



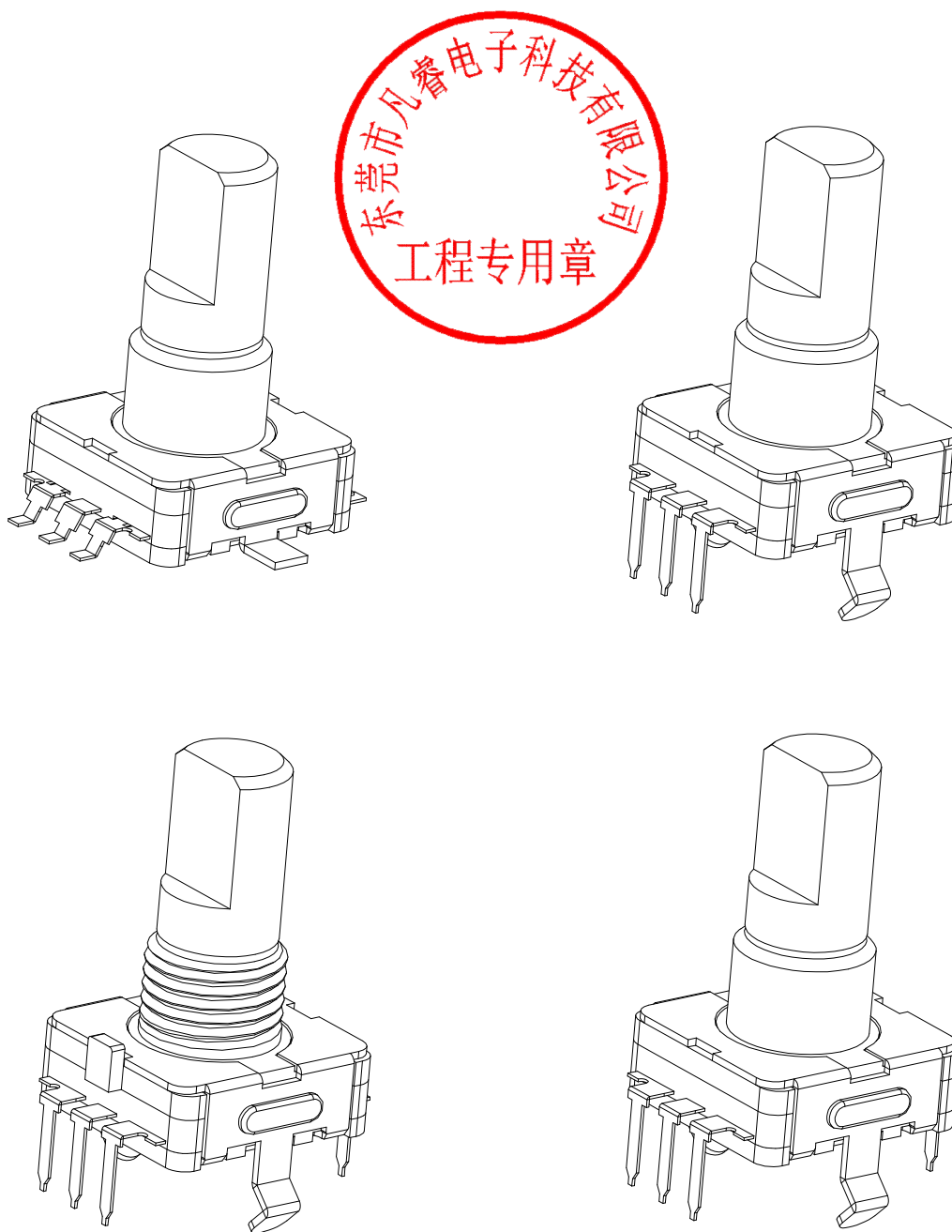
东莞市凡睿电子科技有限公司

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

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ED11 系列旋轉式編碼器規格書



(M7 螺牙/带开关规格书)



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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 11 型薄型迴轉式編碼器。

This specification applies to 11mm size 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

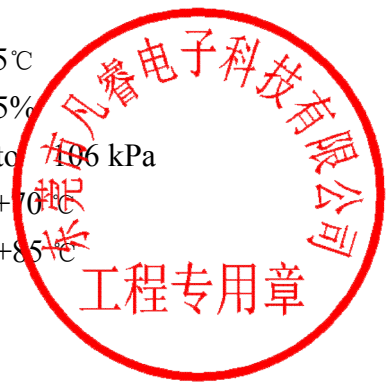
見所附成品圖 Refer to attached drawing

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

	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擎子處位置) 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
4-1	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.



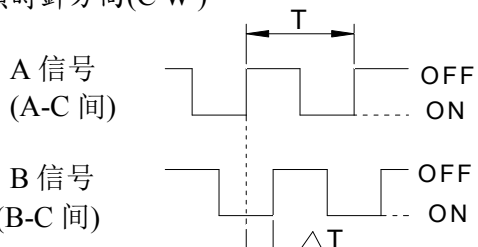
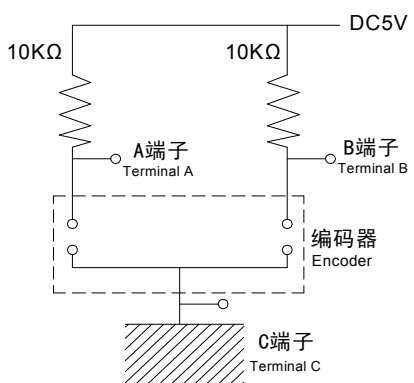
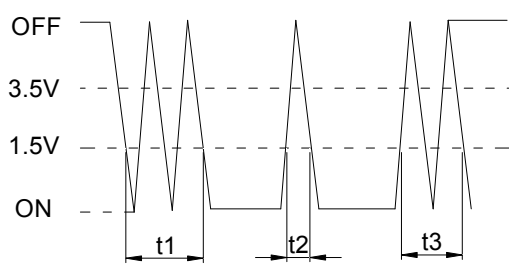


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	項目 Item	條件 Conditions	規格 Specifications
4-2	分解能力 Resolution	迴轉一周的輸出脈衝數 Number of pulses in 360° rotation	<input type="checkbox"/> 15 個脈衝/360° 15 pulses/360° for each phase <input type="checkbox"/> 16 個脈衝/360° 16 pulses/360° for each phase <input checked="" type="checkbox"/> 20 個脈衝/360° 20 pulses/360° for each phase
4-3	相位差 Phase-difference	(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) 順時針方向(CW) 	見(圖 2) MIN $\Delta T \geq 0.08T$ in < fig.2 >
4-4	切换特性 Switching Characteristics	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) 	圖 4(Fig.4) 
4-4.1	滑動雜音 Chattering	編碼從 OFF→ON 或 ON→OFF 時，輸出 1.5V~3.5V 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 ≤ 3mS 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。如上图三(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.	$t_2 \cong 2mS$
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.	<input type="checkbox"/> 60±20gf.cm <input checked="" type="checkbox"/> 100±20gf.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 type="checkbox"/> 16 點定位(間隔角度 22.5°±3°) 16 detents(Step angle : 22.5°±3°) <input checked="" type="checkbox"/> 20 點定位(間隔角度 18°±3°) 20 detents(Step angle : 18°±3°) <input type="checkbox"/> 30 點定位(間隔角度 12°±3°) 30 detents(Step angle : 12°±3°)								
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 80N(8.1kg)的推力和拉力各 10 秒鐘。(在 PCB 焊錫後) Push and pull static load of 80N(8.1kg) 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. Nomechanical abnormality such 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.	<table border="0"> <tr> <td>軸受長 Bushing Length (mm)</td> <td>軸擺動 Wobble 以下 (mm p-p MAX)</td> </tr> <tr> <td>5.0</td> <td>1.1xL/30mm</td> </tr> <tr> <td>7.0</td> <td>0.7xL/30mm</td> </tr> <tr> <td>9.0</td> <td>0.5xL/30mm</td> </tr> </table> L:軸受固定面至施力點之距離 L: measurement point from mounting surface of bushing.	軸受長 Bushing Length (mm)	軸擺動 Wobble 以下 (mm p-p MAX)	5.0	1.1xL/30mm	7.0	0.7xL/30mm	9.0	0.5xL/30mm
軸受長 Bushing Length (mm)	軸擺動 Wobble 以下 (mm p-p MAX)										
5.0	1.1xL/30mm										
7.0	0.7xL/30mm										
9.0	0.5xL/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 abnormality.								
5-10	軸套鎖緊強度 Bushing nut Tightening strength	依下圖(圖五)安裝方式。 Tighten the nut according to 圖五 (fig.5) 	6.2 in-lbs (7.1Kgf·cm) 以下之力使用。 Tightening torque to be no greater than 6.2 in-lbs								



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	項目 Item	條件 Conditions	規格 Specifications
6、耐久性能 Endurance characteristics			
6-1	迴轉壽命 Rotational life	在無負荷條件下軸以 600~1000/h 速度迴轉 30,000 周。 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.	振盪: $t_1, t_2 \leq 3\text{mS}$ 卡點出脫力矩初始值-30%~+10% Chattering $t_1, t_2 \leq 3\text{mS}$ Detent torque initial value-30%~+10%
6-2	耐濕性 Damp heat	溫度 $40 \pm 2^\circ\text{C}$ 、濕度 90~95% 的恆溫恆濕槽中放置 240 ± 10 小時後，在常溫、常濕中放置 1.5 小時後測試。 The encoder shall be stored at temperature of $40 \pm 2^\circ\text{C}$ with relative humidity of 90% to 95% for 240 ± 10 in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H. After which measurements shall be made.	應滿足初期規格。 Specifications in clause
6-3	耐熱性 Dry heat	溫度 $80 \pm 3^\circ\text{C}$ 的恆溫箱中放置 240 ± 10 小時，常溫、常濕放置 1.5 小時後測量。 The encoder shall be stored at a temperature of $80 \pm 3^\circ\text{C}$ for $240 \pm 10\text{H}$ in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H. After witch measurement shaft be made.	應滿足初期規格。 Specifications in clause
6-4	低溫特性 Cold	溫度 $-20 \pm 3^\circ\text{C}$ 的恆溫箱中放置 240 ± 10 小時，常溫、常濕放置 1.5 小時後測量。 The encoder shall be stored at a temperature of $-40 \pm 3^\circ\text{C}$ for $240 \pm 10\text{H}$ in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H. After witch measurement shall be made.	應滿足初期規格。 Specifications in clause 4.1~4.6 and 5.1~5.3 shall be satisfied.
6-5	耐落下性 Free falling	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。 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.	沒有明顯的變形、破損。應滿足初期規格。(但端子變形除外) No excessive deformation or damage. (Except the deformation of terminals.) And specifications in clause 4.1~4.6 and 5.1~5.3 shall be satisfied.

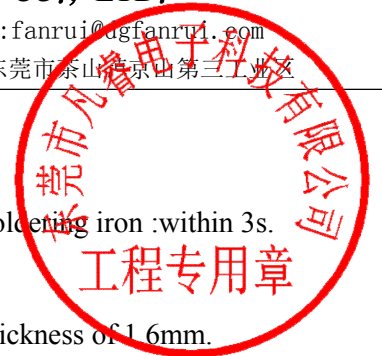


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7、焊接條件 Soldering conditions

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.

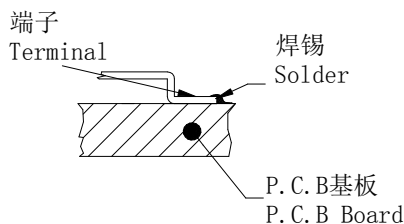
7-3 焊接：溫度 260°C±5°C 以下、時間 3±1 秒以內。以上操作不得重覆二次以上。

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

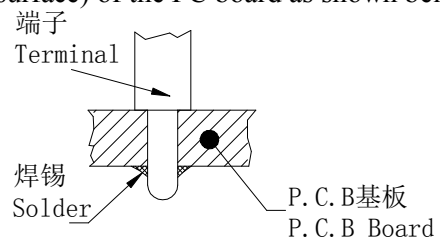
8、焊接注意事項 Note for soldering method

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.



贴片式机种焊线图



插脚式机种焊线图

8-2 焊接洗净后,如果焊剂流入编码器内可能会产生接触不良,请注意!

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			
10、推動開關部份 (带开关机种使用): 額定容量(電阻負荷): Rated capacity (Resistance load) :D.C.5V 10mA(1mA MIN.)						
10-1、電氣性能 Electrical characteristics						
10-1-1	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	300mΩmax.			
10-1-3	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.			
10-1-4	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 etween 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			
10-2、機械性能 Mechanical characteristics						
10-2-1	開關電路、接點數 Switch circuit and Number of pulse		單極單投(推 ON) Single pole and single throw(push on)			
10-2-2	開關移動量 Travel of switch		0.5±0.3mm			
10-2-3	開關動作力 Operating force of switch		6±3N (610±306gf)			
10-3、耐久性能 Endurance characteristics						
10-3-1	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 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:200mΩ以下。 其它,要滿足初期規格。 Contact resistance:200mΩ MAX. Specification in Clause shall be satisfied			
	文件名称	制订日期	版本	核准	审核	制订
	ED11 系列规格书	2010-5-20	A			



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11、包装部分 Packing Portion

11-1 包装材料 Packaging materials

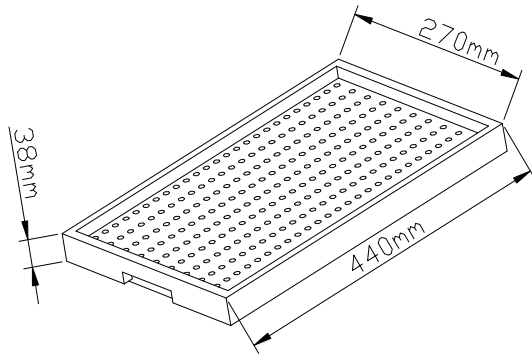
用一盒 250PCS 泡沫盒包装

Pack in a box of 250PCS foam boxes

11-2 泡沫盒尺寸

长*宽*高: 440mm*270mm*38mm

Length * width * height: 440mm*270mm*38mm



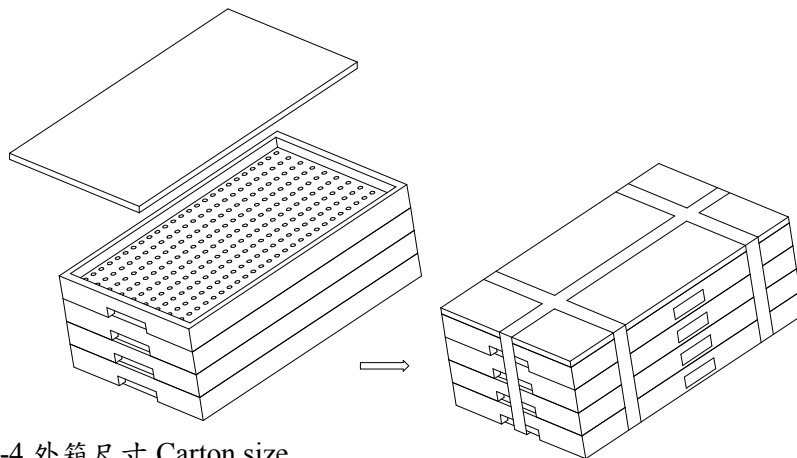
11-3 包装数量 Number of packages

1000PCS/箱: 每盒 250PCS, 共 4 盒。

1000PCS/ Box: 250PCS per box, 4 boxes in total.

2000PCS/箱: 每盒 250PCS, 共 8 盒。

2000PCS/ Box: 250PCS per box, 8 boxes in total.



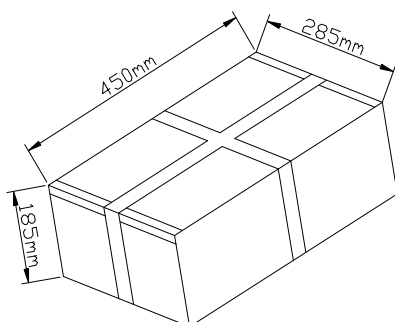
11-4 外箱尺寸 Carton size

1000PCS 外箱长*宽*高: 450mm*285mm*185mm

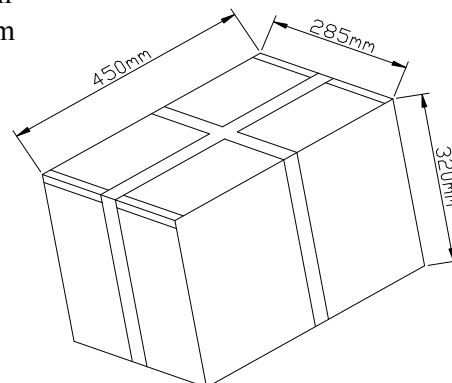
Length * width * height: 450mm*285mm*185mm

2000PCS 外箱长*宽*高: 450mm*285mm*320mm

Length * width * height: 450mm*285mm*320mm



1000PCS Carton



2000PCS Carton