回轉式位元產生器規格書

ROTATIONAL ENCODER SPECIFICATION

一,一般事項 General

1~1 適用範圍 Application

范圍：此規范適用於一般電子機器這微小電流回路用之20mm迴轉式位元產生器

Application: This specification applies to 20mm size rotary encoder(incremental) for microscopic current circu used electronic equipment.

1~2 標準狀態 Standard atmospheric conditions

若無特別規定, 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 : 5℃ to 35℃

相對濕度 Relative humidity : 45% 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 about the results, measurements shall be made within the following:

溫　度 Ambient temperature : 20±2℃

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 : 0℃ to +40℃

1~4 保存溫度範圍

Storage temperature range:-40℃ to +70℃

1~5 構造, 尺寸 Construction and dimensions 依組立圖 Refer to attached drawing

1~6 額定 Rating : D.C10V 1mA (Resistive load)

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TOP-UP INDUSTRY CORP.

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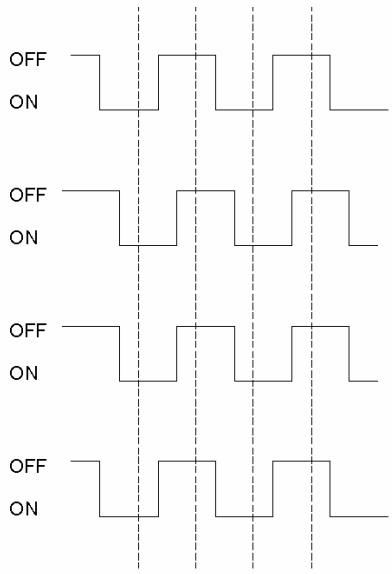
二. 電氣性能 Electrical Characteristics

NO.	項 目 item	條 件 conditions	規 格 specifications
2-1	輸 出 信 號 output signal format	< 圖一 > < fig. 1 >	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定位置) 2. Phase-different signals (Signal A. & signal B) Details shown in < fig.1 > (The broken line shows detent position of with detent type.)
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12脈波/360° 12 pulses / 360° for each phase (2掣子點 1 Pulse) (2 click 1 pulse)

軸回轉方向 Shaft rotational direction	信 號 Signal	輸出波形 Output 定速旋轉 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)	

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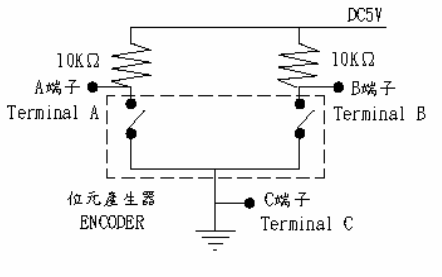
NO.	項 目 item	條 件 conditions	規 格 specifications
2–3	切 換 特 性 Switching characteristics	切換測定回路如<圖二>所示, 以直流電壓10V, 軸回轉速度為每秒鐘回轉360°測定 . Measurement shall be made under the condition as follows . (1). Shaft rotational speed : 360° / S (2). Test circuit : < fig. 2 > . < 圖二 > < fig. 2 >  	
2–4	滑動 雜 音 Sliding noise	(1) 震顫雜音 Chattering 如〈圖三〉所示，位元由狀態OFF→ON或ON→OFF變化時,輸 出電壓在1V~4V的切換時間稱之。 Details shown in <fig.3> Specified by the signal's passage time from 1V to 4V or from 1V to 4V of each switching position (code OFF→ON or ON→OFF) . 注意：針對震顫雜音(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<圖四>所示。 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 <fig. 4>.	t_1 , t_3 ≦3ms

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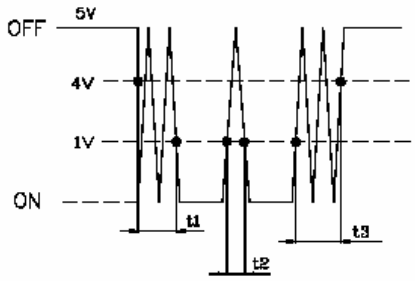
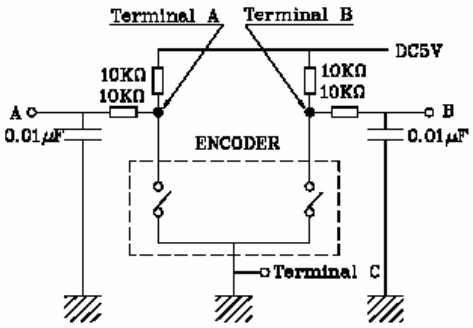
NO.	項　目 item	條　件 conditions	規　格 specifications
		(2) 跳躍雜音 Bounce 如<圖三>所示,位元在ON的狀態時,電壓超過1V以上的時間視為.當在位元ON狀態時,與震顛雜音(t_1或t_3)時間間隔小于1ms時, 則該跳躍雜音視為震顛雜音的一部份 . 當在位元ON狀態時, 兩個跳躍雜音間的間隔小于1ms時, 則視為同一跳躍雜音 . Details shown in <fig.3> .Specified by the time of voltage change exceed 1V in code - ON area . When the bounce has code - ON time less than 1ms between chatterings (t_1 or t_3) , 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 .	t2 ≦ 2ms
		(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	4V 以上 4V Min.

<圖三> <fig.3>



<圖四> <fig. 4>



(t1, t3) : Masking time to avoid chattering.

(t1,t3)Masking time to avoid chattering.
位元OFF狀態 ： 輸出電壓4V以上的狀態稱之 .
位元ON狀態： 輸出電壓1V以下的狀態稱之 .
Code - OFF area : The area which the voltage is 4V or more .
Code - ON area : The area which the voltage is 1 V or less .

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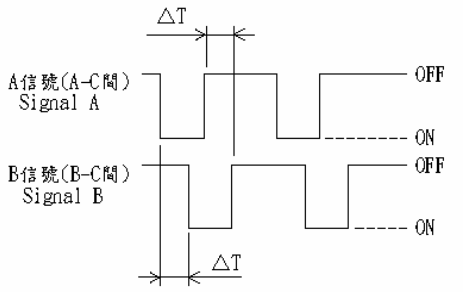
NO.	項　目 item	條　件 conditions	規　格 specifications
2–5	相位差 Phase-difference	以定速每秒鐘旋轉360°測定之 . Measurement shall be made under the condition which the shaft is rotated in 360° /S (constant speed) <圖五><< fig. 5>  旋轉方向 → Rotational direction	如圖五所示，in < fig. 5> ΔT ≧4 msec
		注意事項 :※2.4-2.5之規格，為360° /秒等速下運轉檢測之，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 & 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.	
2–6	絕緣阻抗 Insulation resistance	外加電壓100V D.C. 於固定板與任一端子間. Measurement shall be made under the condition which a voltage of 100V D.C. is applied between individual terminals and attaching plate.	固定板與端子間100MΩ以上. Between individual terminals and attaching Plate:100MΩ MIN .
2-7	耐電壓強度 Dielectric strength	於旋鈕與任一端子間外加電壓100V AC(50~60Hz , 截止電流2mA)1分鐘 A voltage of 100V AC(50~60Hz, cut-off current 2mA)min or a voltage of 360 VA.C. shall be applied for shall be applied for 1 min between individual terminals and knob(Leak current : 1mA)	無損傷,短路及絕緣破壞現象 . Without damage to parts arcing or breakdown .

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)

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NO.	項 目 item	條 件 conditions	規 格 specifications
3–2	掣子點轉距 Detent torque		60gf.cm MAX
3–3	掣子點數及位置 Number and position of detents		24點掣子 24 detents 每點角度: 15°±3° Step angle : 15°±3°
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 .	端子無損壞或顯著松動, 但是端子可允許彎曲 . Without damage or excessive looseness of terminals . Terminals bend is permitted.
3–5	壓鈕、旋鈕擠壓引張強度 Push-pull strength of knob and puch button	在壓鈕、旋鈕之方向加壓力或張力之靜負荷1Kgf，1秒。(實裝狀態) Push and pull static load of 1Kgf shall be applied to the shaft in the axial direction for 15 sec. (After installing)	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.
3-6	壓鈕、旋鈕回轉方向間隙 Rotation play at the click position	使用角度板測定之 Mesure with jig for rotational angle.	4° 以內 4° MAX.
3-7	耐 振 性 Vibration	編碼器固定於試驗機後，依如下之條件實施試驗後測之 Encoder for testing being fixed on a testing device with a normal practical way and with normal fixing devices and being tested as following： ◎ 振動頻率範圍：10~55Hz The range of vibration：10~55Hz ◎ 全振幅：0.75mm Total width of vibration：0.75mm ◎ 振動頻率比率：10-55-10(Hz)約1 分鐘 The proportion of vibration ： 10-55-10(Hz) approx 1 minute. ◎ 振動頻率變化方法：對數或近似直線 The variation of the number of vibration ：Logarithmic or approximately straight line. ◎ 振動方向：互相垂直3 方向(含操作部) The directions：3 vertical direction including operation direction. ◎ 試驗時間：各30 分鐘(計1.5 小時) Duration：30 minutes each (total 1.5 hours)	接觸阻抗(4-1 項)：40mΩ以下 絕緣阻抗(4-2 項)：10MΩ以上 耐電壓(4-3 項)：AC 500V 1 分鐘絕緣不得破壞。 動作力(5-1項)：依個別規格、外觀、構造無異常現象 Contact resistance (4-1)：Max 40mΩ Insulation resistance (4-2)： More than 10MΩ Withstanding voltage (4-3)：500V AC 1 minute not breaking insulation. Operating force (5-1) ：As per individual specification there shall be no defects in appearance or in the mechanical functions.

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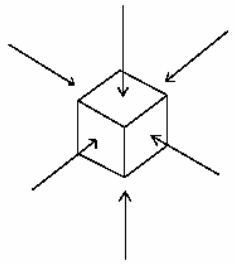
NO.	項　目 item	條　件 conditions	規　格 specifications
3-8	耐衝擊性 Shock	編碼器在以下試驗實施後檢測之 Encoder shall be measured after following test. ◎ 固定方法: 標準固定方式。 Mounting method: Normal mounting method. ◎ 加速度 Acceleration: 490 m/s² ◎ 試驗時間 Duration: 11 ms ◎ 試驗方向 Test direction: 6 面 6 directions ◎ 試驗回合: 各方向3回(共計18回) Number of shocks: 3 times per direction (18 times in total) 	測定電壓 Output voltage (Item 2.3): 1V MAX 絕緣阻抗 Insulation resistance (Item 2.6): 100 MΩ MIN 耐電壓 Voltage proof (Item 2.7): Apply 100V AC for 1min. NO dielectric breakdown shall occur. 無絕緣破壞現象發生。 摯子點轉矩 Rotational torque (Item 3.2): 規格內。Within specified value. 無機械異常現象發生。 Shall be free from mechanical abnormalities.

四. 耐久性能　Endurance characteristics

NO.	項　目 item	條　件 conditions	規　格 specifications
	回轉壽命 Rotational life	無任何電氣負荷下,旋鈕以每小時1800~2100回轉的速度下,持續進行100,000回轉. (1回轉為360°往返各一次) The knob of encoder shall be rotated to 100,000cycles at a speed of 1800~2100 cycles per hour without electrical load , after which measurement shall be made . (1 cycle： rotate 360°C.C.W. rotate 360° C.W.)	震顫雜音: t1,t3≦8mS 跳躍滑動雜音: t2≦5mS 相位差: △T≧4msec 付摯子點機種需有摯子 點的感觸. 其它初期值亦需滿足。 Chattering: t1,t3≦8ms Bounce: t2≦5ms Phase-difference:△T≧4msec 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.

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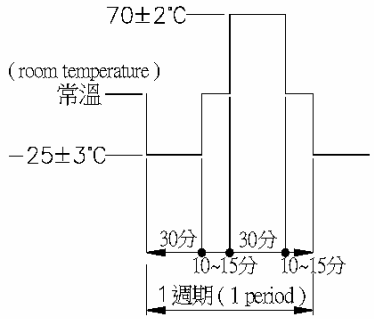
五. 焊錫耐熱性 Soldering condition

NO.	項 目 item	條 件 conditions	規 格 specifications
5–1	人工手焊 Manual Soldering	溫度300℃以下, 時間3秒鐘以內 . Bit temperature of soldering iron : 300℃ or less Application time of soldering iron : 3sec. Max.	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 : t1.6兩面銅泊積層板 . Printed wiring board : Single-sided copper clad laminate 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。 Flux： ＊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。 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.	

6. 耐候性 Weather-proof

NO.	項　目 item	條　件 conditions	規　格 specifications
6–1	耐寒性 Cold proof	-20±2°C放置96小時試驗後，置於常溫常溼中1小時，除去水滴後，在1小時內測定之。 Switch for testing being kept in the conditions at -20±2°C in temperature for 96 hours, and in a normal ambient condition for one hour, then to be measured within one hour.Drop of water being taken away.	接觸阻抗(4-1 項)：40mΩ以下 絕緣阻抗(4-2 項)：10MΩ以上 耐電壓(4-3 項) ： AC500V 1 分鐘絕緣不得破壞・ 動作力(5-1 項)：規定值的+10, -30%以內。 外觀、構造無異常現象。 Contact resistance (4-1)：Max 40 mΩ Insulation resistance(4-2)： More than 10 MΩ Withstanding voltage(4-3) ： 500V AC 1 minute not breaking insulation. Operating force (5-1) ： Within +10, -30% of specifications.There shall be no defects in appearance or in the mechanical functions.
6–2	耐熱性 Hot proof	85±2°C 放置96 小時試驗後，置於常溫常溼中1小時，在1 小時內測定之。 Switch for testing being kept in the conditions 85±2°C in temperature for 96 hours, and in a normal ambient condition for one hour, then to be measured within one hour.	
6–3	耐濕性 Resistance to humidity	在溫度40±2°C 放置，相對溼度90~96%放置96 小時試驗後，置於常溫常溼中1 小時，除去水滴後，在1 小時內測定之。 Switch for testing being kept in the conditions at 40±2°C in temperature 90~96% RH for 96 hours and in a normal ambient condition for one hour then to be measured within one hour. Drop of water being taken away.	
6–4	溫度循環試驗 Change of temperature	以下記條件作5 個週期的試驗後放置1 小時以內測試之，但是水珠必須去除。 After 5 cycles of following conditions, the switch shall be allowed to stand under room temperature and humidity conditions for 1 hour and measurement shall be made within 1 hour after that. Water drops shall be remov  	接觸阻抗(4-1 項)：40mΩ以下 絕緣阻抗(4-2 項)：10MΩ以上 耐電壓(4-3 項) ： AC500V 1 分鐘絕緣不得破壞。 動作力(5-1 項)：規定值的+10, -30%以內。 外觀、構造無異常現象。 Contact resistance(4-1)：Max 40 mΩ Insulation resistance(4-2)：More than 10 MΩ Withstanding voltage(4-3) ： 500V AC 1 minute not breaking insulation. Operating force (5-1) ： Within +10, -30% of specifications. There shall be no defects in appearance or in the mechanical functions.

七、開關電氣性能 Switch Electrical characteristics

NO.	項　目 item	條　件 conditions	規　格 specifications
7–1	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.	300 mΩ 以下 (MAX)
7–2	震顫雜音 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)
7–3	絕緣阻抗 Insulation resistance	外加D.C. 250V 於端子與壓鈕間 Measurement shall be made under the condition which a voltage of 250V D.C. is applied between individual terminals and push button.	端子與壓鈕間100MΩ以上。 Between individual Terminals and push button ：100MΩ MIN.
7–4	耐電壓 Dielectric strength	端子與壓鈕間外加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 push button. (Leak current：1mA)	無損傷，變形或絕緣破壞現象 Without damage to parts arcing or breakdown.
7–5	定格容量 （抵抗負荷） Switch rating (Resistor load)		D.C.10V 1mA (1mA MIN)

備註：壓鈕與開關端子間絕緣。
Note：Shaft is insulated from switch terminal.

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八、開關機械性能 Switch Mechanical characteristics

NO.	項　目 item	條　件 conditions	規　格 specifications
8-1	開關回路,接點數 Contact arrangement		單極單投 (PUSH ON) S.P.S.T (PUSH ON)
8-2	開關移動量 Switching stroke		0.25 (±0.1) mm
8-3	開關作動力 Switch strength		200±50gf

九、開關耐久性能 Switch Endurance characteristics

NO.	項　目 item	條　件 conditions	規　格 specifications
9-1	操作壽命 Operating life	無負荷狀態下動作1000,000 回。 The puch button of switch shall be 1000,000 times without electronically load, after which measurements shall be made.	接觸阻抗: 500mΩ以下 開關作動力：滿足規格值之 +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.

RoHS Compliance

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