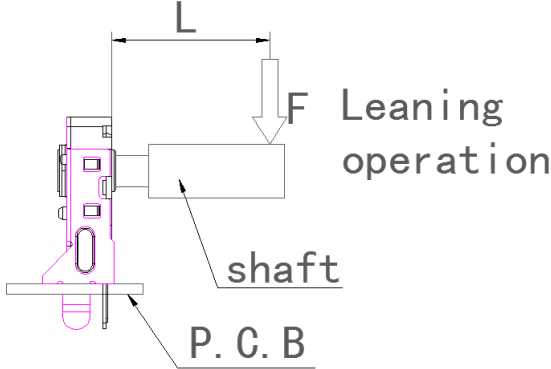


Item 項目	Description 項目描述	Test Condition 测试条件	Requirement 规格要求
6.8	Phase-Difference 相位差	<p>Measurement shaft be made under the Condition which the shaft is rotated in constant speed. 以固定的速度操作轴进行回转。(360° /S)</p> <p>顺时针方向CW A信号 (A-C间) Signal A B信号 (B-C间) Signal B</p>	T1、T2、T3、T4 ≥ 5ms
6.9	Dielectric withstanding voltage 耐电压	<p>Apply a Voltage of AC 50 V (50~60Hz) for 1 minute, according to the below method. (1) Between terminals. (2) Between terminal and Body.</p> <p>输入 50V AC 电压 1 分钟, 按如下接触方法测试: (1) 端子与端子之间. (2) 端子与外壳之间.</p>	No evidence of breakdown 无瞬断、击穿等破坏

**7. Mechanical Performance/机械性能**

7.1	Detent torque 卡点扭力矩	<p>Account the test with the torque within the scope of at 5°C-35°C temperature. 在 5°C-35°C 温度范围内用扭力计测试</p>	15-30gf.cm
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Item 项目	Description 项目描述	Test Condition 测试条件	Requirement 规格要求
7.2	Number and position of detent 定位点数及位置	N/A 不应用	24 detents(Step angle: 15° ±3° ) 24 点定位 (间隔角度: 15° ±3° )
7.3	Push-pull strength of shaft 轴的推拉强度	<p>Mount the product to P.C.B and apply static force(F) of 50mN.m/5s as shown in the (fig5) 制品焊接于 P.C.B(图 5)沿轴垂直方向施加 FXL=50mN.m/5s 荷重的压力。</p> 	Without damage to or excessive play in shaft no excessive abnormality in rotational feeling. And electrical characteristics shall be satisfied 端子不得有明显松动及接触不良, 电气性能异常.
7.4	Rotational life 回转寿命	<p>The shaft of encoder shall be rotated to 300,000 cycles at a speed of 30 cycles per minute without electrical load after which measurements shall be made. 在无负荷条件下轴以 30 次/分钟的速度回转 300, 000 次。</p>	<p>Please difference T1、T2、T3、T4 ≥ 2.5ms Detent torque 8gf.cm(min) Contact resistance: 10 Ω Max Shall meet : No. 6.1 to 6.9 No. 7.1 to 7.3 相位差 T1、T2、T3、T4 ≥ 2.5ms 卡点出脱力 8gf.cm(最小) 接触电阻 10 Ω 以下 满足: No. 6.1 to 6.9 No. 7.1 to 7.3</p>



**8. Environmental Performance/环境性能**

Item 项目	Description 项目描述	Test Condition 测试条件	Requirement 规格要求												
8.1	Cold test 耐寒性	(1) Temperature : - 20±2℃ 温度： - 20±2℃ (2) Duration of test: 96h 持续时间： 96 小时 (3) Take off a drop water 去掉水珠 (4) Standard conditions after test : 1h 试验后的放置条件： 1 小时	Contact resistance: 5Ω Max Shall meet : No. 6.1 to 6.9 No. 7.1 to 7.3 接触电阻 5Ω 以下 满足: No. 6.1 to 6.9 No. 7.1 to 7.3												
8.2	Heat test 耐热性	(1) Temperature : 80±2℃ 温度： 80±2℃ (2) Duration of test: 96h 持续时间： 96 小时 (3) Take off a drop water 去掉水珠 (4) Standard conditions after test : 1h 试验后的放置条件： 1 小时	Contact resistance: 5Ω Max Shall meet : No. 6.1 to 6.9 No. 7.1 to 7.3 接触电阻 5Ω 以下 满足: No. 6.1 to 6.9 No. 7.1 to 7.3												
8.3	Temperature cycle 温度循环	(1) Test cycles: 5 cycles 试验周期： 5 个周期 (2) Standard condition after test:1h 试验后的放置条件： 1 小时 <table border="1"> <thead> <tr> <th></th> <th>Temperature 温度</th> <th>Duration of test 持续时间</th> </tr> </thead> <tbody> <tr> <td rowspan="4">1 cycle 一次循环</td> <td>20±2℃</td> <td>1h</td> </tr> <tr> <td>-20±2℃</td> <td>1h</td> </tr> <tr> <td>20±2℃</td> <td>1h</td> </tr> <tr> <td>80±2℃</td> <td>1h</td> </tr> </tbody> </table>		Temperature 温度	Duration of test 持续时间	1 cycle 一次循环	20±2℃	1h	-20±2℃	1h	20±2℃	1h	80±2℃	1h	Contact resistance: 5Ω Max Shall meet : No. 6.1 to 6.9 No. 7.1 to 7.3 接触电阻 5Ω 以下 满足: No. 6.1 to 6.9 No. 7.1 to 7.3
	Temperature 温度	Duration of test 持续时间													
1 cycle 一次循环	20±2℃	1h													
	-20±2℃	1h													
	20±2℃	1h													
	80±2℃	1h													
8.4	Soldering heat test 耐焊接热	Soldering area: T/2 of PWB thickness. (PWB: T=1.6mm) 焊接面积： 印刷基板的 1/2 厚度处 Soldering temperature: 260+0/-5℃ Soldering time: 3s(max) 焊接温度： 260+0/-5℃ 焊接时间： 3 秒最大	Appearance: No abnormality. 外观无异常												





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## Product Specification

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Item 项目	Description 项目描述	Test Condition 测试条件	Requirement 规格要求
8.5	Solderability 可焊性	<p>1. Hand soldering 手工焊接: Please practice according to below condition: (1) Soldering Temperature : <math>350 \pm 5^{\circ}\text{C}</math> 焊接温度: <math>350 \pm 5^{\circ}\text{C}</math> (2) Continual soldering time: 3s(max) 连续焊接时间: 3 秒最大 (1) Capacity of soldering iron: <math>\leq 20\text{w}</math> 电烙铁功率: 20 瓦以下</p> <p>2. Automatic PIP soldering 自动波峰焊接: For the product of T/H, according to below condition:</p>	At least 95% of surface area of immersed portion shall be covered by solder. 侵焊面积大于 95%以上.
8.6	Humidity test 耐湿性	<p>(1) Temperature : <math>60 \pm 2^{\circ}\text{C}</math> 温度: <math>60 \pm 2^{\circ}\text{C}</math> (2) relative humidity: 90~95% R.H. 相对湿度: 90~95% R.H. (3) Duration of test: 96h 持续时间: 96 小时 (4) Take off a drop water 去掉水珠 (5) Standard conditions after test: 1h 试验后的放置条件: 1 小时</p>	Contact resistance: $5 \Omega$ Max Shall meet : No. 6.1 to 6.9 No. 7.1 to 7.3 接触电阻 $5 \Omega$ 以下 满足: No. 6.1 to 6.9 No. 7.1 to 7.3
8.7	Salt Spray 盐雾测试	<p>Apply the following environment to test: 根据下列条件进行测试:</p> <p>(1) Temperature : <math>35 \pm 5^{\circ}\text{C}</math> 温度: <math>35 \pm 5^{\circ}\text{C}</math>; (2) Salt water density: <math>5 \pm 1\%</math> 盐水浓度: <math>5 \pm 1\%</math>; (3) Duration: 8 hours 持续时间: 8 小时; (4) After test, the salt deposit shall be removed by running water. 实验后将盐沉积物用水冲掉</p>	Appearance: No corrosion spot, no crack, no base plate naked. 外观: 无腐蚀点, 无裂纹, 无裸露基材.  Contact Resistance: $5 \Omega$ Max 接触电阻: 5 欧以下

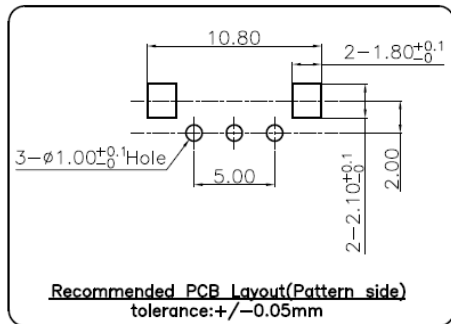
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Item 项目	Description 项目描述	Test Condition 测试条件	Requirement 规格要求
8.8	Withstand K <sub>2</sub> S 硫化测试	Apply the following environment to test: 根据下列条件进行测试  (1) Temperature: 35 ± 5°C 温度: 35 ± 5°C (2) K <sub>2</sub> S Density: 2%; 硫化钾浓度: 2% (3) Duration: 2 minute. 持续时间: 2 分钟	Appearance: No corrosion spot, no crack, no base plate naked. 外观: 无腐蚀点, 无裂纹, 无裸露基材.  Contact Resistance: 5 Ω Max 接触电阻: 5 欧以下

**9. Recommended PCB Layout 推荐的 PCB 安装焊盘规格**

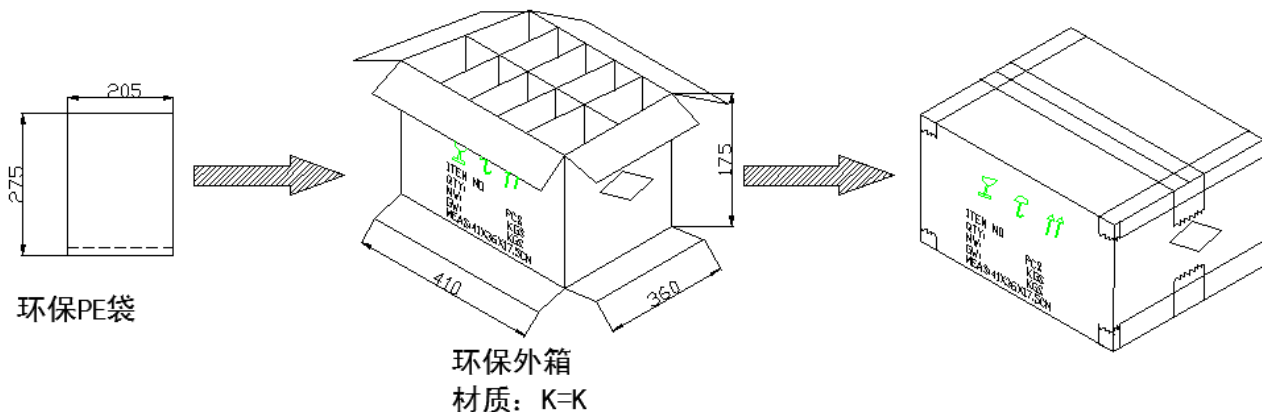
(Top View)  
(Single face board T=1.6mm)



**10. Packaging 包装**

Packaging type: PE Bag, 1000Pcs/Bag, 1000\*10Pcs/Carton.

包装方式: PE 袋, 1000Pcs/袋. 1000\*10Pcs/箱





**11. Precaution 注意事项**

**11.1 Immersion Soldering condition 浸焊条件**

ITEM 项目	CONDITION 条件
Preheat temperature 预热温度	110°C Max (Ambient temperature of soldering surface of P.W.B) 110°C 以下(印刷基板焊锡面周围的温度)
Preheat time 预热时间	60s, Max 60 秒以内
Area of flux 助焊剂面积	1/2 Max of PWB Thickness 印刷基板厚度的 1/2 以内
Temperature of solder 焊锡温度	260+0/-5°C 260+0/-5°C
Time of immersion 浸焊时间	Within 3s 3 秒以内
Number of soldering 焊接次数	2time Max (But should down heat of the first soldering) 2 次以内
Printed wiring board 印刷基板	Single side copper-clad laminates 单面铜箔

- (1) After switches were soldered, please be careful not to clean switches with solvent  
开关浸焊后,注意不要用溶剂清洗.
- (2) Under the condition of using soldering iron, soldering temperature shall be 350°C max within 3 sec.  
在使用烙铁的情况下,焊锡温度应在350°C以下,焊接时间3秒以内.

**11.2 Notes 注意点**

- (1) Please be cautious not to give excessive static load or shock to switches.  
注意不要施加超负荷的压力或晃动开关.
- (2) Please be careful not to stack up P. W. B. after switches were soldered.  
开关焊接以后,印刷基板注意不要叠放.
- (3) Preservation under high temperature and high humidity or corrosive gas should be avoided  
Especially. When you need to preserve for a long period, do not open the carton.  
保管时尤其应注意避开高温高湿和有腐蚀性气体的环境. 如需长时间保存,请不要打开包装箱.
- (4) Products meet the ROHS & REACH environmental management substances control standards  
产品满足 **ROHS & REACH** 环境管理物质管制标准