

# 回轉式位元產生器規格書

## ROTATIONAL ENCODER SPECIFICATION

### 一,一般事項 General

1.1 範圍：此規範適用於一般電子機器之微小電流回路用之12mm 迴轉式位元產生器。

Application : This specification applies to the 12mm size rotary encoder (incremental) for microscopic current circuits used in electronic equipment.

1.2 標準範圍 Standard atmospheric conditions

如無特別規定，依下述狀態測定

Unless otherwise specified the standard range of atmospheric conditions for making measurements and tests is as follows :

溫度 Ambient temperature : 15°C to 35°C

相對濕度 Relative humidity : 25% to 85%

氣壓 Air pressure : 86kpa to 106kpa

但如有疑問時，依下述基準狀態實施

If there is any doubt the results. measurement shall be made within the follow limits :

溫度 Ambient temperature : 20±2°C

相對濕度 Relative humidity : 60% to 70%

氣壓 Air pressure : 86kpa to 106kpa

1~3 使用溫度範圍

Operating temperature range : -10 to +70°C

1~4 保存溫度範圍

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

1~5 構造、尺寸 Construction and dimensions : 依組立圖 Refer to attached drawing.

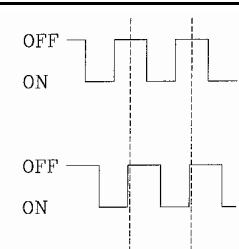
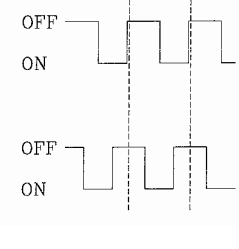
1~6 額定 Rating : D.C 5V 0.5mA

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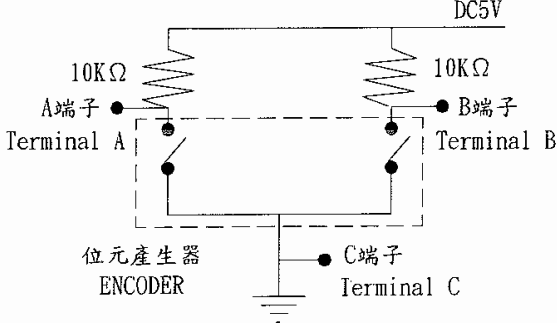
### 二. 電氣性能 Electrical Characteristics

NO.	項目 item	條件 conditions	規格 specifications	
2-1	輸出信號 output signal format		A . B 二信號的輸出時間相位差, 詳細如<圖一>所示. (圖中虛線表示掣子點位置) 2. Phase-different signals ( Signal A. & signal B ) Details shown in < fig.1 > (The broken line shows detent position of with detent type.)	
		軸回轉方向 Shaft rotational direction	信號 Signal	輸出波形output 定速旋轉 360° constant speed :360°
		順時針方向 C. W.	A ( A-C 端子間 ) A ( Terminal A-C )	
			B ( B-C 端子間 ) B ( Terminal B-C )	
反時針方向 C. C. W.	A ( A-C 端子間 ) A ( Terminal A-C )			
	B ( B-C 端子間 ) B ( Terminal B-C )			
2-2	分解能 Resolution	旋轉一圈所產生脈波數目. Number of pulses in 360° rotation .	各相24脈波/360° 24 pulses / 360° for each phase  (1掣子點 1 pulse) (1 click 1 pulse)	

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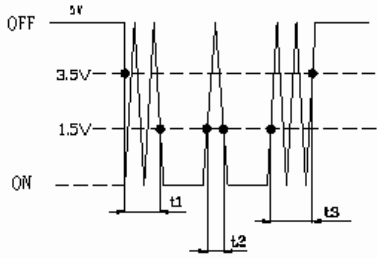
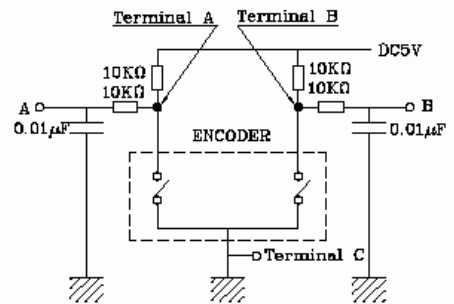
## ROTATIONAL ENCODER SPECIFICATION

NO.	項目 item	條件 conditions	規格 specifications
2-3	切 換 特 性 Switching characteristics	<p>切換測定回路如&lt;圖二&gt;所示，以直流電壓5V、軸迴轉速度為每秒鐘迴轉360°測定。 Measurement shall be made under the condition as follows .</p> <p>(1). Shaft rotational speed : 360° /S (2). Test circuit : &lt; fig. 2 &gt; .</p> <p style="text-align: center;">&lt; 圖二 &gt; &lt; fig. 2 &gt;</p> 	
2-4	滑 動 雜 音 Sliding noise	<p>(1) 震顛雜音 Chattering</p> <p>如 &lt;圖三&gt; 所示，位元由狀態OFF→ON或ON→OFF變化時,輸出電壓在1.5V~3.5V的切換時間稱之</p> <p>Details shown in &lt;fig.3&gt; Specified by the signal's passage time from 3.5V to 1.5V or from 1.5V to 3.5V of each switching position ( code OFF→ON or ON→OFF ) .</p> <p>注意：針對震顛雜音(t1 , t3)部分，請於訊號抓取上加以遮蔽，進行過濾雜訊。 建議追加過濾迴路，如&lt;圖四&gt;所示。</p> <p>Note : To avoid chattering( t1 , t3), please consider masking time and adding C/R filters on your circuit for pulse count design, as show in &lt;fig. 4&gt;.</p>	$t_1, t_3 \leq 3\text{ms}$

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NO.	項目 item	條件 conditions	規格 specifications
		<p>(2) 跳躍雜音 Bounce            如&lt;圖三&gt;所示,位元在ON的狀態時,電壓超過1.5V以上的時間視為.當在位元ON狀態時,與震顛雜音(<math>t_1</math>或<math>t_3</math>)時間間隔小于1ms時,則該跳躍雜音視為震顛雜音的一部份.當在位元ON狀態時,兩個跳躍雜音間的間隔小于1ms時,則視為同一跳躍雜音.            Details shown in &lt;fig.3&gt; .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 chatterings (<math>t_1</math> or <math>t_3</math>), 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 .</p>	$t_2 \leq 2ms$
		<p>(3) 滑動雜音 Sliding noise            位元OFF狀態時的電壓變動.            The voltage change in code-OFF area</p>	3.5V 以上 3.5V MIN.
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>&lt;圖三&gt; &lt;fig. 3&gt;</p>  <p>(<math>t_1, t_3</math>): Masking time to avoid chattering.</p> <p>位元OFF狀態 : 輸出電壓3.5V以上的狀態稱之.            位元ON狀態 : 輸出電壓1.5V以下的狀態稱之 .            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 .</p> </div> <div style="text-align: center;"> <p>&lt;圖四&gt; &lt;fig. 4&gt;</p>  </div> </div>			

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2-5	相位差 Phase-difference	<p>以定速每秒鐘旋轉360°測定之。 Measurement shall be made under the condition which the shaft is rotated in 360°/S(constant speed).</p> <p style="text-align: center;">&lt;圖五&gt; &lt;fig.5&gt;</p> <div style="text-align: center;"> </div> <p>旋轉方向 → Rotational direction</p> <hr style="border-top: 1px dashed black;"/> <p>注意事項： ※ 2-4、2-5之規格，為360° / 秒等速下運轉檢測之，與手動旋轉會有所不同。 ※ 與韌體程式之搭配性，請實際使用測試確認之。 Note : ※ The test is conducted with equipment at constant speed: 360°/S according to Spec. Item 2-4 &amp; 2-5, and the test result could be different from the result by manual test. ※ In order to prove the interoperability between the firmware and the encoder, please test the part in real condition</p>	<p>如圖五所示，in &lt; fig. 5 &gt; <math>\Delta T \geq 3.5 \text{ msec}</math></p>
2-6	絕緣阻抗 Insulation resistance	<p>外加電壓250VD.C 于固定板與任一端子間。 Measurement shall be made under the condition which a voltage of 250VD.C is applied between individual terminals and attaching plate.</p>	<p>固定板與端子間100MΩ 以上。 Between individual terminals and attaching plate 100MΩ MIN .</p>
2-7	耐電壓強度 Dielectric strength	<p>於固定板與任一端子間外加電壓300VA.C. 1分鐘或360VA.C. 2 秒鐘 A voltage of 300V A.C. shall be applied for 1 min or a voltage of 360V A.C. shall be applied for 2 sec between individual terminals and attaching (Leak current : 1mA)</p>	<p>無損傷, 短路及絕緣破壞現象。 Without damage to parts arcing or breakdown .</p>
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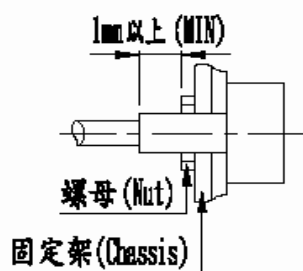
### 三. 機械性能 Mechanical characteristics

NO.	項目 item	條件 conditions	規格 specifications
3-1	全回轉角度 Total rotational angle		360° 回轉 360° ( Endless )
3-2	掣子點轉距 Detent torque		30~200gf.cm
3-3	掣子點數及位置 Number and position of detents		24點掣子點 24 detents (每點角度: $15^\circ \pm 3^\circ$ ) (Step angle : $15^\circ \pm 3^\circ$ )
3-4	端子強度 Terminal strength	外加靜重300gf之力于端子前端之任意方向上1分鐘. A static load of 300gf shall be applied to the tip of terminals for 1 minute in any direction .	端子無損壞或顯著鬆動, 但是端子可允許彎曲 . Without damage or excessive looseness of terminals. Terminal bend is permitted.
3-5	軸擠壓引張強度 Push - pull strength of shaft	在軸之方向加壓力或張力之靜負荷5Kgf . 10秒 ( 實裝狀態 ) . Push and pull static load of 5Kgf shall be applied to the shaft in the axial direction for 10sec .( After installing )	不可有電氣或機械上的異常 Without damage or excessive play in shaft .No excessive bnormality in rotational feeling.
3-6	軸鬆動 Shaft wobble	軸端5mm處, 加上500gf-cm之力矩 . A momentary load of 500gf-cm shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft .	1.0XL/30mmp-p以下(MAX) L : 軸的固定長度 L : Shaft length

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NO.	項目 item	條件 conditions	規格 specifications
3-7	軸回轉方向間隙 Rotation play at the click position	使用角度板測定 Measurement with jig for rotational angle .	4度以內 4° MAX.
3-8	軸垂直側壓強度 Side thrust strength of shaft	軸前端5mm處，加上2Kgf的靜荷重10秒 A load of 2Kf shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft. (After soldeting of the PC board)	不可有電氣或機械上的異常 Without damage or excessive play in shaft .No excessive abnormality in rotational feeling.
3-9	安裝注意事項 Notice for mounting	<p>&lt;圖五&gt;軸受固定示意圖。 Tighten the nut according to &lt;fig.5&gt;</p> <p>&lt;圖五&gt; &lt;fig.5&gt;</p> 	10kgf.cm以下。 Tightening torque to be no greater than 10kgf.cm.

### 四. 耐久性能 Endurance characteristics

NO.	項目 item	條件 conditions	規格 specifications
4-1	回轉壽命 Rotational life	<p>無任何電氣負荷下,軸以每小時600~1000回轉的速度下,持續進行30,000回轉. (1回轉為360°往返各一次)</p> <p>The shaft of encoder shall be rotated to 30,000 cycles at a speed of 600~1000 cycles per hour without electrical load , after which measurement shall be made (1 cycle : rotate 360° C.C.W. rotate 360° C.W.)</p>	<p>震顛雜音: <math>t_1, t_3 \leq 5\text{ms}</math> 跳躍滑動雜音: <math>t_2 \leq 3\text{ms}</math> 相位差: <math>\Delta T \geq 2.5\text{msec}</math> 付摯子點機種需有摯子點的感觸。 其它初期值亦需滿足 Chattering: <math>t_1, t_3 \leq 5\text{ms}</math> Bounce: <math>t_2 \leq 3\text{ms}</math> Phase-difference : <math>\Delta T \geq 2.5 \text{ msec}</math> Detent feeling has to remains. (Applied for detent type ) Except above items, specifications in clause 2.1~7 and 3.1~8 shall be satisfied.</p>

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## ROTATIONAL ENCODER SPECIFICATION

### 五. 焊錫耐熱性 Soldering condition

NO.	項目 item	條件 conditions	規格 specifications
5-1	人工手焊 Manual Soldering	溫度350°C以下,時間3秒鐘以內。 Bit temperature of soldering iron : 350°C or less Application time of soldering iron : within 3s.	不可發生絕緣體變形,破損 以及感觸異常。 There shall be no deformation or cracks in molded part. No excessive abnormality in rotational feeling.
5-2	自動焊錫 Dip soldering	使用基板:t1.6兩面銅箔積層板。 Printed wiring board : Both-sided copper clad amine board with thickness of 1.6mm . 助焊劑:發泡式助焊機內置比重0.82以上的助焊劑。 發泡面高度為基板板厚之2/3。 <b>Flux :</b> • Specific gravity : 0.82 or more . • Flux shall be applied to the board using a bubble foaming type fluxed . • The board shall be soaked in the flux bubble only to the 2/3 of its thickness. 預熱條件:基板表面溫度100°C以下,時間2分鐘以內 Preheating : • Surface temperature of board : 100°C or less • Preheating time : within 2 min . 焊錫爐條件:溫度 260 ± 5°C ,時間 5 ± 1 秒以內。 Soldering : • Solder temperature : 260 ± 5°C . • Immersion time : 5 ± 1 sec . 以上工程以一次或兩次為宜。 Apply the above soldering process for 1 or 2 times .	

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# SWITCHES SPECIFICATIONS

## 6. 開關電氣性能 Switch Electrical characteristics

NO.	項目 Item	試驗條件 Test conditions	規格 Specifications
6-1	接觸阻抗 contact resistance	以D.C.定電流電壓降下法測定之。 Measured by decides the electric current D.C. voltage drop method.	100 mΩ以下 (MAX)
6-2	震顛雜音 Chattering	一週期動作(OFF-ON-OFF)為1秒鐘。 Switch is operated at the rate of 1 cycle 1 sec. The 1 cycle shall be OFF-ON-OFF.	10 msec以下 (MAX)
6-3	耐電壓 Dielectric strength	端子與固定板間外加A.C. 300V 1分鐘或外加A.C.360V 2秒鐘測定。(Leak電流：1mA) A voltage of 300V A.C. shall be applied for 1 min or a voltage of 360V A.C. shall be applied for 2 sec between individual terminals and attaching plate.(Leak current：1mA)	無損傷，變形或絕緣破壞現象。 Without damage to parts arcing or breakdown.
6-4	絕緣阻抗 insulation resistance	外加D.C. 250V於端子與固定板間。 Measurement shall be made under the condition which a voltage of 250V D.C. is applied between individual terminals and attaching plate	端子與固定板間100MΩ以上。 Between individual terminals and attaching plate：100MΩ MIN.
6-5	定格容量 (抵抗負荷) Switch rating (Resistor load)		D.C.5V 10mA
備註：軸與開關端子間絕緣。 Note：Shaft is insulated from switch terminal.			

## 7. 開關機械性能 Switch Mechanical characteristics

NO.	項目 Item	試驗條件 Test conditions	規格 Specifications
7-1	開關回路 接點數 Contact arrangement		單極單投 (PUSH ON) S.P.S.T (PUSH ON)
7-2	開關移動量 Switch stroke		0.5 (+0/-0.3) mm
7-3	開關作動力 Switch strength		450±200gf

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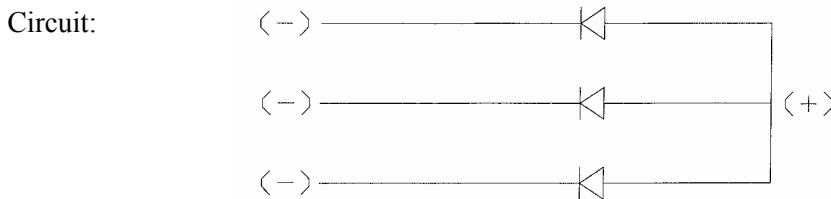
# SWITCHES SPECIFICATIONS

## 8、開關耐久性能 Switch Endurance characteristics

NO.	項目 Item	試驗條件 Test conditions	規格 Specifications
8-1	操作壽命 Operating life	無負荷狀態下動作20,000回。 The shaft of switch shall be 20,000 times with electronically load, after which measurements shall be made.	接觸阻抗: 200mΩ以下 開關作動力: 滿足初期規格值之+10%/-30%。 其它項目均需滿足初期規格值 Switch contact resistance : 200mΩ MAX. Switch strength : Relative to the previously specified value +10%/-30%. Except above items Specification in clause 6.1~4 and 7.1~3 shall be satisfied.

## 9. L.E.D.共用規格書 COMMON SPECIFICATIONS

一、回路:



二、L.E.D. 特性 Characteristic:

1 反轉電壓 Reverse Voltage:5V

2 使用溫度 Operating Temperature:-40°C~+85°C

3

發光色 Emitted color	功率消耗 Power dissipation (mW)	直流下向電流 DC Forward Current (mA)	試驗條件 Test conditions IF=20mA		
			直流順電壓 Forward voltage(V)		
			標準值 Typ	最大值 MAX	
紅色/綠色/藍色 Red/Green/Blue	紅色 Red	60	25	2.0	2.4
	綠色 Green	110	25	3.3	3.7
	藍色 Blue	110	25	3.3	3.7

**ROHS COMPLIANCE**

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