



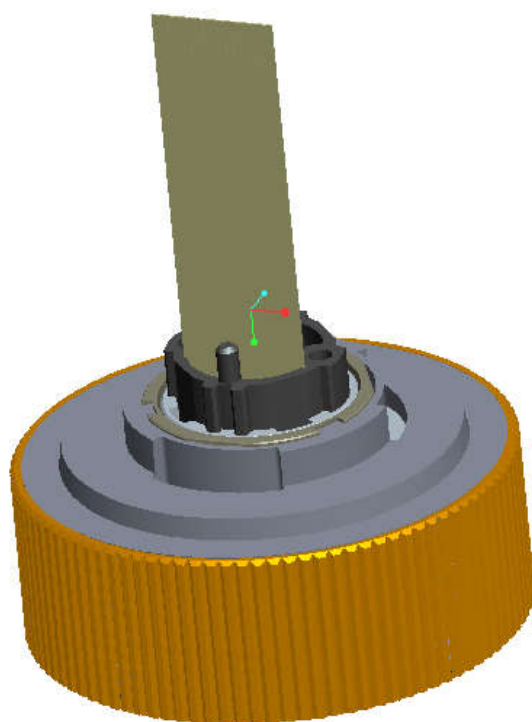
# 东莞市凡睿电子科技有限公司

**DONG GUAN FAN RUI TECHNOLOGY&ELECTRONICS CO., LTD.**

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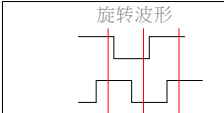
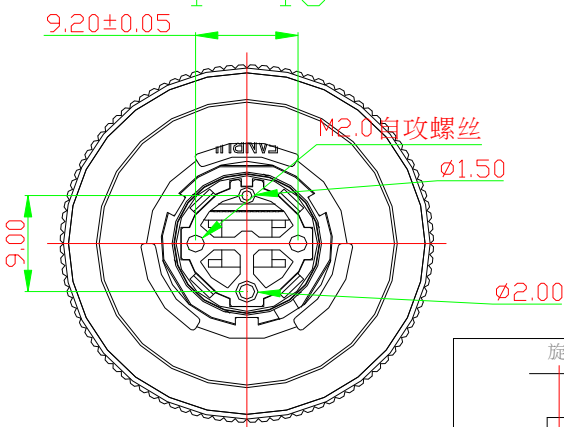
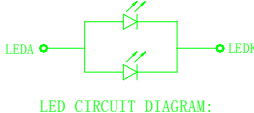
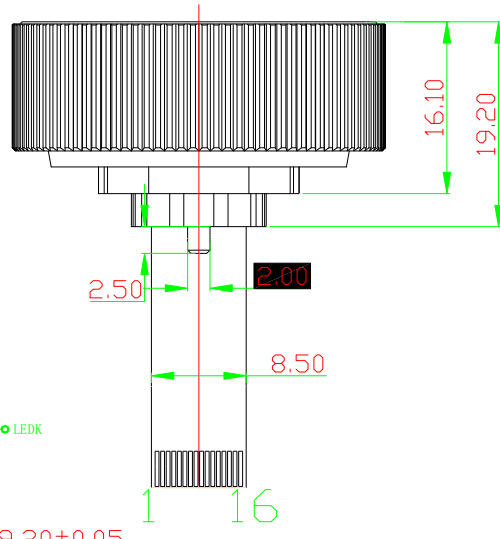
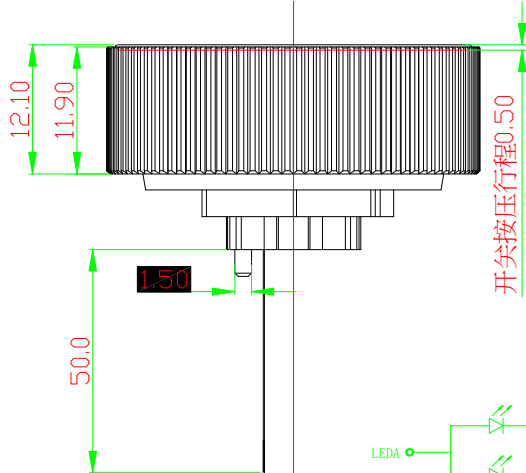
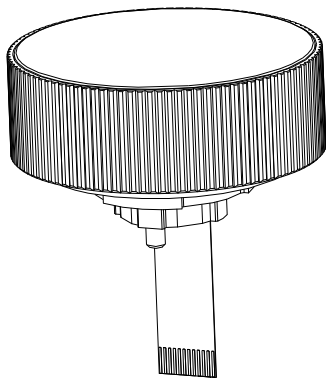
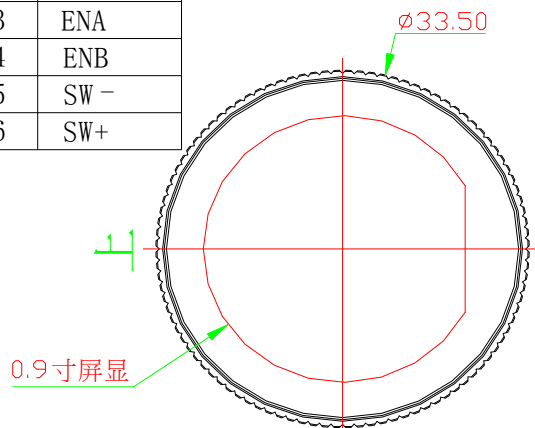
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PIN	EN/SW
13	ENA
14	ENB
15	SW -
16	SW +

PIN	DESCRIPTION
1	GND
2	RESET
3	SDA
4	SCL
5	D/C
6	GND
7	GND
8	VDD
9	SCL
10	LEDA
11	LEDK
12	GND/ENC



**技术说明:**

1. 开关1万次寿命, 编码器3万次寿命,
2. 屏幕0.9寸。
3. 外观光洁, 车制件外观无毛刺, 屏贴合平整。

**附注:**

1. 显示器类型: 0.99“薄膜晶体管
2. 观看方向: 全部
3. 偏光镜模式: 透射式黑色
4. 驱动器集成电路: GC9107
5. 背光: 2个芯片白光LED: 40毫安, 3.0伏
6. LCM亮度: 350 CD/M2 (典型值)

基本参数	脉冲数	9P
	定位点	18HC
	定位脱出力	150±70gf. cm

东莞市凡睿电子科技有限公司 DONG GUAN FAN RUI ELECTRONICS & TECHNOLOGY CO., LTD.		Unit MM	Scale 3 / 1		TOLERANCE		
Title	MZ33 Series	DESIGN	吕单	$\Delta 6$		UNDER 10	$\text{M} 0.3$
Dwg Name	MZ3312S-9-18C150-FR	CHECK	韦英杰	$\Delta 5$		10~100	$\text{M} 0.5$
Dwg NO.		APPROVAL	刘建国	$\Delta 4$		OVER 100	$\text{M} 0.8$
				$\Delta 3$		ANGULAR DIMENSION	$\text{M} \sim$
				$\Delta 2$	Devision	Version	A2
				$\Delta 1$	Date	Design	Rev.



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## 1、一般事項 General

### 1-1 適用規格 Scope

本規格書適用於電子設備用微小電流回路迴轉式編碼器模組。

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

### 1-2 標準狀態 Standard atmospheric conditions

除另有規定外，測量應在以下狀態下進行：

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

溫度 Ambient temperature	: 15°C to 35°C
相對溼度 Relative humidity	: 25 % to 85%
氣壓 Air pressure	: 86 kPa to 106 kPa

1-3 使用溫度範圍 Operating temperature range : - 20 °C to +70 °C

1-4 保存溫度範圍 Storage temperature range : - 35 °C to +85 °C

## 2、構造 Construction

### 2-1 尺寸 Dimensions

見所附成品圖 Refer to attached drawing

## 3、額定值 Rating

3-1 額定電壓: Rated voltage : D.C 5V 10mA(1mA MIN)

## 4、電氣性能 Electrical characteristics

4-1	項目 Item	條件 Conditions	規格 Specifications
	輸出信號 Output signal format	圖一 (fig.1)	AB 兩個信號的相位差輸出波型詳見(圖一)。附卡點時，卡點位子如下圖所示：(虛線表示帶卡點裝置的上孛子處位置) 2 phase-different signals(signal A signal B)Details shown in <fig.1>(The broken line shows detent position)
	軸的迴轉方向 Shaft rotational direction	信號 Signal	輸出波型 Output
	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)	(fig.1)圖 1  A signal OFF ON B signal OFF ON Detent stability position (When the switch is provided) CW direction ※Detent position cannot be specified for B signal.

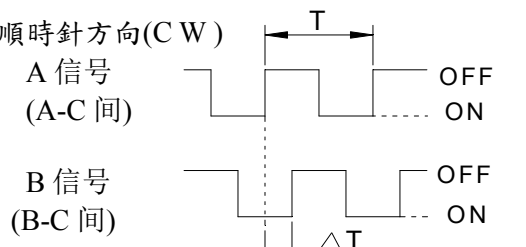
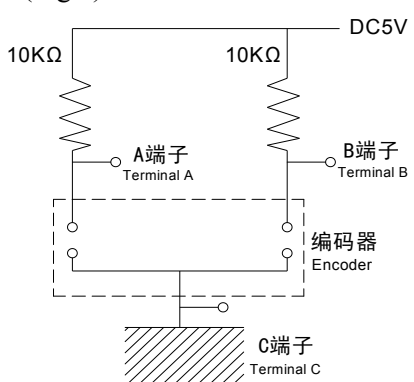
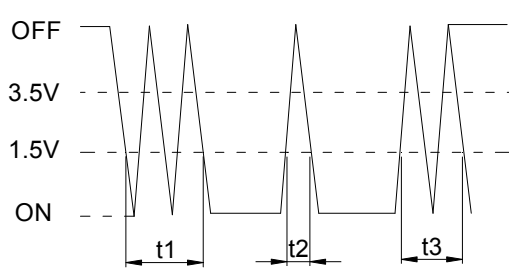


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	項目 Item	條件 Conditions	規格 Specifications
4-2	分解能力 Resolution	迴轉一周的輸出脈衝數 Number of pulses in 360° rotation	☑ 9 個脈衝/360° 9 pulses/360° for each phase
4-3	相位差 Phase-difference	<p>(圖 2) 所示回路, 軸以 360°/s 的速度轉動測定。 Measurement shall be made under the condition which the shaft is rotated at 360°/s 圖 2 (fig.2)</p> <p>順時針方向(CW)</p> 	見(圖 2) MIN $\Delta T \geq 0.08T$ in (fig.2)
4-4	切换特性 Switching Characteristics	<p>下(圖 3)所示迴路, 軸以 360°/s 的速度迴轉測定。 Measurement shall be made under the condition as follows. 1) Shaft rotational speed : 360°/s 2) Test circuit 圖二(Fig.3)</p>  <p>圖 4(Fig.4)</p>  <p>(註) 編碼器 ON 指輸出電壓 1.5V 以下的狀態。 編碼器 OFF 指輸出電壓 3.5V 以上的狀態。 (note) Code-ON area : The area which the voltage is 1.5V or less Code-OFF area : The area which the voltage is 3.5V or more</p>	
4-4.1	滑動雜音 Chattering	編碼從 OFF→ON 或 ON→OFF 時, 輸出的通過時間應符合規定。 Specified by the signal's passage time from 1.5V to 3.5V of each switching position (code OFF~ON or ON~OFF)	t1, t3 $\leq 3\text{ms}$ 帶卡點時, 在卡點位置上的 B 信號振盪無規定。 On the case within detent, B Signal will be irregular Oscillation.

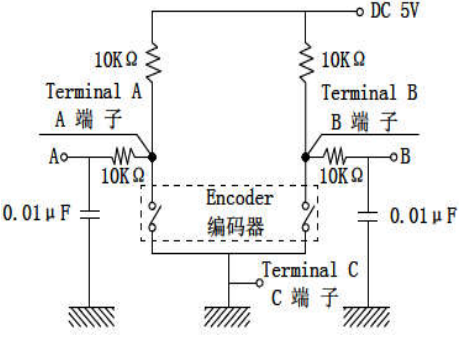


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	項目 Item	條件 Conditions	規格 Specifications
4-4.2	(突跳) Sliding bounce	編碼 ON 部份的 1.5V 以上的電壓變動時間在振盪 t1,t3 之間會產生 1ms 以上 1.5 V 以下的 ON 部份。另外，如果各突跳間 1.5V 以下的範圍在 1ms 以上時，則判定為另一個突跳。如上圖三(Fig.3) Specified by the time of voltage change exceed 1.5V in code-ON area. 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.	$t_2 \cong 2\text{ms}$
4-5	耐電壓 Dielectric strength	在端子和軸套間施加 A.C.300V 電壓 1 分鐘。 A voltage of 300V A.C. shaft be applied for 1min between individual terminals and bushing.	不得有絕緣破壞 Without arcing or breakdown.
4-6	絕緣阻抗 Insulation resistance	在端子和軸套間施加 D.C.250V 1mA Measurement shaft be made under the condition which a voltage of 250V D.C. is applied between individual terminals and bushing.	端子和軸間電阻 100MΩ 以上 Between individual terminals and bushing: 100MΩ Min.
4-7	接觸電阻 Closed Circuit Resistance	用 D.C 5V 1mA 電壓降下法測定 Voltage step-down test at D.C.5V 1ma	3 ohms maximum
4-8	RC 濾波電路 RC Filter circuit	在脈衝計算或選項控制的運用時，盡可能採用右圖所示的濾波電路過濾雜訊 For the implementation of the pulse count or menu control, always use the RC filter circuit right as below.	
5、機械性能 Mechanical characteristics			
5-1	全迴轉角度 Total rotational angle		360°(無止擋點) 360°(Endless)
5-2	卡點出脫力矩 Detent torque	只適用於附卡點裝置 Only suitable for C.C. equipment.	$\checkmark 150 \pm 700 \text{gf.cm}$



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	項目 Item	條件 Conditions	規格 Specifications
5-3	定位點數及位置 Number and Position of detents	只適用於附卡點裝置 Only suitable for C.C, equipment.	<input checked="" type="checkbox"/> 18 點定位(間隔角度 $20^{\circ}\pm 3^{\circ}$ ) 18 detents(Step angle : $20^{\circ}\pm 3^{\circ}$ )
5-4	端子強度 Terminal strength	端子前端的任意方向施加 500gf 的靜負荷力 1 分鐘。 A static load of 500gf shall be applied to the tip of terminals for 1 min in any direction.	端子不得有明顯鬆動及接觸不良,但允許變形。 Without excessive play in terminal or poor contact.
5-5	軸的推拉強度 Push-pull strength of shaft	在軸端,沿軸向施加 50N(5.1kg)的推力和拉力各 10 秒鐘。(在 PCB 焊錫後) Push and pull static load of 50N(5.1kg) shall be applied to the shaft in the axial direction for 10S.(After installing)	端子不得有明顯鬆動及接觸不良。電氣性能無異常。 Without damage to. Or excessive play in shaft no excessive abnormality in rotational feeling. And electrical characteristics shaft be satisfied.
5-6	耐焊接熱 Resistance to soldering heat	在第七條的條件下。 Specified by the clause 7 "Soldering conditions".	不得有絕緣體的破損、變形。接觸無異常。 Electrical characteristics shall be satisfied. Nomechanicalabnormalitysuch as a excessive play.
5-7	軸擺動 Shaft wobble	在軸前端 5mm 處,沿徑向瞬間施加 500gf 的力。 A momentary load of 500gf shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft.	軸受長 Bushing Length (mm) 2.0 5.0 L:軸受固定面至施力点之距離 L:measurement point from mounting surface of bushing. 軸擺動 Wobble 以下 (mm p-p MAX) 1.1xL/30mm 0.7xL/30mm
5-8	軸的軸向間隙 Shaft play in axial direction	在軸上加 5N(0.51Kgf)的押引荷重。 Push and pull static load of 5N shall be applied to the shaft in the axial direction.	0.4mm p-p 以內 0.4mm p-p MAX
5-9	軸的垂直押引強度 Side thrust strength of shaft	在軸前端 5mm 處加 30N(3.06Kgf)的靜負荷力 10 秒鐘。 A load of 30N shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft.	軸不得有明顯鬆動及接觸不良。 Without excessive play of bending in shaft. No mechanical abnormally.



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	項 目 Item	條 件 Conditions	規 格 Specifications
<b>6、耐久性能 Endurance characteristics</b>			
6-1	迴轉壽命 Rotational life	<p>在無負荷條件下軸以 600~1000/h 速度迴轉 30,000 周。</p> <p>The shaft of encoder shall be rotated to 30,000 cycles at a speed of 600~1000/h without electrical load, after which measurements shall be made.</p>	<p>振盪: <math>t_1, t_2 \leq 3mS</math></p> <p>卡點出脫力矩初始值-30%~+10%</p> <p>Chattering <math>t_1, t_2 \leq 3mS</math></p> <p>Detent torque initial value-30%~+10%</p>
6-2	耐濕性 Damp heat	<p>溫度 <math>40 \pm 2^\circ C</math>、濕度 90~95% 的恆溫恆濕槽中放置 <math>240 \pm 10</math> 小時後，在常溫、常濕中放置 1.5 小時後測試。</p> <p>The encoder shall be stored at temperature of <math>40 \pm 2^\circ C</math> with relative humidity of 90% to 95% for <math>240 \pm 10</math> in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H. After which measurements shall be made.</p>	<p>應滿足初期規格。</p> <p>Specifications in clause</p>
6-3	耐熱性 Dry heat	<p>溫度 <math>80 \pm 3^\circ C</math> 的恆溫箱中放置 <math>240 \pm 10</math> 小時，常溫、常濕放置 1.5 小時後測量。</p> <p>The encoder shall be stored at a temperature of <math>80 \pm 3^\circ C</math> for <math>240 \pm 10H</math> in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H. After witch measurement shaft be made.</p>	<p>應滿足初期規格。</p> <p>Specifications in clause</p>
6-4	低溫特性 Cold	<p>溫度 <math>-20 \pm 3^\circ C</math> 的恆溫箱中放置 <math>240 \pm 10</math> 小時，常溫、常濕放置 1.5 小時後測量。</p> <p>The encoder shall be stored at a temperature of <math>-40 \pm 3^\circ C</math> for <math>240 \pm 10H</math> in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H. After witch measurement shall be made.</p>	<p>應滿足初期規格。</p> <p>Specifications in clause</p> <p>4.1~4.6 and 5.1~5.3 shall be satisfied.</p>
6-5	耐落下性 Free falling	<p>製品從 60cm 高度以任意方向自由落到鋪展在水泥地面上的塑膠墊上。</p> <p>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.</p>	<p>沒有明顯的變形、破損。應滿足初期規格。(但端子變形除外)</p> <p>No excessive deformation or damage. (Except the deformation of terminals.)</p> <p>And specifications in clause 4.1~4.6 and 5.1~5.3 shall be satisfied.</p>



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## 7、焊接條件 Soldering conditions

### 7-1 手工焊接 Manual soldering

溫度 300°C 以下，時間 3 秒以內。

Bit temperature of soldering iron :300°C or less. Application time of soldering iron :within 3s.

### 7-2 槽焊 Dip soldering

使用基板：t=1.6 的單面覆銅板。

Printed wiring board : Single-sided copper clad laminate board with thickness of 1.6mm.

焊劑：採用比重為 0.82 以上的焊料和發泡式助焊劑，浸入深度不超過基板厚度的二分之一，且基板表面不得有焊劑流入。

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. Flux shall not come into contact with the component side surface.

預熱：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.

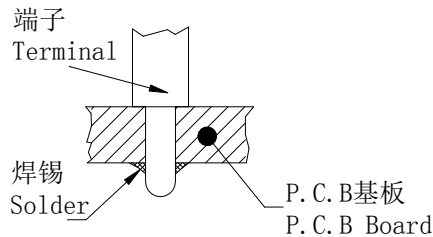
### 7-3 焊接：溫度 260°C±5°C 以下、時間 3±1 秒以內。以上操作不得重覆二次以上。

Soldering : Solder temperature:260°C or less. Immersion time: Within 3s. Apply the above soldering process for 1 or 2 times.

## 8、焊接注意事項 Note for soldering method

### 8-1 如下圖所示，請不要在 P.C.B 板上面焊接處附近配線。

Please avoid soldering on upper surface (the component side surface) of the PC board as shown below.



插腳式機種焊線圖

### 8-2 焊接洗淨後,如果焊劑流入編碼器內可能會產生接觸不良,請注意!

After the clean welding, if the flux into the encoder may cause poor contact, please note!

## 9、其它使用方面的注意事項 Precautions in use.

### 9-1 避免儲藏與高溫潮濕及腐蝕的場所，產品溝入後盡可能在 6 個月內使用完。拆包裝後未使用完的剩餘產品需儲藏於防潮防毒的環境下。

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.

### 9-2 對編碼器脈衝數的處理、設計時，要充分考慮速度、脈衝調制時間和雜音干擾等因素。在實際確認後再使用!

As design of the pulse count process. Care should be taken with operational speed.

### 9-3 本製品在卡點上使 A 相在 OFF 狀態下比較安定,軟件設計時以 A 相為標準。

With this part detent positions we always be aligned with a-off phase. Therefore Make the a phase the reference at the soft ware design stage.

### 9-4 本製品本體若接觸水分則對脈沖波形能產生異常影響,避免直接接觸水分。

This product when touching wet or water can be influence the pulse wave.

### 9-5 本製品對軸不能施加橫壓力,為避免製品機能損傷,應事先設置旋鈕方向。

The shaft can't be over pressure. For avoided damaged the function, please Pre-setting the button direction.

### 9-6 本製品對軸不要施加過大的沖擊力,以免使產品機能受損。

Please don't shocking the shaft. To avoided damaged the function.





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項目 Item	條件 Conditions	規格 Specifications			
<b>推動開關部份 (帶開關機種使用):</b>					
1、額定容量(電阻負荷): Rated capacity (Resistance load) :D.C.5V 10mA(1mA MIN.)					
2、電氣性能 Electrical characteristics					
2-1	接觸電阻 Contact resistance	用 D.C 5V 10mA 電壓降下法測定 Voltage step-down test at D.C.5V 10ma 200mΩmax.			
2-2	絕緣電阻 Insulation resistance	在端子與安裝板間施加 D.C.250V 1mA Measurement shall be made under the Condition which a voltage 250V D.C 1mA is applied between individual terminals and bracket 在端子安裝板間 100MΩ以上 Between individual Terminals and bracket 100MΩ MIN.			
2-3	耐電壓 Dielectric strength	在端子與安裝板間施加 A.C. 300V 1分鐘或 A.C 60V 2秒鐘(漏電流 1mA) A voltage of 300V A.C/min or 60V A.C/2 nd (leak current 1mA) be applied between individual terminals and bracket 不得有絕緣破壞。 Without arcing or Breakdown. 注意:軸與開關端子間是絕緣的			
3、機械性能 Mechanical characteristics					
3-1	開關電路、接點數 Switch circuit and Number of pulse	單極單投(推 ON) Single pole and single throw(pushon)			
3-2	開關移動量 Travel of switch	0.5±0.3mm			
3-3	開關動作力 Operating force of switch	6±3N (610±306gf)			
4、耐久性能 Endurance characteristics					
4-1	壽命特性 Operating life	在無負荷條件下,對軸以每小時 500 往復速度連續運轉 10,000 往復。在 5000 個往復時進行中間測定。(軸按壓力.1kgf.cm 以下) The encoder's shall be rotated to 10,000 cycles at a speed of 500/h without electrical load. The measurement is done at 5000 cycles (shaft push load: 1kgf.cm Max) 接觸電阻:300mΩ以下。 其它,要滿足初期規格。 Contact resistance:300mΩ MAX. Specification in Clause shall be satisfied			
文件名稱	制訂日期	版本	核准	審核	制訂
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