

EC09 SERIES SPECIFICATION

EC09 系列规格书

1/5P

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9Φmm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：-20°C to 80°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 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体等考虑进去.

4-3. With this products ,detent positon will always be aligned with A-OFF or ON phase. Therefore make the A phase of the microcom-puter 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或ON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,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.

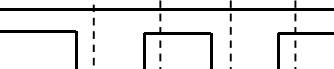
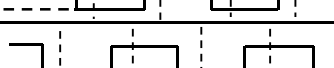
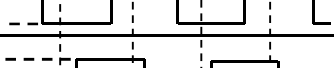
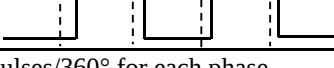
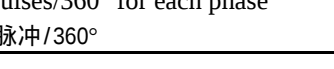
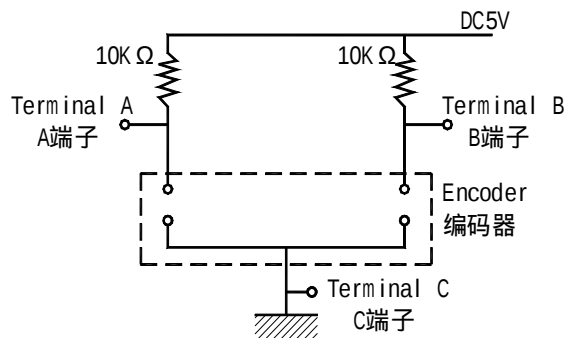
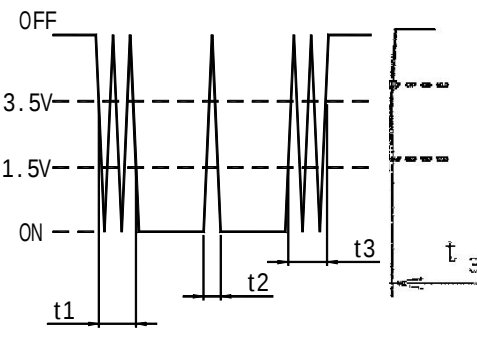
在使用编码品时速度宜控制在360°/S 内，转速过快会导致IC抓取不到信号及产品内部的接触刷会瞬间脱离产生接触不良。

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5、 ELECTRICAL CHARACTERISTICS电气性能

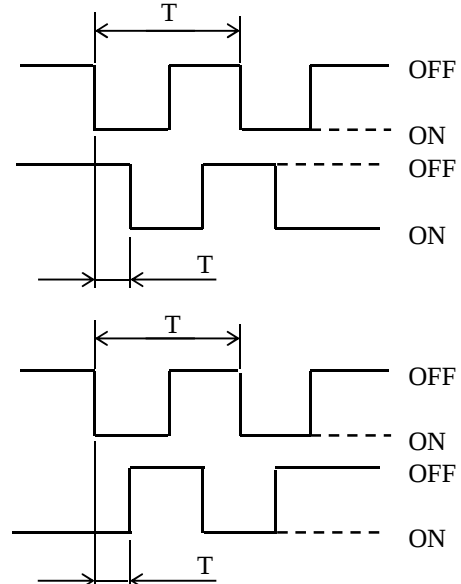
ITEM 项 目	CONDITIONS 条 件		SPECIFICATIONS 规 格
5-1、 Output signal format 输出信号	Note: Output signal is 1 pulse per 2 detents. And terminal A-C is pulse ON or OFF at detent position. No specified output of terminal B-C at detent position. 注意事项：输出信号方式是2个定位1个脉冲。在定位点位置时A-C端子处于ON或OFF状态，而B-C端子间不作特定要求。		2 Phase-different 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。		10 pulses/360° for each phase 10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  (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。 fig.3 图3 		
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。图三		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。 $t_1, t_3 \leq 3\text{mS}$
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。		$t_2 \leq 2\text{mS}$

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5、 ELECTRICAL CHARACTERISTICS电气性能

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	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  C W 顺时针方向 A信号(A~C间) Signal A B信号(B~C间) Signal B C C W 逆时针方向 A信号(A~C间) Signal A B信号(B~C间) Signal B	T=0.25±0.17T 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 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 bushing. 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	5~30mN.m. (50~300gf.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	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 8KG 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 8KG的静负荷力推和拉各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,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 50mN.m(0.51Kgf.cm) 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50mN.m (0.51Kgf.cm)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8kgf.cm。	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
6-10、 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.	0.4mm MAX. 0.4mm以下.
7、 Endurance characteristics 耐久性能		
7-1、 Rotational life 回转寿命	The shaft of encoder shall be rotated to 30,000 cycles 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 30,000 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 振荡 t1,t3 ≤ 5mS Bounce t2 ≤ 3mS 突跳 t2 ≤ 3mS Detent torque:Relative to the previously specified value:-50%~+10% 定位力矩：初期规格值的-50%~+10%
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 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±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 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.	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 -25±3°C for 96±4H 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-25±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±1s in the same manner as para. 端子在260 ° C±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
7-6、 Resistance to Soldering heat 耐焊接热	Manual soldering手工焊接 Bit temperature of soldering iron : 300°C less than Application time of soldering iron : within 3s 温度300°C以下，时间3秒以内。 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的单面覆铜板。 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 3S 焊接：温度260±5°C或以下，时间3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。

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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.		100mΩ MAX 100mΩ 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		10mS MAX 10mS 以下			
1-2-3、Insulation res- istance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 ap- plied 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 ^{+0.3} -0.3 mm			
1-3-3、Operating force of switch开关作动力				5 ^{+3.0} -3.0 N (500 ⁺³⁰⁰ -300 gf)			
1-4 Endurance characteristics耐久性能							
Push operating life 寿命特性		The encoder's shall be pushed to 30,000 cycles at a speed of 1800±200 /H without electrical load.(shaft push load: 1kgf.cm max.) 在无负荷条件下,对轴以每小时1800±200次的速度推动30,000次 , (轴按压力1kgf .cm以下).		Contact resistance : 200mΩ max. Specification in clause 1-2-2~4,1-3-1~2 shall be satisfied. Operating force:Before test 80%. 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%.			
文控编号：EC-069		编制时间		 SOUNDWELL ELECTRONIC			
版本号：01		2008-3-1					
变更记事：		变更时间					
修改开关按压寿命规格		2009-10-28		DSGD.主 办	CHKD.审 查	APPD.核 准	TITLE 标题：
							ENCODER 编码器
							EC09-10P
							DOCUMENT No.文号：
							EC09