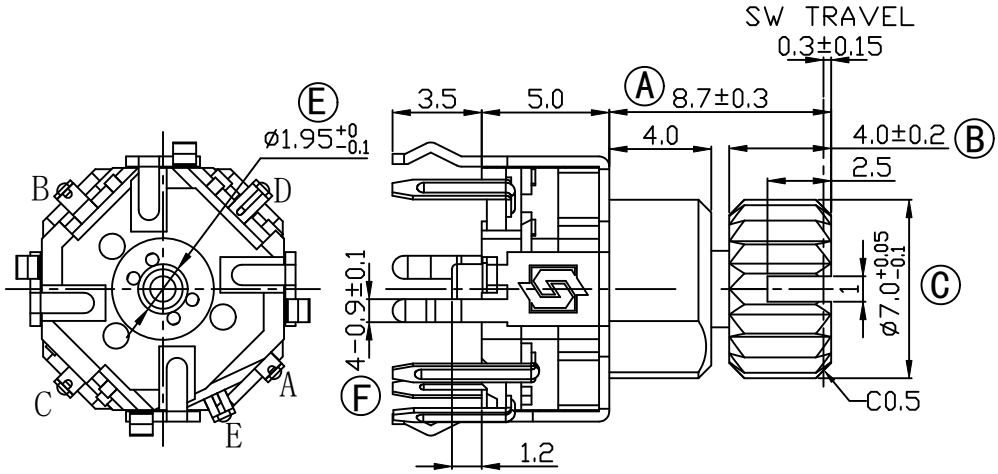
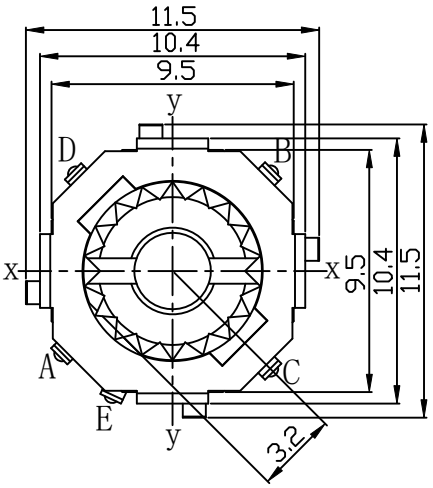
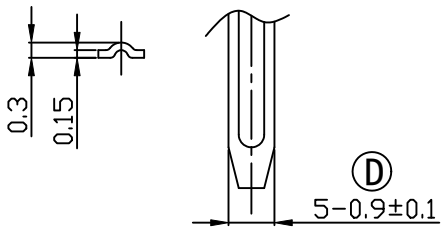
符合产品环境品质管理标准与用途

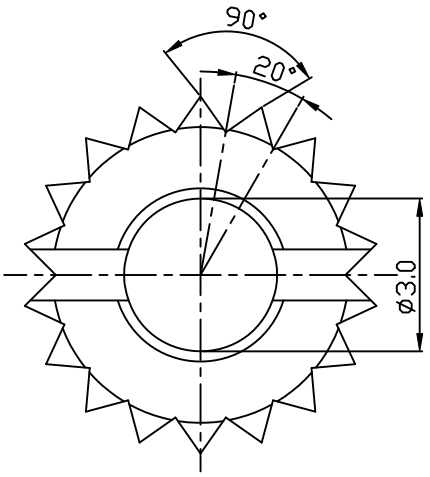
文件发行章





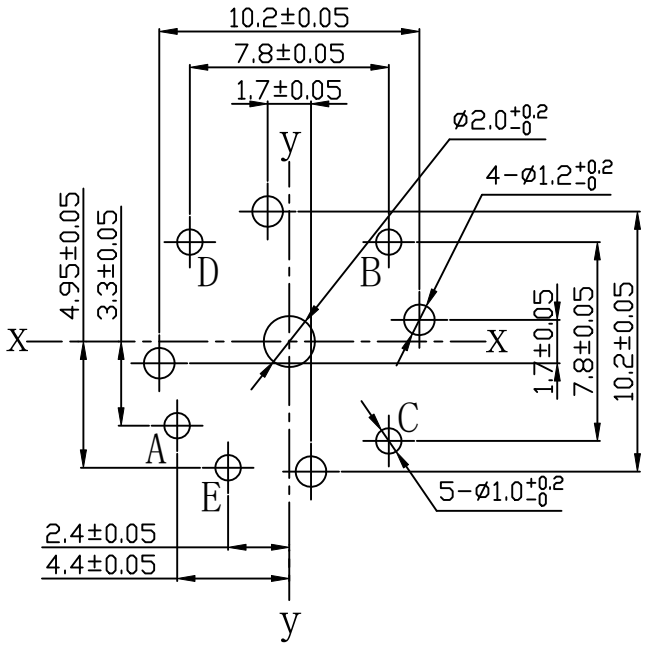


TERMINAL DETAIL 2:1

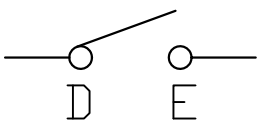


齿部详图

2:1



出图 23-02-21 昇威电子



SWITCH CIRCUIT DIAGRAM

P.C.B. MOUNTING DETAIL

注：重点管控尺寸Ⓐ-Ⓕ。

01			03		
00	ORIGINAL DRAWING	2023-02-21	02		
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			TOL. UNLESS OTHERWISE SPEC.		
黄铁坚	HUNG KAM PIU	HUNG KAM PIU	BASIC DIMENSIONS	TOL.	TITLE: ENCODER
			L≤10	±0.3	MODEL: EC090201H2A-HA1-005
DSGD.	CHKD.	APPD.	10<L	±0.5	
	SCALE		100≤L	±0.8	SPECIFICATION: 12P5-KC087A040
	UNIT	mm	ANGLE	±5°	

EC0902 SERIES SPECIFICATION
EC0902 系列规格书

1、 General 一般事项

1-1、Scope 适用规格

This specification applies to 9mm size low-profile thin rotary encoder (incremental type) for microscopic current circuits， used in electronic equipment.

本规格书为9mm小型回转式编码器（增量型），适用于电子设备内微小电子电路。

1-2、Standard atmospheric conditions标准状态

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

除另有规定外，测量应在以下状态下进行：

Ambient temperature温度：15°C to 35°C

Relative humidity相对湿度：25% to 85%

Air pressure气压 ：86kPa to 106kPa

1-3、Operating temperature range

使用温度范围 ：-40°C to 85°C

1-4、 Storage temperature range

保存温度范围 ：-40°C to 85°C

2、Construction 构造

2-1 Dimensions 尺寸

Refer to attached drawing 见所附成品图

3、 Rating 额定值

3-1、Rated voltage 额定电压: DC 5V

3-2、Maximum operating current (resistive load)最大额定电流（阻抗负载）

Each lead 各相导线 ：0.5mA(Max 10mA; Min 0.5mA)

Common lead 公共导线：1mA(Max 10mA; Min 0.5mA)

4、Application Notes 使用上的事项

4-1. Avoid storing the products in a place at high temperature, high humidity and in Corrosive gases. Please use this product as soon as possible with 6 months limitation . If any remainder left after packing is opened, please store it with proper moistureproofing, gasproofing etc.

避免储藏于高温,潮湿及腐蚀的场所，产品购入后尽可能在6个月内使用完，拆包装后未使用完的剩余产品需储藏于防潮防毒的环境下。

4-2. The encoder pulses count method should be designed with taking operating speed ,sampling time and design software into cosideration.

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件等考虑进去。

4-3. With this products ,detent positon will always be aligned with A-OFF or ON phase. Therefore make the A phase of the microcomputer the reference at the software design stage.

此产品在定位点状态时A相波形是处于OFF或ON状态,因此在设计软件时请留意此现象。

4-4. At design of the pulse count process. Using the C/R filter circuit is Recommended.

在设计时要考虑到杂讯,须使用C/R滤波电路。

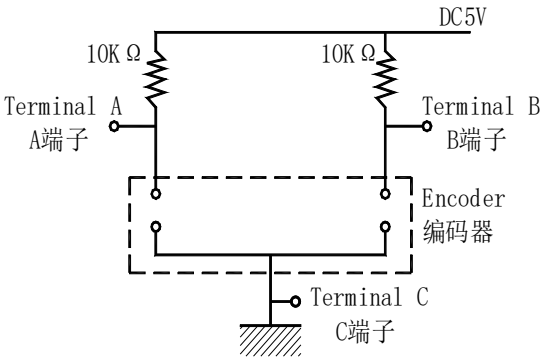
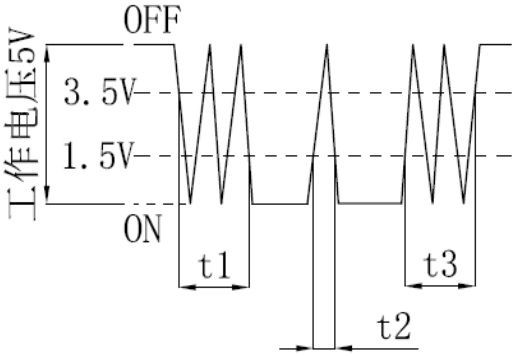
4-5. Care must be taken not to expose this product to water or dew to prevent possible problem in pluses output waveform.

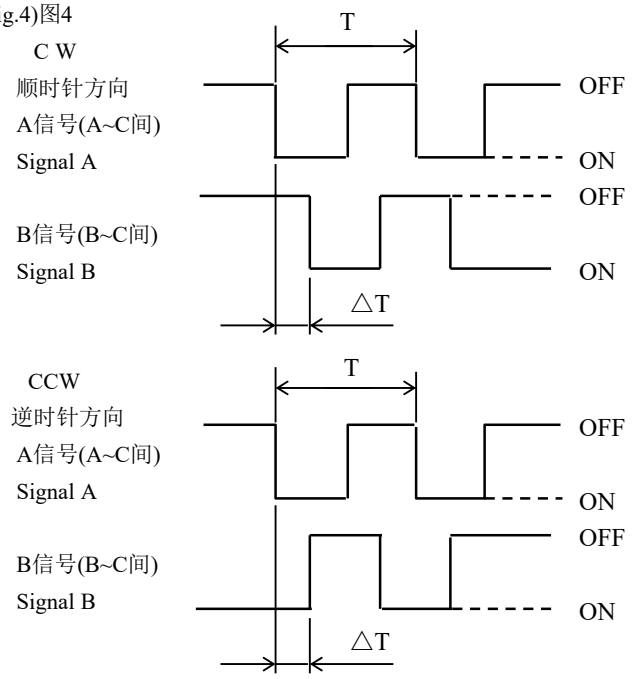
本产品请勿碰触到水,可能会导致输出波形的异常。

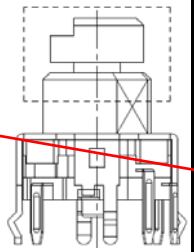
4-6.When encoder are used, the speed is suitable for controlling with 360°/s. The highest speed will lead that IC doesn't obtain signal. Mean while,the slide contact in the inside of product can be divorced form in order to be poor conatct.

在使用编码器时速度宜控制在360°/s 内，转速过快会导致IC抓取不到信号及产品内部的接触刷会瞬间脱离产生接触不良。

5、 ELECTRICAL CHARACTERISTICS电气性能

ITEM 项 目	CONDITIONS 条 件		SPECIFICATIONS 规 格
5-1、Output signal format 输出信号	Note: Output signal is 1 pulse per 2 detents. And terminal A-C is pulse ON or OFF at detent position. No specified output of termial B-C at detent position. 注意事项：输出信号方式是2个定位1个脉冲。在定位点位置时A-C端子处于ON或OFF状态，而B-C端子间不作特定要求。		2 Phase-different signals (signal A, signal B) Details shown in〈fig.1〉(The broken line shows detent position .) A、B两信号输出相位差,输出波形详细见(图1)。虚线表示带卡点装置的卡点处位置。
	Shaft rotational direction 轴回转方向	Signal 信号	Output 〈fig.1〉 输出波形 (图1)
	C .W 顺时针方向	A(Terminal A-C) A(A-C端子间)	OFF ON
		B(Terminal B-C) B(B-C端子间)	OFF ON
	C.C.W 逆时针方向	A(Terminal A-C) A(A-C端子间)	OFF ON
		B(Terminal B-C) B(B-C端子间)	OFF ON
5-2、Resolution 分解能力	Number of pulses in 360° rotation。 回转360°的输出脉冲数。		12 pulses/360° for each phase 12个脉冲/360°
5-3、 Switching characteristics 开关特性	Measurement shall be made under the condition as follows. 1)Shaft rotational speed : 360°/S 2)Test circuit : （fig.2） 下（图2）所示回路，轴以360°/秒的速度回转测定。 fig.2  〈fig.3〉图3  (Note) Code-OFF area :The area which the voltage is 3.5V or more. Code-ON area :The area which the voltage is 1.5V or less. （注）编码器OFF指输出电压3.5V以上的状态。 编码器ON指输出电压1.5V以下的状态。		
5-3-1、Chattering 振荡	Specified by the signal's passage time from 1.5V to 3.5V of each switching position (code OFF~ON or ON~OFF) (Fig.3) 编码从OFF → ON 或 ON → OFF时，输出1.5V~3.5V通过的时间应符合规定。(图3)		On the case within detent, B signal will be irregular oscillation.带卡点时,在卡点位置上的B信号振荡无规定。 t1,t3 ≤ 5ms
5-3-2、Sliding noise (Bounce) 滑动杂音(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 (t1 or t3).the voltage change shall be regarded as a part of chatteri-ng.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1.5V以上的电压变动时间在振荡t1,t3之间会产生1毫秒以上1.5V以下的ON部分.另外,如果各突跳间1.5V以下的范围在1毫秒以上时,则判定为另一个突跳.		t2≤2ms
5-3-3、Sliding noise 滑动噪音	The voltage change in code - OFF area. 编码OFF部分的电压变动。		3.5V Min 3.5V 以上

5、 ELECTRICAL CHARACTERISTICS电气性能		
ITEM **项 目**	**CONDITIONS** **条 件**	**SPECIFICATIONS** **规 格**
5-4、Phase difference 相位差	Measurement shall be made under the condition which the shaft is rotated in 360°·S^{-1} (constant speed).以360°/s的速度测量。 (Fig.4)图4  	△T≥5 ms In(fig.4) 见图4
5-5、Insulation resistance 绝缘电阻	Measurement shall be made under the condition which a voltage of 250V DC 1min is applied between individual terminals and bushing. 在端子和安装板间施加电压 250V DC 1分钟。	Between individual terminals and bushing 100 MΩ Min 端子安装板间电阻100 MΩ以上。
5-6、Dielectric strength 耐电压	A voltage of 300V AC shall be applied for 1 minute between individual terminals and bushing.（Leak current:1mA). 在端子和安装板间施加 AC 300V电压1分钟。（漏电流:1mA)。	Without arcing or breakdown. 不得有绝缘破坏。
6、 Mechanical characteristics 机械性能		
6-1、Total ratational angle 全回转角度		360°(Endless) 360°(无止挡点)
6-2、Detent Torque 定位点力矩	Only suitable for C.C, equipment. 只适用于附卡点装置	6± 4mN.m（60±40) gf.cm）
6-3、Number and position of detent 定位点数及位置	Only suitable for C.C, equipment. 只适用于附卡点装置	24 detents(Step angle:15°±3°) 24点定位（间隔角度 15°±3°）
6-4、Push-pull strength of shaft 轴推拉强度	Pull static load of 100 N(10 kgf) for 10s and push static load of 100 N(10 Kgf)for 10s shall be applied to the shaft in the axial direction .(After soldering of the PC board). 在轴端，沿轴向施加100 N(10 kgf)的静负荷力拉力10秒钟和施加100 N（10 Kgf)推力10秒钟(焊锡固定在PCB上）。	Without damage or excessive play in shaft . No excessive abnormality in rotational feeling.And electrical characteristics shaft be satisfied. 轴无破损，旋转、电气性能无异常。
6-5、Terminal strength 端子强度	A static load of 5N(0.5kgf) shall be applied to the tip of terminals for 10 s in any direction. 端子前端的任意方向施加5N(0.5kgf)的静负荷力10秒钟。	Without excessive play in terminal or poor contact. 端子不得有明显松动及接触不良。
6-6、Shaft wobble 轴摆动	A momentary load of 50mN.m(500 gf) shall be applied at the point 2mm from the tip of the shaft in a direction perpendicular to the axis of shaft. 在轴前端2mm处,沿径向瞬间施加50mN.m (500 gf)的力。 L:Distance between mounting surface and measuring point on the shaft. L:安装表面与轴心测量点之间的距离。	Bushing length Wobble 轴套长（mm） 摆动(mmp-p less) ■ 4 0.5*L/30
6-7、Side thrust strength of shaft 轴的垂直押引强度	A load of 20N(2.04Kgf) shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft for 10 s. 在轴前端5 mm处加20 N(2.04Kgf)的静负荷力10秒钟。	Without excessive play of bending in shaft. No mechanical abnormally. 轴不得有明显松动及接触不良。

ITEM 项 目	CONDITIONS 条 件	SPECIFICATIONS 规 格
6、 Mechanical characteristics 机械性能		
6-8、Shaft play in rotational wobble 轴的回转方向摆动	Testing by angle board. 用角度板测定.	3° Max 3° 以下
6-9、Shaft play in axial direction 轴向间隙	The pull / push load of 0.5N(51gf) shall be imposed on the shaft. 在轴上施加0.5N(51gf)的推力或拉力.	0.3mm Max. 0.3mm以下.
7、Endurance characteristics耐久性能		
7-1、Rotational life 回转寿命	The shaft of encoder shall be rotated to15,000 cycles at a speed of 600~800 cycles/H without electrical load,after which measurements shall be made. 在无负荷条件下轴以600~800周/小时速度回转15,000 周。 1 cycle: rotate 360° CCW rotate 360° CW 1周指顺时针转360°逆时针转360°	Chattering t1,t3≤5ms Bounce t2≤3ms 振荡：t1,t3≤5ms；突跳：t2≤3ms Detent torque:Relative to the previously specified value 50%. 定位力矩：不低于初始规格值的50% Shaft wobble should be within 150% of the specifications. 轴摆动为原始规格值的150%以内 Shaft play in rotational wobble:5º Max. 轴的回转方向摆动：5º以内
7-2、Damp heat 耐湿性	The encoder shall be stored at temprature of 40±2°C with relative humidity of 90% to 95% for 240±10H in a thermostatic chamber .And the encoder shall be subjected to standard atmospheric conditions for 1.5H, After which measurements shall be made. 温度40±2°C,湿度90~95%的恒温恒湿槽中放置240±10小时后,在常温、常湿中放置1.5小时后测试.	Contact resistance:100 Ω Max. SW Contact resistance:200 mΩ max. Encoder characteristics item: 5-1、5-5、5-6、6-2 Push switch characteristics item: 1-2-3、1-2-4、1-3-2、1-3-3 The same as the initial specfications. 接触阻抗小于100 Ω。 开关接触阻抗小于200 mΩ。 编码器特性项目：5-1、5-5、5-6、6-2 按压开关特性项目：1-2-3、1-2-4、1-3-2、1-3-3应同原规格值相同。
7-3、Dry heat 耐热性	The encoder shall be stored at a temperature of 80±3°C for 240±10H in a thermostatic chamber.And then the encoder shall be subjected to standard atmospheric conditions for 1.5H .After witch measurement shall be made.温度80±3°C的恒温箱中放置240±10小时,常温、常湿放置1.5小时后测试.	
7-4、Cold 低温特性	The encoder shall be stored at a temperature of -40±3°C for 240±10H in a thermostatic chamber.And then the encoder shall be subjected to standard atmospheric conditions for 1.5H .After witch measurement shall be made .温度-40±3°C的恒温箱中放置240±10小时,常温、常湿放置1.5小时后测试。	
7-5、Waterproof 防水特性	The upper part of the product is waterproof (as shown in the right column), the lower part of the product shall be assembled in customer's mechenical design to achieve waterproof function. 本产品上半部分可满足防水要求(如右图示方框内)，下半部分与客户的装配机构密封组合为一体达到 防水效果。  此项不适用	The waterproof rating is grade IP67。 防水等级为IP67级。
7-6、Solder ability 焊锡性	The terminals shall be immersed into solder bath at 260°C±5°C for 3s±1s in the same manner as para. 端子在260℃±5°C温度的焊锡槽内浸锡3秒±1秒。	A new uniform coating of solder shall cover 75% minimum of the surface being immersed. 浸渍面须有75%以上焊锡附着
7-7、Resistance to Soldering heat 耐焊接热	Manual soldering手工焊接 Bit temperature of soldering iron： 350°C less than Application time of soldering iron： within 3s 温度350°C以下，时间3秒以内。 Dip soldering槽焊 Printed wiring board : copper clad laminate board with thickness of 1.6mm. 使用基板：t=1.6mm的覆铜板。 Preheating : 1、Surface temperature of board: 100°C or less. 2、Preheating time : within 2 min. 预热：基板表面温度100°C以下,时间2分钟以内。 Soldering : Solder temperature : 260±5°C or less Immersion time :within 5s 焊接：温度260±5°C或以下，时间5秒以内。	Electrical characteristics shall be satisfied No mechanical abnormality. 不得有绝缘体的破损、变形、接触无异常。

Push switch portion 推动开关部分

Note: The following specification is only suitable for the one type with switch construction of EC09 encoder series.
注：以下规格只适用于此EC09编码器系列带开关结构。

1-1、Rated capacity (Resistance load): DC 5V 10mA (1mA Min)
额定容量（电阻负荷）: DC 5V 10mA (1mA 以上)

1-2 Electrical characteristics电气性能

ITEM 项 目	CONDITIONS 条 件	SPECIFICATIONS 规 格
1-2-1、Contact resist- ance接触电阻	Voltage step-down test at DC 5V 1mA 用DC 5V 1mA 电压降下法测定.	100 mΩ Max 100 mΩ 以下
1-2-2、Bouncing 振荡	Shaft shall be rotated at 1 cycles/S (OFF-ON-OFF) 以1秒钟1往返（OFF-ON-OFF）回转运转	10 ms Max 10 ms 以下
1-2-3、Insulation res- istance绝缘电阻	Measurement shall be made under the condition which a voltage 250V DC 1min±5S is applied between individual terminals and tracked 在端子与安装板间施加电压DC 250V 1分钟±5秒。	Between individual terminals and bracket 100 MΩ Min. 在端子安装板间100 MΩ以上。
1-2-4 Dielectric strength 耐电压	A voltage of 250V AC /min or300 V AC /2S(leak current 1mA) be applied between individual terminals and bracket.在端子与安装板间 施加AC 250V 1分钟或AC 300V 2秒钟（漏电流1mA）。	Without arcing or breakdown. 不得有绝缘损坏。

1-3 Mechanical characteristics机械性能

1-3-1、Switch circuit and number of pulse 开关电路、接点数		Single pole and single throw (push on) 单极单投（推ON）
1-3-2、Travel of switch开关移动量		0.3±0.15mm
1-3-3、Operating force of switch开关作动力		1.5~2.5N (150~250gf)

1-4 Endurance characteristics耐久性能

Push operating life 寿命特性	The encoder's shall be pushed to 10,000 cycles at a speed of 1200±300/h without electrical load.(shaft push load: 1 kgf Max.) 在无负荷条件下,对轴以每小时1200±300次的速度推动10,000次， (轴按压力1 kgf以下)。	Contact resistance : 200 mΩ Max. Specification in clause 1-2-2~4,1-3-1~2 shall be satisfied. Operating force:Before test 50%. 接触电阻 : 200 mΩ以下。 1-2-2~4,1-3-1~2 满足初期规格。 开关动作力为寿命前的50%。

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