

P. C. B MOUNTING HOLE DETAIL

注：重点管控尺寸 A - F。

01				03	
00	ORIGINAL DRAWING		2021-09-03	02	
. ISSU.	REVISION		DATE	. ISSU.	
丁剑勇	HUNG KAM PIU	HUNG KAM PIU	TOL. UNLESS OTHERWISE SPEC.	SOUNDWELL®	SOUNDWELL ELECTRONICS
			BASIC DIMENSIONS	TOL.	TITLE: ENCODER
			L ≤ 10	± 0.3	MODEL: EC121101X2A-VA1-012
DSGD.	CHKD.	APPD.	10 < L	± 0.5	
	SCALE		100 ≤ L	± 0.8	SPECIFICATION: 24P5-KQ140B070
	UNIT	mm	ANGLE	± 5°	

EC12 SERIES SPECIFICATION

EC12系列规格书

1/5P

1、General 一般事项

1-1、Scope 适用规格

This specification applies to 12mm size low-profile thin rotary encoder (incremental type) for microscopic current circuits used in electronic equipment.

本规格书适用于电子设备用微小电流回路12型回转式编码器。

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 follows:

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 5mA; 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 of the microcomputer software into consideration.

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 position will always be aligned with A-OFF phase. Therefore make the A phase the reference at the soft ware design stage.

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

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

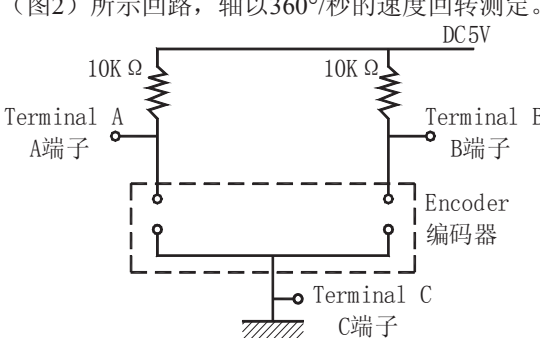
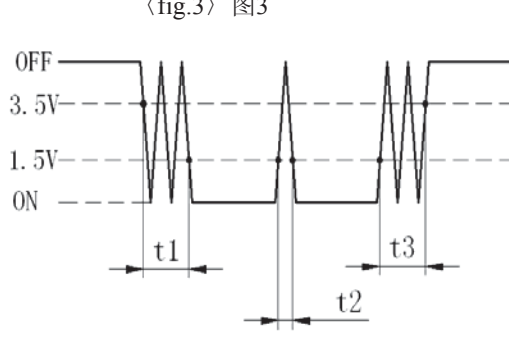
在设计时要考虑到杂讯，建议使用C/R滤波电路。

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

本产品请勿碰触到水，可能会导致输出波形的异常。

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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 1 detents. And terminal A-C is pulse ON or OFF at detent positions. No specified output of terminal B-C at detent positions. 注意事项：输出信号方式是1个定位1个脉冲。在定位点位置时A-C端子处于OFF状态，而B-C端子间不作特定要求。	
	Shaft rotational direction 轴回转方向	Signal 信号
	C.W. 顺时针方向	A(Terminal A-C) A(A-C端子间)
	C.C.W. 逆时针方向	B(Terminal B-C) B(B-C端子间)
	C.C.W. 逆时针方向	A(Terminal A-C) A(A-C端子间)
		Output <fig.1> 输出波形(图1)
		OFF ON OFF ON OFF ON OFF ON OFF ON OFF ON OFF ON 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 <input type="checkbox"/> 18 <input type="checkbox"/> 24 <input checked="" type="checkbox"/> pulses/360° for each phase 12 <input type="checkbox"/> 18 <input type="checkbox"/> 24 <input checked="" type="checkbox"/> 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.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) 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。	If the product is with 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 ≤ 3ms
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 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

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ITEM 项目	CONDITIONS 条件	SPECIFICATIONS 规格
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
5-4、 Phase difference 相位差	<p>Measurement shall be made under the condition which the shaft is rotated in contant speed.以固定的速度操作轴进行回转。 (Fig.4)图4</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>C W 顺时针方向 A信号(A~C间) Signal A</p> <p>B信号(B~C间) Signal B</p> </div> <div style="margin-left: 20px;"> <p>OFF</p> <p>ON</p> <p>OFF</p> <p>ON</p> </div> </div> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>C C W 逆时针方向 A信号(A~C间) Signal A</p> <p>B信号(B~C间) Signal B</p> </div> <div style="margin-left: 20px;"> <p>OFF</p> <p>ON</p> <p>OFF</p> <p>ON</p> </div> </div>	<p>$\Delta T \geq 0.08T$ In(fig.4) 见图4</p>
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 bracket. 在端子和安装板间施加电压 250V DC 1分钟。	Between individual terminals and bracket 10MΩ MIN. 端子安装板间电阻10MΩ以上。
5-6、 Dielectric strength 耐电压	A voltage of 50V AC shall be applied for 1 minute between individual terminals and bracket. 在端子和安装板间施加 AC 50V电压1分钟。	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	9± 6 mNm (90±60gf.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	<input type="checkbox"/> 12 detents(Step angle:30°±3°) 12点定位 (间隔角度 30°±3°) <input type="checkbox"/> 18 detents(Step angle:20°±3°) 18点定位 (间隔角度 20°±3°) <input checked="" type="checkbox"/> 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	Push and pull static load of shall be applied to the shaft in the axial direction for 10s. (After soldering of the PC board) 在轴端,沿轴向施加的静负荷力推和拉各10秒钟 (焊锡固定在PCB上)。 <input checked="" type="checkbox"/> With switich 5.1kgf <input type="checkbox"/> On Without switch 10kgf <input checked="" type="checkbox"/> 带开关为5.1kgf <input type="checkbox"/> 不带开关为10kgf	Without damage or excessive play in shaft No excessive abnormality in rotational feeling. And electrical characteristics shall be satisfied. 轴无破损,回转无异常;电气性能无异常。
6-5、 Terminal strength 端子强度	A static load of 3N(0.31kgf) shall be applied to the tip of terminals for 10S in any direction. 端子前端的任意方向施加3N(0.31kgf)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 5N(0.51Kg) shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft. 在轴前端5mm处,沿径向瞬间施加5N (0.51Kg)的力。	1.0x L / 30mm p-p MAX(L:shaft length) 1.0 x L / 30mm p-p 以下(L:安装长度)
6-7、 Nut tightening strength 螺母紧固强度	Nut tighten with 8.0kgf.cm 螺母紧固强度为8.0kgf.cm. 此项不适用	No excessive uneven rotation feeling occur 不可有回转发生 (打滑)。

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6 Mechanical characteristics 机械性能		
ITEM 项目	CONDITIONS 条件	SPECIFICATIONS 规格
6-8、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 10s. 在轴前端5mm处加20N(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.
6-9、Shaft play in rotational wobble 轴的回转方向摆动	Testing by angle board. 用角度板测定.	4° MAX 4° 以下
7 Endurance characteristics 耐久性能		
7-1、Rotational life 回转寿命	The cycles that the shaft of encoder shall be rotated to at a speed of 600~1000 cycles/H without electrical load, after which measurements shall be made. 在无负荷条件下轴以600~1000周/小时速度回转的周数。 <input checked="" type="checkbox"/> Rotate Torque 旋转力矩 ≤100gf. cm 30,000cycles <input type="checkbox"/> Rotate Torque 旋转力矩 >100gf. cm 15,000cycles	Chattering t1,t3≤5ms 振荡 t1,t3≤5ms Bounce t2≤3ms 突跳 t2≤3ms Torque: Relative to the previously specified value: -50%~+10% 力矩: 为原始规格值的 -50%~+10%
7-2、Damp heat 耐湿性	The encoder shall be stored at temperature of 40°C±2°C 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. 温度40°C±2°C,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.	Specifications in clause all items is shall be satisfied. 所有项应满足初期规格
7-3、Dry heat 耐热性	The encoder shall be stored at a temperature of 85°C±3°C for 240±10h in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5h, after which measurement shall be made. 温度85°C±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.	Specifications in clause all items is shall be satisfied. 所有项应满足初期规格
7-4、Cold 低温特性	The encoder shall be stored at a temperature of -40°C±3°C for 96±4h in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5h, after which measurement shall be made. 温度-40°C±3°C的恒温箱中放置96±4小时,常温、常湿放置1.5小时后测试.	Specifications in clause all items is shall be satisfied. 所有项应满足初期规格
7-5、Solder ability 焊锡性	The terminals shall be immersed into solder bath at 260°C±5°C for 3s±0.5s in the same manner as para. 端子在260°C±5°C温度的焊锡槽内浸锡3秒±0.5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
7-6、Resistance to Soldering heat 耐焊接热	<input type="checkbox"/> Manual soldering 手工焊接 Bit temperature of soldering iron: below 350°C Application time of soldering iron: within 3 s. 温度350°C以下,时间3秒以内。 <input checked="" type="checkbox"/> Dip soldering 槽焊 1. Printed wiring board : copper clad laminate board with thickness of 1.6mm; 使用基板: t=1.6mm的覆铜板。 2. Solder flux: Specific gravity: 0.82 or more. Flux shall be applied to the board using a bubble foaming type fluxer. The board shall be soaked in the flux bubble only to the middle of its thickness. 助焊剂: 使用发泡式比重0.82以上的焊剂,发泡面高大致在基板厚度一半的位置,而且助焊剂不可流入基板表面上。 3. Preheating : Surface temperature of board: 100°C or less; Preheating time : within 2 min. 预热: 基板表面温度100°C以下,时间2分钟以内。 4. Soldering : Solder temperature : 260°C±5°C less Immersion time: within 5±1 s 焊接: 温度260°C±5°C,时间5±1 s。 Apply the above soldering process for 1 or 2 times. 以上工程适用1至2次。	Electrical characteristics shall be satisfied. No mechanical abnormality. 不得有绝缘体的破损、变形、接触无异常。

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Push switch portion 推动开关部分					
Note: The following specification is only suitable for the EC12 encoder series with push-on switch. 注：以下规格只适用于此EC12编码器系列带开关结构。					
1-1、Rated capacity (Resistance load) 额定容量 (电阻负荷)					
DC 5V 10mA (1mA MIN)					
1-2 Electrical characteristics 电气性能					
ITEM 项目	CONDITIONS 条件		SPECIFICATIONS 规格		
1-2-1、Contact resistance 接触电阻	Voltage step-down test at DC 5V 1mA 用DC 5V 1mA 电压降下法测定.		100mΩ MAX 100mΩ 以下		
1-2-2、Chattering 振荡	Switch is operated at the rate of 1 cycle 1 sec .The 1 cycle shall be OFF-ON-OFF 以1秒钟1往返 (OFF-ON-OFF) 操作开关.		10ms MAX 10ms 以下		
1-2-3、Insulation resistance 绝缘电阻	Measurement shall be made under the condition which a voltage 50V DC 1min±5s is applied between individual terminals and tracked 在端子与安装板间施加电压DC 50V 1分钟±5秒。		Between individual terminals and bracket 10MΩ MIN. 在端子安装板间10MΩ以上		
1-2-4 Dielectric strength 耐电压	A voltage of 50V AC /min or 60 V AC /2S(leak current 1mA) be applied between individual terminals and bracket.在端子与安装板间施加AC 50V 1分钟或AC 60V 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			0.5 ^{+0.4} _{-0.3} mm		
1-3-3、Operating force of switch 开关作动力			4.5±2.5 N (450±250gf)		
1-4 Endurance characteristics 耐久性能					
Push operating life 寿命特性	The encoder's shall be pushed to 20,000 cycles at a speed of 1800±300/h without electrical load.(shaft push load: 1kgf max.) 在无负荷条件下,对轴以每小时1800±300次的速度推动20000次.(轴按压力1kgf以下).		Contact resistance : 200mΩ max. Specification in clause 1-2-2~4,1-3-1~2 shall be satisfied. Operating force: 80% of initial value. 接触电阻 : 200mΩ以下. 1-2-2~4,1-3-1~2 满足初期规格. 开关动作为寿命前的80%.		
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变更记事	变更时间				
2.重新整理	2006-5-8	DSGD 主办	CHKD 审查	APPD 核准	TITLE 标题: ENCODER 编码器
3.增加螺母强度规格	2006-12-2	技术部 21-09-02	技术部 21-09-02	技术部 21-09-02	
4.修改轴推拉强度	2008-9-8	李苗	欧阳昌雄	苏朝晖	DOCUMENT No.文号: EC12-01
5.重新整理	2010-4-3				
6.焊锡耐热性规格修改	2012-9-12				