

# 旋风轴 规格书

## Encoder Key Switch Specification

型 号/Model: 02-0KNOB-E200

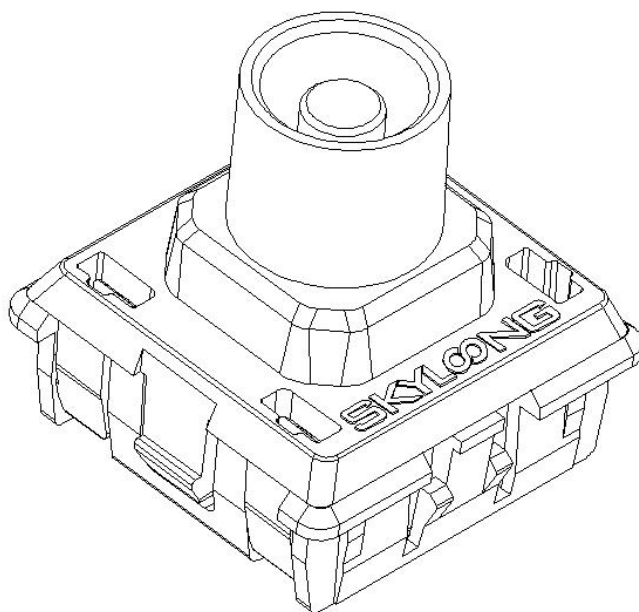
版 本/Version: V1

日 期/Date: 2023-04-27

制 定/Draft: 周自然

审 核/Checked:

批 准/Approval:



## 修订记录:

版本	修订摘要	修订人	修订日期	备注
V1	新版本发行	周自然	20230427	

## 1. 总论 General

### 1-1. 适用范围 Scope

本规格书适用于微小电流回路的电子设备，属机械键盘使用的标准开关尺寸的回转型编码器。

This specification applies to mechanical keyboard standard switch size rotary encoder (incremental type) for microscopic current circuits, used in electronic equipment.

### 1-2. 标准使用环境 Standard atmospheric conditions

除另有规定外，测量应在以下状态下进行：

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and test is as following limits:

温度 Ambient temperature : 15°C to 35°C

相对湿度 Relative humidity : 25% to 85%

气压 Air pressure : 86kpa to 106kpa

如果对在上述所提到的条件中所做的实测值有疑问的话，应使用以下条件进行测量：

If doubt arises on the decision based on the measured values under the above-mentioned conditions, the following conditions shall be employed:

温度 Ambient temperature : 20°C

相对湿度 Relative humidity : 63% to 67%

气压 Air pressure : 86kpa to 106kpa

### 1-3. 使用温度范围

Operating temperature range : -30°C to +80°C

### 1-4. 储存温度范围

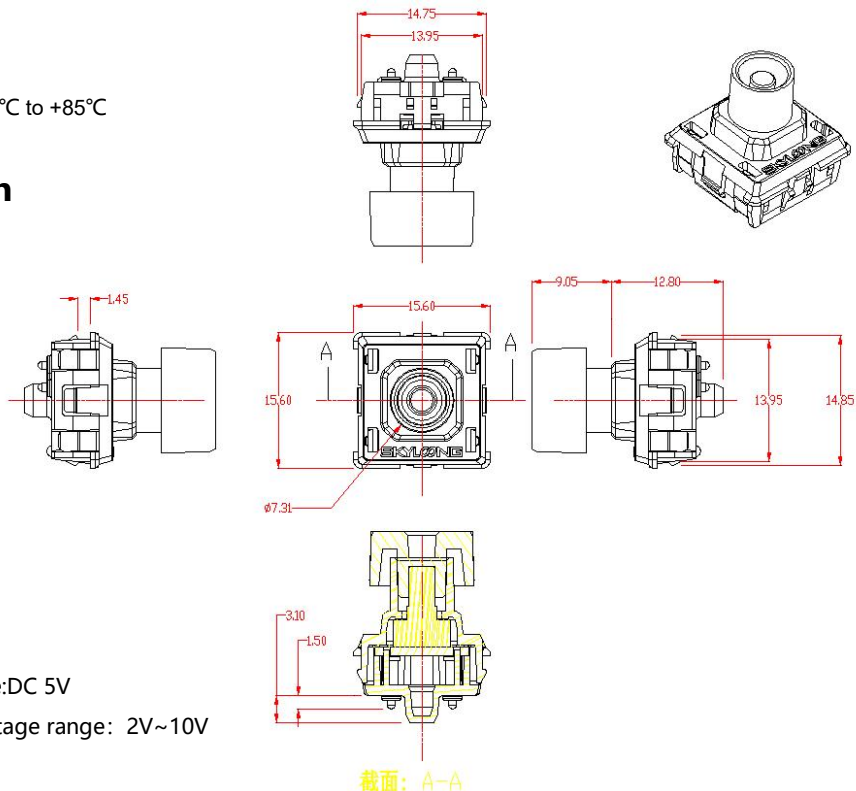
Storage temperature range : -40°C to +85°C

## 2. 结构规格 Construction

### 2-1. 尺寸 Dimensions

基本尺寸如右图，详细尺寸

请参考附件图纸。



## 3. 额定规格 Rating

### 3-1 编码相关组件 Encoder Part

3-1-1. 额定电压 Rated voltage: DC 5V

3-1-2. 工作电压范围 Operating voltage range: 2V~10V

3-1-3. 最大额定电流 (阻抗负载)

Maximum operating current (resistive load)

各相引脚 Each lead: 0.5mA (Max 5mA; Min 0.5mA)

公共引脚 Common lead: 1mA (Max 10mA; Min 0.5mA)

### 3-2 微动开关相关组件 Tact Switch Part

3-2-1. 额定电压 Rated voltage: DC 5V

## 4.应用说明 Application Notes

### 4-1.避免储藏于高温潮湿及腐蚀的场所

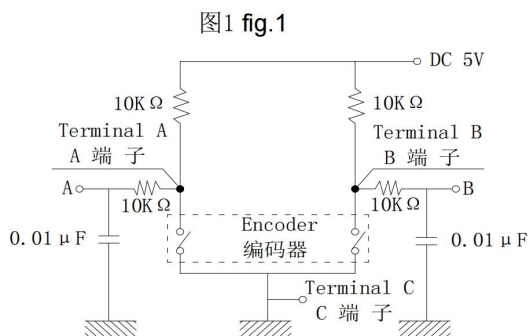
Avoid storing the products in a place at high temperature,high humidity and in Corrosive gases.

### 4-2.编码器信号的计算方法应将操作的速度,信号的取样时间及电子回路中的微电脑软体等考虑进去.

The encoder pulses count method should be designed with taking operating speed,sampling time and design of the microcomputer software into consideration.

### 4-3.在设计时要考虑到杂讯,建议使用 R/C 滤波电路,(图 1)

At design of the pulse count process.Using the R/C filter circuit is Recommended.(fig .1)

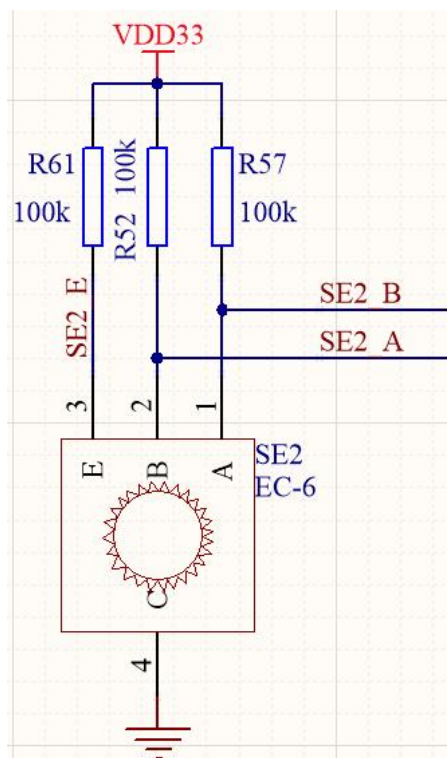
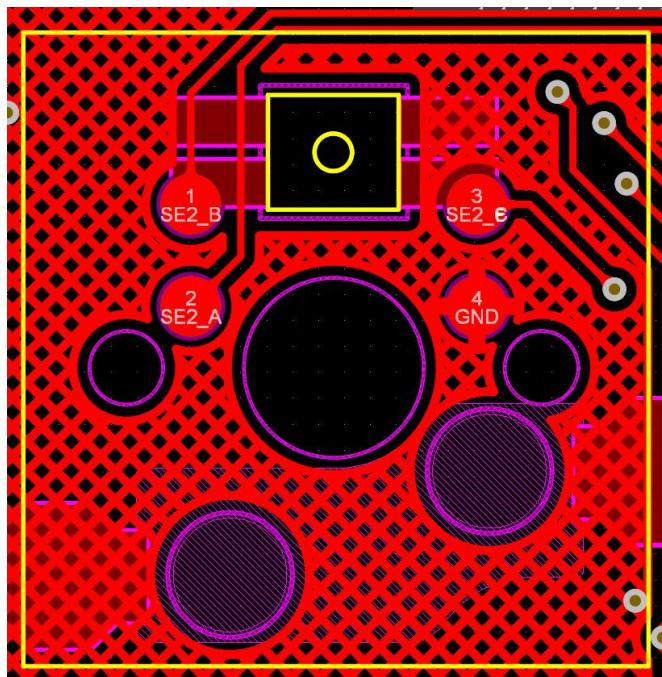


### 4-4.本产品请勿碰触到水,可能会导致输出波形的异常.

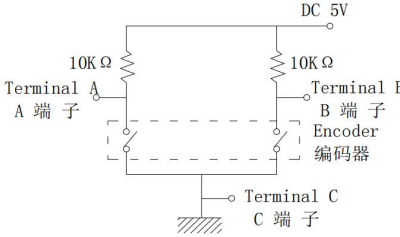
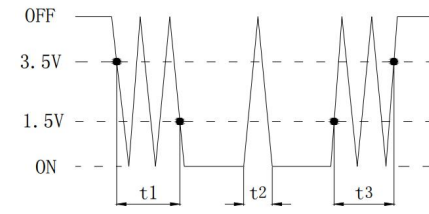
Care must be taken not to expose this product to water or dew to prevent possible problem

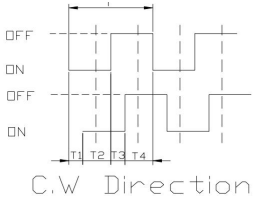
### 4-5. PCB 设计参考

PCB design reference



## 5.电气性能 Electrical Characteristics

项目 ITEM	条件 CONDITIONS	规格 SPECIFICATIONS
<b>编码相关组件 Encoder Part</b>		
5-1.输出信号 Output signal format	A、B 两信号输出相位差, 输出波形详细见 (图 2) (虚线表示带卡点装置的上孛子处位置) 2 Phase-different signals (signal A,signal B) Details shown in<fig.2> (The broken line shows detect position.)	
	轴回转方向 Shaft rotational direction	信号 Signal
	顺时针方向 C.W	A(A-C 端子间) A(Terminal A-C)
	逆时针方向 C.C.W	B(B-C 端子间) B(Terminal B-C)
		输出波形 Output 图 2 fig.2
5-2.分解能力 Resolution	回转 360°的输出脉冲数. Number of pulses in 360°rotation.	6 个脉冲/360°(图 2) 6pulses/360°(fig.2)
5-3. 开关特性 Switching characteristics	<p>下 (图 3) 所示回路, 轴以 360°/s 的速度转动测定。 Measurement shall be made under the condition as follows.Shaft rotational speed : 360°/s;Test circuit : (fig.3)</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>图 3 (fig.3)</p>  </div> <div style="text-align: center;"> <p>图 4 (fig.4)</p>  </div> </div> <p>(注) 编码 OFF 指输出电压 3.5V 以上的状态(fig.4). Code-OFF area :The area which the voltage is 3.5V or more(fig.4). 编码 ON 指输出电压 1.5V 以下的状态(fig.4). Code-ON area : The area which the voltage is 1.5V or less(fig.4).</p>	
5-3-1.振荡 Chattering	编码从 OFF→ON 或 ON→OFF 时,输出 1.5V ~ 3.5V 的通过时间.应符合规定。 Specified by the signal's passage time from 1.5V to 3.5V of each switching position(code OFF~ON or ON~OFF)	t1,t3 ≤ 3ms

5-3-2.滑动杂讯(突跳) Sliding noise (Bounce)	编码 ON 部份的 1.5V 以上的电压变动时间在振荡 $t_1, t_3$ 之间会产生 1ms 以上, 1.5V 以下的 ON 部份. 另外, 如果各突跳 1.5V 以下的范围在 1ms 以上时, 则判定为另一个突跳. Specified by the time of voltage change exceed 1.5V in code-ON area. When the bounce has code-ON time less than 1ms between chattering 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.	$t_2 \leq 2\text{ms}$
5-3-3.滑动跳变门限 Sliding threshold	编码 OFF 部份的电压变动。 The voltage change in code-OFF area.	3.5V 以上 3.5VMin
5-4.相位差 Phasedifference	下(图 5)所示回路, 轴以 $360^\circ/\text{s}$ 的速度转动测定。 Measurement shall be made under the condition which the shaft is rotated at $360^\circ/\text{s}$ .  A 信号 (A~C 间) signal A  B 信号 (B~C 间) signal B  	$T_1, T_2, T_3, T_4 \geq 5\text{ms}$  见图 5 (fig.5)
5-5.绝缘阻抗 Insulation resistance	在端子和支架间施加电压 250V DC。 Measurement shall be made under the condition which a voltage of 250V DC is applied between individual terminals and frame.	50MΩ 以上 50MΩ Min
5-6.耐电压 Dielectric strength	在端子和支架间施加 AC300V 电压 1 分钟。 At voltage of 300V AC shall be applied for 1 minute between individual terminals and frame.	不得有绝缘破坏 Without arcing or breakdown.
5-7.端子间接触阻抗 Contact resistance	出力信号处于 ON 时安定状态条件下测定。 Measurement shall be stable condition which a output signal is ON.	10Ω 以下 10ΩMax
<b>微动开关部分 Tact Switch Part</b>		
5-8.接触电阻 Contact resistance	用 DC 5V 1mA 电压测定。 Voltage test at DC 5V 1mA.	$\leq 100\text{m}\Omega$ 100mΩ or less
5-9.绝缘阻抗 Insulation resistance	在端子和安装板间施加电压 250V DC。 Measurement shall be made under the condition which a voltage of 250V DC is applied between individual terminals and bushing and plank.	50MΩ 以上 50MΩ Min
5-10.振荡 Bouncing	以 1 秒钟 1 往返(OFF-ON-OFF)按压动作。 Shaft shall be push at 1 cycles/s(OFF-ON-OFF)	$\leq 10\text{ms}$ 10ms or less
5-11.耐电压 Dielectric strength	在端子和安装板间施加 AC300V 电压 1 分钟。 A voltage of 300V AC shall be applied for 1 minute between individual terminals and bushing and plank.	不得有绝缘破坏 Without arcing or breakdown.

## 6.机械性能 Mechanical Characteristics

### 编码相关组件 Encoder Part



6-1.全回转角度 Total rotational angle		360°(无止档点) 360°(Endless)
6-2.定位点力矩 Detente torque	只适用于附卡点装置 Only suitable for C.C,equipment.	2 ~ 4.5mN.m(20-45gf.cm)
6-3.定位点数及位置 Number and position of	只适用于附卡点装置 Only suitable for C.C,equipment.	12 点定位间隔角度 30°±2° 12 detentes Step angle:30°±2°
6-4.轴的拉强度 Pull strength of shaft	在轴芯端,沿轴向施加 30N 的静负荷力拉 5 秒钟 Pull static load of 30N shall be applied to the shaft in the axial direction for 5s.	产品不可有散开 The product can not be disperse
6-5.轴的推强度 Push strength of shaft	在轴芯端,沿轴向施加 50N 的静负荷力推 5 分钟 Push static load of 50N shall be applied to the shaft in the axial direction for 5min.(After soldering of the PC board)	轴向虚位间隙 0.4mm 以内 Shaft play in axial direction 0.4mm Max ;
6-6.端子强度 Terminal strength	在端子的先端施加 3N 的力 1 分钟。 A static load of 3N be applied to the tip of terminals for 1 minute in any direction.	端子无损坏,无过度的松动.允许变形. Without damage or excessive looseness of terminals. Terminal bend is permitted.
6-7.轴向间隙 Shaft play in axial direction		0.1mm 以下 0.1mm Max
6-8.轴的回转方向摆动 Shaft play in rotational	用角度板测定。 Testing by angle board.	5°以下 5°Max
<b>微动开关部分 Tact Switch Part</b>		
6-9.开关电路接点数 Switch circuit and number of pulse		单极单投(按压 ON) Single pole and single throw ( push ON )
6-10.开关动作力 Operation force of switch	在轴芯端, 沿轴向施加的按压力。 Push static load to the shaft in the axial direction	3.25±0.75N(325±75gf)
6-11.开关行程 Travel of switch		0.1+0.1/-0 mm

## 7.耐久性能 Endurance Characteristics

项目 ITEM	条件 CONDITIONS	规格 SPECIFICATIONS
7-1.回转寿命 Rotational life	<p>在无负荷条件下轴以 600 ~ 1000 周/小时速度回转 (顺时针旋转, 360°, 再逆时针旋转 360°为一周)一日连续 5000 ~ 8000 次.</p> <p>The shaft of encoder shall be rotated at a speed of 600~1000cycles/H(clockwise for 360°, and then counter-clockwise for 360°as one cycle),without electrical after with measurements shall be made.load,(5000 to 8000 continuous cycles for 24 hours.)</p>	<p>30,000±200 周.力矩变化率为初始值的±70%; 振荡 t1,t3≤5ms.突跳 t2≤3ms; 端子间接触 阻抗 200Ω以下; 其它性能符合第 5-1、5-2、5-4--5-6;</p> <p>30,000±200cycles; Rotation torque change rate shall be within ±70% against initial value; Chattering t1,t3≤5ms.Bounce t2≤3ms; Contact resistance 200ΩMax; The performance requirements specified in item 5-1、5-2、5-4--5-6 shall be satisfied</p>

7-2.按压寿命  Push-life	<p>在无负荷条件下沿轴向施以 5N 以下的力, 以 600-1000 次/小时 的速度按压。</p> <p>Push 5N to the shaft of encoder in the axial direction under non-load conditions, and with a speed of 600-1000 times/hour.</p>	<p>50,000±200 次; 按压力变化率为初始值的 ±40%; 开关接触电阻: ≤200mΩ; 其它性能符合第 5-9---5-10。</p> <p>50,000±200cycles; Switch pressure change rate shall be within ±40% against initial value. Switch contact resistance: 200mΩ or less. The performance requirements specified in item 5-9---5-10 shall be satisfied</p>
7-3.耐湿性  Damp heat	<p>温度 40±2℃, 湿度 90~95% 的恒温恒湿槽中放置 96±4 小时后, 在常温、常湿中放置 1.5 小时后测试。</p> <p>The encoder shall be stored at temperature of 40 ±2℃ with relative humidity of 90% to 95% for 96±4H in a thermostatic chamber. And the encoder shall be subjected to standard atmospheric conditions for 1.5H, After which measurements shall be made.</p>	<p>端子间接触阻抗 200Ω以下; 开关接触阻抗 200mΩ以下; 力矩变化率为初始 值的±40%; 按压力变化率为初始值的±30%; 其它性能符合第 5-1---5-6;</p> <p>Contact resistance 200ΩMax; Switch Contact resistance: 200mΩ or less; Rotation torque change rate shall be within ±40% against initial value; Operation Force of Switch change rate shall be within ±30% against initial value; The performance requirements specified in item 5-1---5-6 shall be satisfied</p>
7-4.耐热性  Dry heat	<p>温度 85±3℃ 的恒温箱中放置 96±4 小时, 常温、常湿放置 1.5 小时后测试。</p> <p>The encoder shall be stored at a temperature of 85±3℃ for 96±4H in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H, After which measurements shall be made.</p>	
7-5.低温特性  Cold	<p>温度 -40±3℃ 的恒温箱中放置 96±4 小时, 常温、常湿放置 1.5 小时后测试。</p> <p>The encoder shall be stored at a temperature of -40±3℃ for 96±4H in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H, After which measurements shall be made.</p>	



## 8. 包装规格 Package Specification

### 8.1 包装材质 Material

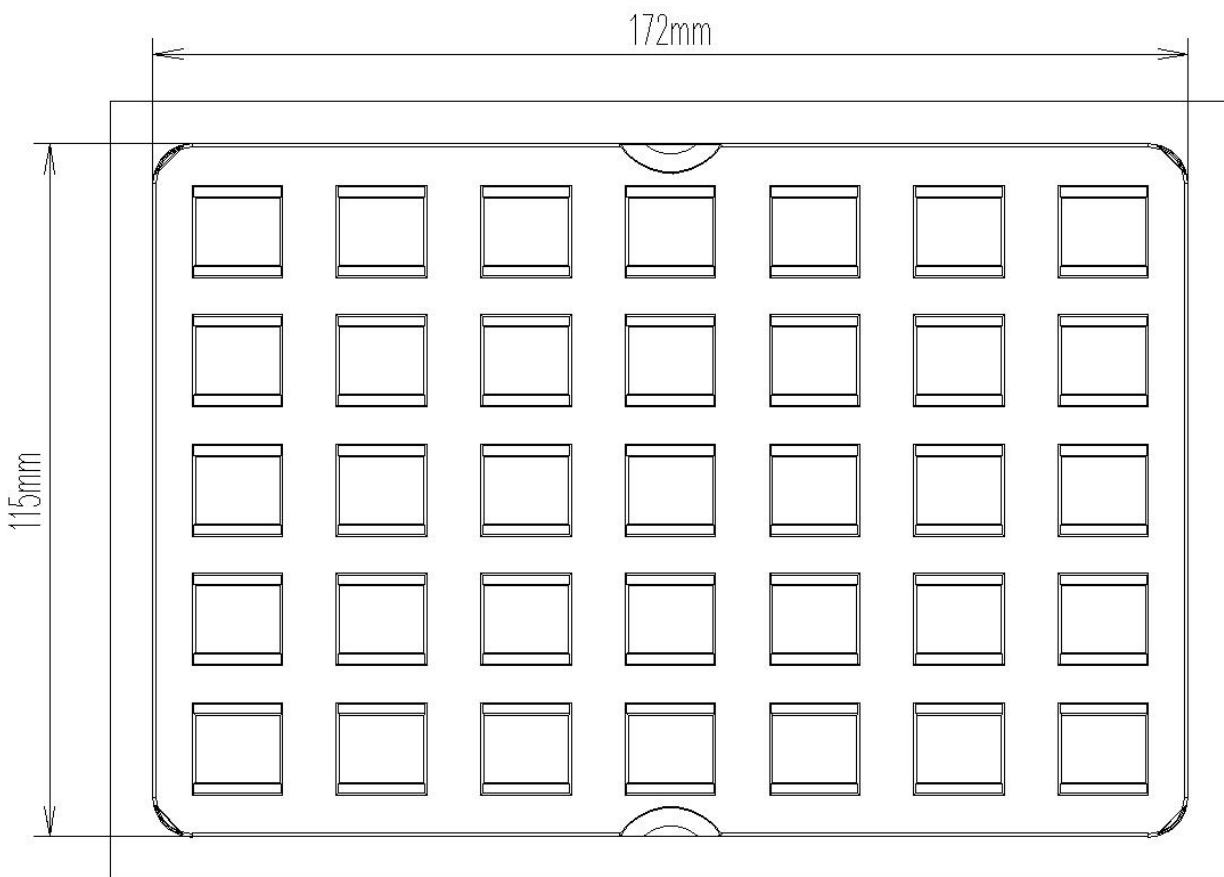
吸塑包装 Blister packaging

### 8.2 包装数量 Quantity

每版 35 只装 35pcs/PNL

### 8.3 包装尺寸 Package Size

172\*115mm



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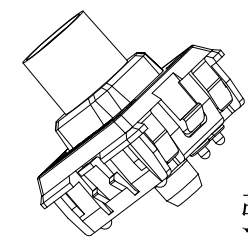
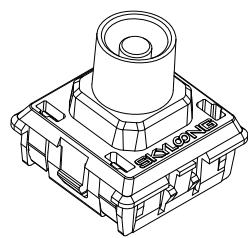
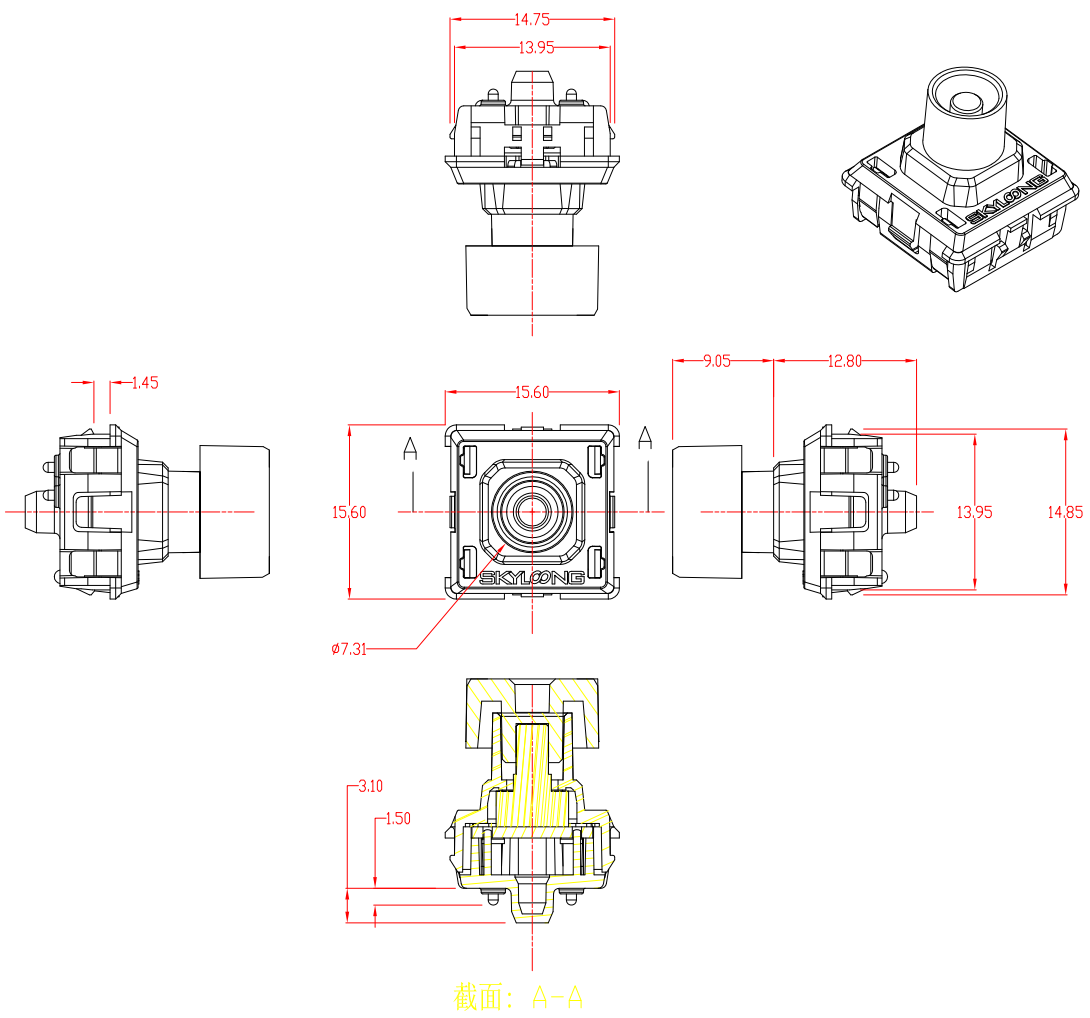
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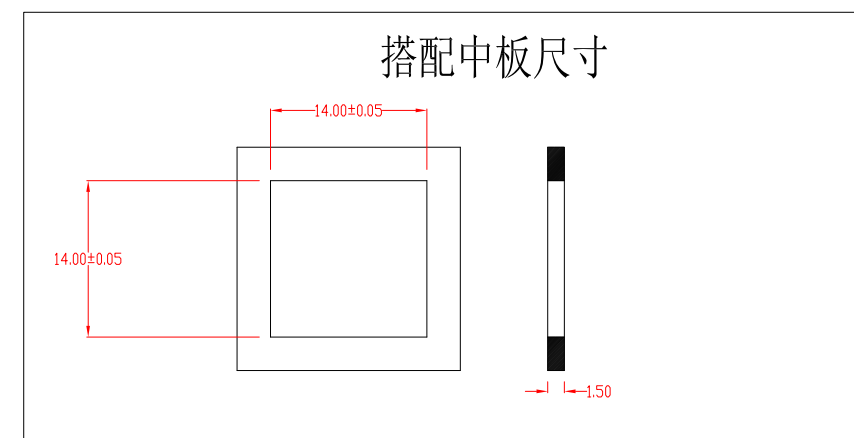
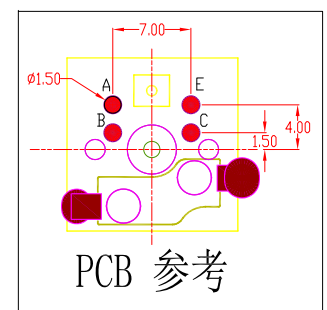
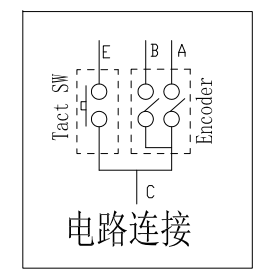
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一般尺寸公差 X.XXX ±0.005 X.XX ±0.05 X.X ±0.1	材质				料 号:
	表面处理				02-0KNOB-E200
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