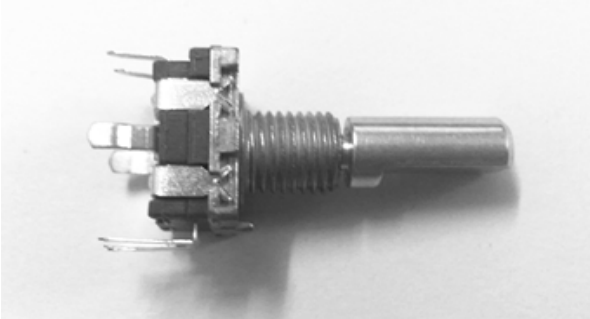


11mm Metal Shaft Rotary Encoder With Push-On Switch

11mm 金屬軸旋轉編碼器附開關



Part Number

EC1112S- 20P -20C- 20 F

With switch
帶開關

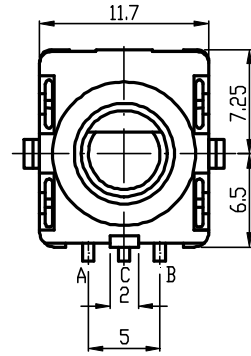
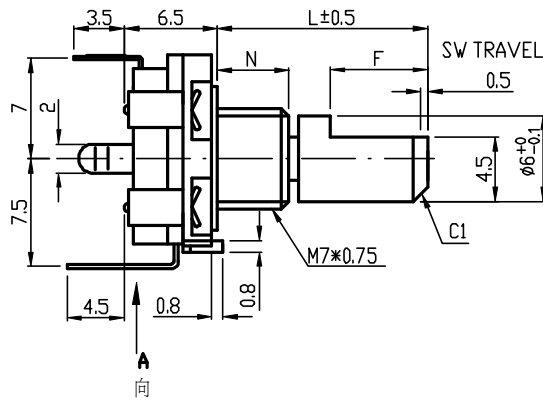
Pulses
脈衝

Clicks
卡點

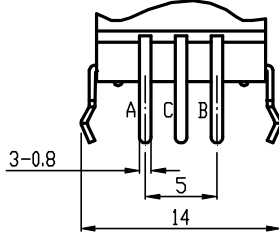
Shaft length
軸長

Shaft typ
軸型

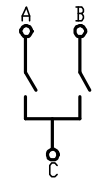
Dimensions 規格尺寸



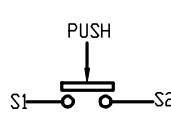
A向旋轉90°



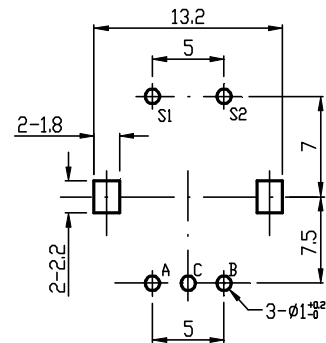
CIRCUIT



SWITCH

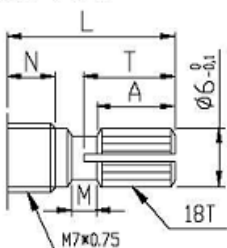


P.C.B MOUNTING HOLE DETAIL



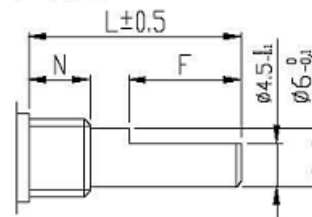
Shaft Type 軸型

KC-TYPE



N	5	7			
L	10	12	15	20	30
T	25	5	7	12	14
A	2	4	6	10	12
M	0.5	1	1	2	4

F-TYPE



N	5	7	
L	15	20	25
F	7	10	12

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1. General 一般事项

1-1、Scope 适用规格

This specification applies to 11mm 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11型薄回转式编码器（增量型）。

1-2、Standard atmospheric conditions 标准大气状态

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

如果没有其它特殊要求时，则其测定及实验的大气压状态，标准范围如下：

Ambient temperature 温度：15℃ ~ 35℃

Relative humidity 相对湿度：25% ~ 85%

Air pressure 气压：86kPa ~ 106kPa

1-3、Operating temperature range 使用温度范围：-20℃ ~ 80℃

1-4、Storage temperature range 保存温度范围：-40℃ ~ 85℃

2、Construction 构造

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、Resistive load 最大额定电流: 0.5mA(common lead共公端:1mA)

4、Precautions in use 使用方面的注意事项

4-1、During operating storage in high temperature and humidity, and in corrosive gas should be avoided.

请避免存放于高温，潮湿及具腐蚀性的场所。

4-2、At design of the pulse count processes. Using the C/R filter circuit as bellow is recommended.

在设计上时脉计算处理的动作方式，建议使用C/R过回路装置。

4-3、With this part, Detent position will always be aligned with A-OFF phase. Therefore make the A phase of microcomputer the reference at the soft ware design stage.

此产品在定位状态时A相波形是处于OFF状态，因此在设计软件时请留意此现象。

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

注意本制品必须避免直接接触到水或露水,可能会导致输出波形异常。

4-5、Excessive impact force may decrease the performance Of this product. Please pay attention to impact force.

本制品的主轴无法承受过大的撞击力，以确保制品的机能。请避免严重的撞击力量。

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.

在编码器时速度需控制在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

4-7、Consideration to provide protective guard for knob is highly recommended to avoid side pressure to the shaft.

本制品的主轴，无法承受太大的侧向压力，所以主要在旋转帽套设计时，必须考虑到帽套的侧向压力，以确保制品的机能。

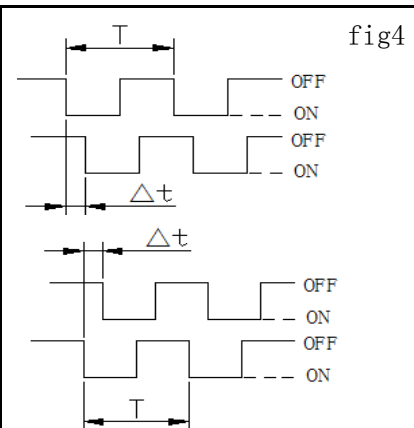
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5、 ELECTRICAL CHARACTERISTICS 电气性能

ITEM 项目	CONDITIONS 条件	SPECIFICATIONS 规格	
5-1 Resolution 分解能力	Number of pulses in 360° rotation. 回转一周输出的脉冲数。	20 pulses/360° 20个脉冲/360°	
5-2 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 position。 No specified output of terminal B-C at detent position。 注意事项：输出信号方式是1个定位1个脉冲。在定位位置时，A-C端子间处于ON或OFF状态，而B-C端子不作特定要求。	2 Phase-different signals (signalA, signalB) Derails shown in <fig 1>(The broken line shows detent position)。 A、B俩信号输出相位差,输出波形详见<图1>,(虚线表示带卡点装置的定位处位置)。	
	Shaft rotational direction 轴回转方向	Signal 信号	Output 输出波形 fig1
	C.W. 顺时针方向	A(A~C 端子间) A(Terminal A~C)	
		B(B~C 端子间) B(Terminal B~C)	
C.C.W. 逆时针方向	A(A~C 端子间) A(Terminal A~C)		
	B(B~C 端子间) B(Terminal B~C)		
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: <fig2>。 下图2所示回路，轴以360°/秒的速度回转测之。 		
	Note: Code-OFF area :The area which the voltage is 3.5V or more, Code-ON 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 to3.5V of each switching position (code OFF-ON or ON-OFF)<fig3>。 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≤3ms。	

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5、 ELECTRICAL CHARACTERISTICS 电气性能

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 1linked 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。 电压从高电位切换到低电位区间时	3.5V Min 3.5V 以上
5-4	Phase difference 相位差	Measurement shall be made under the condition which the shaft is rotated in speed 360°/s。 以360°/s的速度操作轴进行回转。 C.W. 顺时针方向 A信号(A~C 之间) Signal A B(B~C 之间) Signal B C.C.W. 逆时针方向 A信号(A~C 之间) Signal A B(B~C 之间) Signal B	 fig4 ΔT≥3.5ms In <fig 4> 见图4
5-5	Contact Resistance 接触电阻	Measurement shall be stable condition which a output signal is ON condition。 在输出信号为ON的稳定状态下测量。	Max 1Ω 小于1Ω
5-6	Insulation resistance 绝缘电阻	Measurement shall be made under the condition which a voltage of DC 50V 60±5s is applied between individual terminals and bracked。 在端子和支架之间外加 DC 50V 60±5秒。	Between individual terminals and bracked 10MΩ Min。 端子与安装支架间电阻10MΩ以上
5-7	Dielectric strength 耐电压	A voltage of AC 300V 60±5s shall be applied between individual terminals and bracked。 在端子和支架之间外加 AC 300V 60±5秒。	Without arcing or breakdown 不得有绝缘破坏。

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6、MECHANICAL CHARACTERISTICS 机械性能

ITEM 项目		CONDITIONS 条件	SPECIFICATIONS 规格
6-1	Total notational angle 全回转角度	Angle of effective rotation. 有效回转角度。	360°(Endless)
6-2	Detent Torque 定位力矩	Only suitable for C.C, equipment. 只适用于附卡点装置。	20~200 gf.cm(2~20mN.m)
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。	20 detents(Step angle:18°±3°) 20 点定位(间隔角度:18°±3°)
6-4	Push-pull strength of shaft 轴推拉强度	Push and pull static load of 80N(metal bushing) or 10N(plastic bushing)shall be applied to the shaft in the Axial direction for 10s (After soldering of the PCB board) 沿轴向施加80N (金属轴套)或10N(塑胶轴套)的静负荷力推和拉各10秒钟。(成品焊接至电路板上)	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 3N (0.3kg) shall be applied to the tip of terminals for 10s in any direction。 在端子前端任意方向施加3N(0.3kgf)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 轴晃动	A momentary load of 5N(0.5kgf) shall be applied at the point 5mm from the tip shaft in a direction per pedicle to the axis of shaft。 在轴顶端5mm处, 沿径向瞬间施加5N(0.5kgf)的力。	1.0*L/30mm p-p Max(L:shaft length) 1.0*L/30mm p-p以下(L:安装长度)
6-7	Side thrust strength of shaft 轴的垂直接押强度	A load of 20N (2kgf) shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft for 10s。 在轴顶端5mm处施加20N (2kgf) 的静负荷力10秒。	Without excessive play of bending in shaft。 No mechanical Abnormality 轴不得有明显松动现象。机械特性上没有异常现象。
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。	4°Max 4°以下
6-9	Shaft play in axial direction 轴向间隙	The pull / push load of 0.5N(50gf) shall be imposed on the shaft 在轴上施加0.5N(50gf)的推力或拉力。	0.3mm Max 0.3mm以下
6-10	Bushing Nut Tighten Strength 轴套螺母强度	Only suitable for bushing with-thread type equipment。 只适用于轴套带螺纹的产品。	metal bushing ≥8.0kgf.cm; plastic bushing ≥3kgf.cm; 金属轴套大于8kgf.cm; 塑胶轴套大于3kgf.cm。

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7、ENDURANC CHARACTERISTICS 耐久性能

ITEM 项目		CONDITIONS 条件	SPECIFICATIONS 规格
7-1	Dry Heat 耐热性	The encoder shall be stored at temperature of $85\pm 3^{\circ}\text{C}$ for $240\pm 10\text{h}$ 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 $85\pm 3^{\circ}\text{C}$ 的恒温箱中放置 240 ± 10 小时, 在常温、常湿中放置1.5小时后测试。	
7-2	Low Temperature 耐寒性	The encoder shall be stored at temperature of $-40\pm 3^{\circ}\text{C}$ for $240\pm 10\text{h}$ 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 $-40\pm 3^{\circ}\text{C}$ 的恒温箱中放置 240 ± 10 小时, 在常温、常湿中放置1.5小时后测试。	Contact resistance: 100Ω Max; SW Contact resistance: $200\text{m}\Omega$ Max; Specifications in clause: 5-2、5-6~7、6-1~2、10-3~4 and 11-2~3 shall be satisfied. 接触阻抗小于: 100Ω ; 开关接触阻抗小于: $200\text{m}\Omega$; 项目5-2、5-6~7、6-1~2、10-3~4和11-2~3应满足初期规格。
7-3	Damp Heat 耐湿性	The encoder shall be stored at temperature of $40\pm 3^{\circ}\text{C}$ with relative humidity of 90% to 95% for $240\pm 10\text{h}$ in a thermostatic chamber. And the potentiometers shall be subjected to standard atmospheric conditions for 1.5h, After which measurements shall be made. 温度 $40\pm 3^{\circ}\text{C}$,湿度90~95%的恒温恒湿槽中放置 240 ± 10 小时, 在常温、常湿中放置1.5小时后测试。	
7-4	Vibration test 耐振性	The entire frequency range, from 10Hz to 55Hz and return to 10Hz, shall be transverse in 1min. Amplitude(total excursion): 1.5mm. This motion shall be applied for a period of 2h in each of 3 mutually perpendicular axes(A total of 6h). 频率范围: 10~55~10Hz; 周期: 1分钟; 振幅: 1.5mm 振动方向: XYZ三个坐标方向上各2小时(共6小时)。	Specifications in clause: 5-2、5-6~7、6-1、10-3~4 and 11-2 shall be satisfied 项目5-2、5-6~7、6-1、10-3~4和11-2应满足初期规格。
7-5	H2S test 硫化试验	The encoder shall be stored at condition of H2S gas 3PPM as volumetric concentration, temprature of $40\pm 2^{\circ}\text{C}$ with relative humidity of 90% to 95% for $96\pm 3\text{h}$ 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 $40\pm 2^{\circ}\text{C}$,湿度90~95%,在装有浓度 $3\pm 1\text{PPM}$ 的H2S气体的恒温恒湿槽中放置 96 ± 3 小时后, 在常温常湿中放置1.5小时后测试。	Contact resistance: 100Ω Max; SW Contact resistance: $200\text{m}\Omega$ Max; Specifications in clause: 5-2、5-6~7、6-1~2、10-3~4 and 11-2~3 shall be satisfied. 接触阻抗小于: 100Ω ; 开关接触阻抗小于: $200\text{m}\Omega$; 项目5-2、5-6~7、6-1~2、10-3~4和11-2~3应满足初期规格。

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7、ENDURANC CHARACTERISTICS 耐久性能

ITEM 项目		CONDITIONS 条件	SPECIFICATIONS 规格
7-6	Free falling 耐落性	The encoder shall be fallen freely at any posture from 60cm height to the concrete floor covered with vinyl-tile. After which measurement shall be made. 从60公分的高度，成自由落体垂直落至铺有乙烯材料的水泥地面。	No excessive deformatin of damage (except the deformation of terminal) 。 Specifications in clause: 5-2、 6-1 and 11-3 shall be satisfied。无过度变形及损坏(端子变形除外)。5-2、6-1和11-3 应满足初期规格。
7-7	Brine test 盐雾试验	The encoder shall be stored at condition of brine gas 5% as volumetric concentration, temprature of 40±2°C for 24±2h 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±20°C，在装有浓度为5%的盐水气体的恒温恒湿槽中放置24±2小时后，在常温常湿中放置1.5小时后测试	Contact resistance:100Ω Max; SW Contact resistance:200mΩ Max; Specifications in clause: 5-2、5-6~7 and 10-3~4 shall be satisfied。接触阻抗小于:100Ω; 开关接触阻抗小于:200mΩ; 项目5-2、5-6~7和10-3~4 应满足初期规格。
7-8	Rotational life 回转寿命	The shaft of encoder shall be rotated to20,000 cycles at a speed of 600~1000 cycles/h without electrical load, after which measurements shall be made。 在常温、常湿、无负载条件下以600~1000周/小时速度回转20,000周。 1cycle:rotate 360° C.W rotate 360° C.C.W。 1周指顺时针转360°再逆时针转360°。	Chattering: t1&t3≤5ms;Bounce: t2≤3ms;Detent torque:Initial torque 50% ; Phase-difference:3ms Min;Contact resistance:100Ω。振荡:t1&t3≤5ms;突跳:t2≤3ms;定位力矩:不低于初期值的50%;接触阻抗小于100Ω。

8、SOLDERING CHARACTERISTICS 焊锡性能

ITEM 项目		CONDITIONS 条件	SPECIFICATIONS 规格
8-1	Manual Soldering 手工焊锡	Bit temperature of soldering iron: 350°C or less , Application time of soldering iron: Within 3s。 温度: 350°C以下, 时间: 3秒钟以内。	Electrical characteristics shall be satisfied no mechanical abnormality 。 不得有绝缘体的破坏、变形、接触无异常。
8-2	Dip Soldering 槽焊	Printed wiring board: Single-sided copper clad laminate board with thickness of 1.6mm。使用基板t=1.6mm单面铜箔板。 Preheating: 1、 Surface temperature of board: 100°C or less; 2、 Preheating time: within 1min。 预热: 基板表面温度: 100°C以下, 时间: 1分钟以内。 Soldering : 1、 Soldering temperature:260±5°C; 2、 Immersion time: 3±1s。 焊锡温度: 260±5°C; 时间: 3±1秒。 Conduct the above soldering process for 1 or 2 times。 按上述的测试条件, 实施焊接工程1~2次。	
8-3	Solder ability 焊锡性	The terminals shall be immersed into solder bath at 260±5°C for 3±1s in the same manner as para。 端子在260±5°C温度的焊槽内浸锡3±1秒。	

A new uniform coating of solder shall cover 90% minimum of the surface being immersed。
浸渍面须有90%以上的焊锡附着。

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9、PUSH SWITCH PORTION 推动开关部分:

9-1 Note: The following specification is only suitable for the one type with switch construction of EC11 encoder series.

注：以下规格只适用于EC11编码器系列带开关结构。

9-2 Rated capacity (Resistance load): DC 5V 10mA (1mA Min)

额定容量（电阻负荷）：DC 5V 10mA（1mA 以上）

10、ELECTRICAL CHARACTERISTICS 电气性能

ITEM 项目	CONDITIONS 条件	SPECIFICATIONS 规格
10-1 Contact resistance 接触电阻	Voltage step-down test at DC 5V 1mA。 采用DC 5V 1mA降压法测试。	100mΩ Max 最大100 mΩ
10-2 Bouncing 振荡	Shaft shall be rotated at 1 cycles/s (OFF-ON-OFF)。 以1秒钟1个往返(OFF-ON-OFF)按压运转。	Less than 10ms 10毫秒以下
10-3 Insulation resistance 绝缘电阻	Measurement shall be made under the condition which a voltage of DC 250V 60±5s is applied between individual terminals and bracked。 在端子和支架之间外加 DC 250V 60±5秒。	Between individual terminals and bracked 50MΩ Min。 端子与安装支架间电阻50MΩ以上
10-4 Dielectric strength 耐电压	A voltage of AC 300V 60±5s shall be applied between individual terminals and bracked。 在端子和支架之间外加 AC 300V 60±5秒。	Without arcing or breakdown 不得有绝缘破坏。

11、MECHANICAL CHARACTERISTICS 机械性能

ITEM 项目	CONDITIONS 条件	SPECIFICATIONS 规格
11-1 Switch type 开关型式		Single pole and single throw(push on) 单极单投(推ON)
11-2 Travel of switch 开关移动量	Measure the distance until switch turned on when pressing the shaft to the operation direction of push SW(At push force 8N) 量测按压开关直至其导通的行程(按压力为8N)。	0.4±0.2mm
11-3 Operating force of switch 开关动作力	Measure the max load until switch turned on when pressing the shaft to the operation direction of push SW。 量测按压开关直至其导通时的最大压力。	500±200gf (5±2N)

12、ENDURANCE CHARACTERISTICS 耐久性能

ITEM 项目	CONDITIONS 条件	SPECIFICATIONS 规格
12-1 Push operating life 开关按压寿命	The encoder shall be rotated to 20,000 cycles at a speed of 1800cycles/h without electrical load. The measurement is done at 5000 cycles (shaft push load: 1kgf Max)。 在无负荷条件下，对轴以每小时1800次往返速度连续运转20,000次。每5000次进行量测1次（轴按压力1kgf以下）。	SW contact resistance:200mΩ Max; Specifications in clause :10-3~4、11-2 shall be satisfied; Operating force:initial force 50%。开关接触电阻：200mΩ以下；开关接触电阻：200mΩ以下；项目10-3~4、11-2应满足初期规格;开关动作力为初期值的50%。

次数	变更原因	变更日期	深圳市海华声电子有限公司 Shenzhen HaiHuasheng Electronic Co., Ltd					
			制 作	邓剑辉	审 核	凌 艺	批 准	朱秋生