

【總阻值】

將軸（操縱杆）放置在端子 1 或 3 的終端，沒有特別規定測量電阻器的端子 1 和 3 之間的電阻值。

【額定功率】

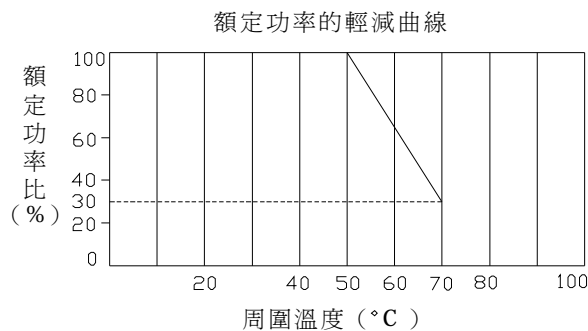
在額定周圍溫度中對電阻體全區域（端子 1 和 3 之 3 間）連續施加負荷功率，以額定功率乘上由下圖的降功耗曲線決定的額定功率比后的值作為最大功率。

[Total resistance]

With the shaft (lever) placed at the termination of terminal 1 or 3, total resistance shall be determined by measuring the resistance between the resistor terminals 1 and 3 unless otherwise specified

[Rated power]

Rated power shall be the maximum value of electric power that can be applied continuously to the whole area of a resistor (between terminals 1 and 3) at the rated ambient temperature. The rated ambient temperature of a carbon film resistor shall be 50°C. The maximum power at an ambient temperature of 50 to 70°C shall be obtained by multiplying the rated power by the rated power ratio determined from the derating curve shown below.



【額定電壓】

作為適應于額定功率的電壓，由下式計算。但，所求的額定電壓超過最高使用電壓時，以此最高使用電壓為額定電壓。

[Rated voltage]

Rated voltage is associated with the rated power and shall be determined by the following equation. When the resulting rated voltage exceeds the maximum operating voltage of a specific resistor, the maximum operating voltage shall be taken as the rated voltage.

$E = \sqrt{P \cdot R}$	
E: 定格電壓 (V)	rated voltage (V)
P: 定格功率 (W)	rated power (W)
R: 公稱全抵抗值 (Ω)	total nominal resistance (Ω)

【抽頭間電阻值】

測量抽頭和規定的端子（端子 1 和端子 3）之間的電阻值。

[Tap resistance]

Determined by measuring the resistance between a tap terminal and a specified terminal (terminal 1 or terminal 3).

【殘留抵抗值】

將軸（操縱杆）放置在端子 1 側的終端，測量端子 1 和 2 之間的電阻值。然後，把軸（操縱杆）放在 3 端子側的終端，測量端子 1 和 3 之間的有抽頭的旋轉和（移動）和（操縱杆），測量抽頭與端子 2 之最小電阻值。

[Residual Resistance]

With the shaft (lever) placed at the termination of terminal 1, the resistance shall be measured between the terminals 1 and 2. Next, with the shaft (lever) placed at the end of terminal 3, the resistance shall be measured between the terminals 2 and 3. If there are tap terminals, the shaft (lever) shall be turned (moved) and the resulting minimum resistance between the tap terminal and the terminal 2 shall be measured.

【最大減衰值】

將軸放置在端子 1 側的終端，測量端子 1 和 2 之間的電壓，算出對端子 1 和 3 之間的電壓比。此外，只要沒有特別規定，可代替用于調節音量用旋轉型電位器的量用旋轉型電位器的終端電阻值適用。

【插入損失】

將軸放置在端子 1 的終端，測量端子 1 和 2 之間的電壓，算出端子 1 和 3 之間的電壓比。此外，只有沒有特別要規定，可代替用于調接音量用旋轉型電位器的終端電阻值適用。

【滑動雜音】

與具有 JIS C 6443 規定的頻率性能和增幅器連接，在端子 1 和 3 之間加上 20V 的直流電壓（額定電壓為 20V 以下時，以此電壓），使（還操縱杆）以每分約 30 轉的速度旋轉（移動）進行測量。

【耐電壓】

在規定的地方加上一分鐘交流電壓，觀察有無弧光，燒毀，絕緣破壞等逆常。試驗可一次性在各自的端子上進行。只要沒有特別規定，應進行下述地方的試驗。但，在結構上導電的地方，可不進行該部分的試驗。

【絕緣電阻】

用規定的電壓絕緣電阻計測量規定的地方。只要沒有特別規定，應對下列的地方進行試驗。在構造上已接通機構處，此部分可不進行試驗。

【耐電壓和絕緣電阻的測量點】

- 端子和軸（操縱杆）之間
- 端子和金屬（殼架）之間
- 連接在獨立的電阻體端子和連接在其他電阻體端子之間
- （多聯型時）
- 開關端子和軸之間
- 開關端子和電阻端子之間
- 開關端子和金屬罩之間

【Maximum Attenuation Level】

With the shaft placed at the termination of terminal 1, maximum attenuation level shall be determined by measuring the voltage applied between the terminals 1 And 2, and calculating the ratio to the voltage applied between the terminals 1 and 3.

Unless otherwise specified, the value obtained shall be used in place of the residual resistance of a rotary potentiometer for volume control

【Insertion Loss】

With the shaft placed at the termination of terminal 3, insertion loss shall be determined by measuring the voltage applied between the terminals 1 and 2 and calculating the ratio to the voltage applied between the terminals 1 and 3, Unless otherwise specified, the value obtained shall be used in place of a rotary potentiometer for volume control.

【Sliding Noise】

Measured by connecting the resistor to an amplifier having frequency characteristics specified in JIS C 6443, Applying DC voltage of 20V between the terminals 1 and 3 (if rated voltage is 20V or less, this voltage shall be applied) and by rotating (moving) the shaft (lever) at a speed of about 30 cycles per minute.

【Voltage Withstand】

Determined by applying AC voltage to the specified locations for one minute and checking for any are, burning, dielectric breakdown and other abnormalities Respective terminals may be. tested together .The locations described below shall be tested unless otherwise Specified. However, if the section concerned is so constructed as to conduct, that particular part shall not be Tested.

【Insulation Resistance】

Measured with a megger by applying specified voltage to the specified locations the locations below shall be tested unless otherwise specified . However, if the section concerned is so constructed as to conduct, that particular part shall not by tested.

【Measuring Locations For Withstand Voltage and Insulation Resistance】

- Between terminal and shaft (lever)
- Between terminal and metal cover (frame)
- Between terminal connected to separate resistor element and terminal connected to another resistor element (of multi-ganged-unit)
- Between switch terminal and shaft
- Between switch terminal and resistance terminal
- Between switch terminal and metal cover

【相互偏差】

將軸（操縱杆）放置在規定的位置，在有端子 1 和 3 之間以 $1,000\pm 200\text{Hz}$ 分別施加 2~15v（正懸波有效值）的試驗電壓，測量電位器的端子 2 和規定的端子（端子 1 或端子 3）之間的電壓，由下式算出。此外，如果對判斷不產生，試驗電壓還可以使用直流。

【Gang Error】

With the shaft (lever) placed in the specified position, gang shell be determined by applying test voltage of 2 to 15v (sine-wave

RMS value) between the terminals 1 and 3 at $1,000\pm 200\text{Hz}$ and measuring the voltage between the resistor terminal 2 and the specified terminal (terminal 1 or 3) and then by using the following equation.

If there are no questions on determination, DC voltage may be applied for this test.

$$\text{相互偏差 Gang error} = 20 \log \frac{V_2}{V_1}$$

在這里 V_1 ：作為基準的電位器端子 1 和 2 之間的電壓（電阻規規律 C,E,逆 D 時，端子 2 和 3 之間的電壓）。

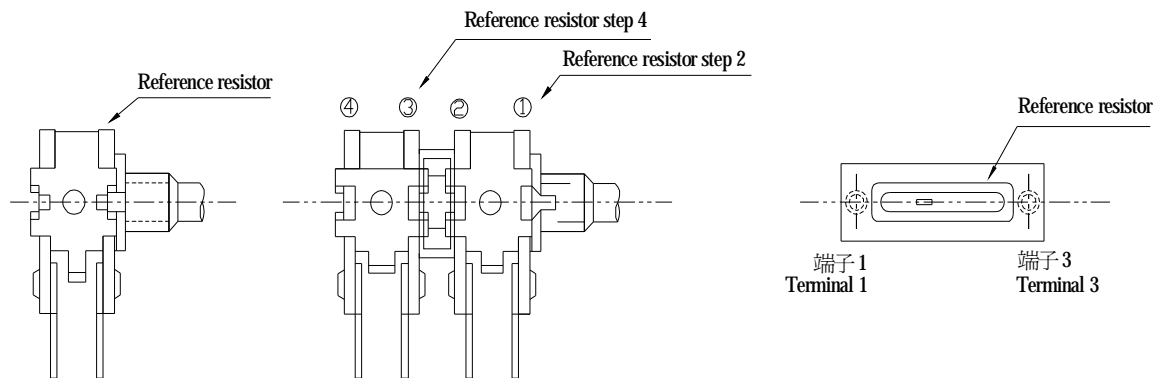
V_2 ：基準以外就電位器端子 1 和 2 之間的電壓（電阻規規律 C,E,逆 D 時，端子 2 和 3 之間的電壓）。

有軸頭時，在軸頭和端子 1 之間（電阻規律為 C 時，在軸頭和端子 3 之間）連接相當於額定電阻值 1/10 的固定電阻器進行測量。

Where V_1 : Voltage between the reference resistor terminals 1 and 2 (voltage between the terminals 1 and 3 if the resistance tapers are C,E and reverse D)

V_2 : Voltage between the non-reference resistor terminals 1 and 2 (voltage between the terminals 1 and 3 if the resistance tapers are C, E and reverse D)

If there is a tap terminal, measurement shall be made by Connecting a fixed resistor whose resistance is equivalent To 1 / 10 of the nominal total resistance between the tap Terminal and the terminal 1 (if the resistance taper is C, Make connection between the tap terminal and the terminal 3).



【開關接觸電阻】

沒有特別規定時，在接點間施加 1A5v 直流，測量接點閉合時的電壓降，算出接觸電阻。

【Contact Resistance of Switch】

Unless otherwise specified, contact resistance of switch shall be determined by measuring drop voltage when 5v DC, 1A is applied between contacts and the contacts are closed.

機器的性能 Mechanical Performance----

【全旋轉角度（操縱杆移動距離）】

測量將軸（操縱杆）從端子 1 側的終端位置轉到端子 3 側的終端位置（移動）時的旋轉角度（移動距離）。

【Total Rotational Angle (Travel)】

Determined by measuring the rotational angle (travel) when the shaft (lever) is turned (moved) from the termination position of terminal 1 to termination position of terminal 3.

【旋轉扭矩（動作力）】

測量軸（操縱杆）旋轉（移動）所需的旋轉扭矩（動作力）。沒有特別規定時，在周圍溫度為 5~35℃時進行，軸的旋轉速度為每目秒 60°，操縱杆的移動速度為每秒 20mm。

【Rotational Torque (Operating Force)】

Determined by measuring the torque (operating force) necessary to turn (move) the shaft (lever). Unless otherwise specified, measurement shall be made at an ambient temperature of 5 to 35℃, and the shaft rotational speed shall be 60° per second and the lever moving speed 20mm per second.

【起動旋轉扭矩（起動力）】

測量長時間放置后，第一次旋轉（移動）軸（操縱杆）時需要的旋轉扭矩（動作力）。沒有特別規定時，應在周圍溫度為 5~35℃時進行，軸旋轉速度為每秒 60°，操縱杆的移動速度為每秒 20mm。

【Starting Torque (Starting Force)】

Determined by measuring a torque (operating force) necessary to turn (move) the shaft (lever) for the first time after allowing the test piece to stand for a long period of time. Unless otherwise specified, measurement shall be made at an ambient temperature of 5 to 35℃, and the shaft rotational speed shall be 60° per second and the lever moving speed 20mm per second.
Remarks : To be specified only when required in particular

【軸晃動】

自基準面，在距軸端處 3mm 以內的互相從不同的方向垂直上直給軸施加 0.1N·m（絕緣軸 50mN·m）的彎曲力矩，測定位于自基準面 30mm 位置的抖動偏差大小。但，軸的長度不到 30mm 時，按比例進行計算。

【Shaft Wobble】

Determined by measuring the amount of deflection at a position of 30mm from the reference surface with a bending moment of 0.1N.m (50m N .m for insulated shaft) applied perpendicularly to the shaft from 180° different directions at a point within 3mm from the place where a smooth cylindrical surface of the shaft ceases to exist. However, if the length of the shaft is less than 30mm, proportional calculation shall be used.

【軸的終端止擋強度（操縱杆移動止擋強度）】

將軸（操縱杆）放置在端子 1 的終端，在其方向上施加規定的力矩（力）10 秒鐘。然後，將軸（操縱杆）放在端子 3 的終端，同樣也施加規定扭力矩（力）之後，檢查操作部及關聯部分的變形，破壞。

【Allowable Operating Torque for Shaft (Lever)】

With the shaft (lever) placed at the termination of terminal 1, a specified torsional moment (force) shall be applied in that direction for 10 seconds. Next, the shaft (lever) shall be placed at the termination of terminal 3 and a specified torsional moment (force) shall be applied similarly, to check the control part and other related sections for any deformation or breakage.

【推拉強度（操縱杆推拉強度）】

向軸（操縱杆）的軸方向分別施加規定大小的力度 10 秒鐘后，檢查操作部及相關部分的變形，損壞狀態。

【Push-pull Strength (Lever Push-pull Strength)】

A specified force shall be applied in the axial direction of the shaft (lever) for 10 seconds to check the control part and other sections for any deformation or breakage and for operating condition.

耐久性能 Durability---

[回轉壽命(滑動壽命)]

在超過 90%有效回轉角度(總移動量)的情況下，軸(把手)將可達到每小時 600 轉(一個往返運動計為 1 轉)且達每天 5,000 至 8,000 轉。
除非有其他的特別指定，以下的需要將會於測試完成後達成：
總電阻的變異數：±15%
轉動噪音：低於 150mV

[耐熱性(僅碳素皮膜電阻)]

在將一電阻置於一個溫度達 70±3℃的測試實驗室達 240±8 小時後，該電阻會被拿出實驗室放置 90 分鐘，接下來測試其總電阻，總電阻的變異性以及運轉表現。

除非有其他的特別指定，此總電阻的變異性將與測試前之數值相差介於+5%及-30%之間，電阻仍可正常運轉。

[抗溫度特性(適用於碳素皮膜電阻)]

在電阻置於一個溫度達 70±3℃的且 5 小時無運轉後，總電阻值將可立即被測量。
除非有其他的特別指定，此總電阻的變異性將與測試前之數值相差請參照下表：

溫度特性 Temperature characteristics		Unit: %	
抵抗變化特性 Taper		B	B以外 Other than B
公稱全抵抗值 Normal total resistance			
10KΩ 以下	10KΩ max.	+5 -20	+5 -20
10KΩ and over to 1M	incl.	+5 -25	+5 -30
Over 1MΩ		+5 -30	+5 -35

[耐濕負荷(僅碳素皮膜電阻)]

定價的直流電(設定在最高的操作溫度環境下)被應用在一個熱對流的溫度達 40±2℃，溼度達 90%-95%的房間下達一個半小時，且中斷半小時。再重複此一循環約 350±10 小時後，此一樣本將被放至一個常溫且溼度正常的房間無運轉 5 小時，接下來測試總電阻值，絕緣抵抗以及轉動噪音。
除非有其他的特別指定，此總電阻的變異性將與測試前之數值相差介於±20%之間，且噪音值小於 150mV。

[Rotational Life (Sliding Life)]

The shaft (level) shall be turned at a speed of 600 cycles per hour (counting 1 reciprocating motion as 1 cycle) and 5,000~8,000 cycles a day over 90% of the effective rotational angle (total travel).
Unless otherwise specified, the following requirements shall be met after the test is completed:
Variation in total resistance: ± 15%
Slider noise: less than 150mV

[Heat Resistance (Carbon-film Resistor Only)]

After allowing the resistor to stand in a test chamber of 70±3℃ for 240±8 hours, it shall be taken out of the test chamber and allowed to stand for 1 hour and 30 minutes, then the total resistance shall be measured and a variation in total resistance and its mechanical performance shall be examined. Unless otherwise specified, the variation in total resistance in reference to the value given before the test shall be within ±⁵₃₀ % and the resistor shall remain mechanically operative.

【Resistance Temperature Characteristics (Applicable to Carbon-based Films)】

The total resistance shall be measured immediately after allowing the resistor in a test chamber of 70±30℃ for 5 hours without load.
Unless otherwise specified, the variation in total resistance in reference to the value given before the test shall be in accordance with the following table

[Moisture Resistance Under Load (Carbon-Film Resistor Only)]

Rated DC voltage (maximum operating temperature if any) shall be applied in a thermohydrostatic chamber of 40±2℃ and 90~95% for 1 hour and 30 minutes and then shall be cut off for 30 minutes. After repeating this cycle for 350±10 hours, the specimen shall be allowed to stand in a room of normal temperature and humidity for more than 5 hours without load, then the total resistance, insulation resistance and slider noise shall be measured.
Unless otherwise specified, the variation in total resistance in reference to the value given before the test shall be within ±20% and the slider noise shall be less than 150mV.

全制品共通 Common for all products---

[一般通性]

1: 於目錄上介紹的產品皆已由自動化電子儀器設計且製造，如果這些產品將要使用於需要更高安全性及可靠性的複雜儀器時，請確認其相容性或與我們確認相關細節部分。

2: 雖然我們已經盡最大的努力以維持所有產品的品質，我們並無法保證我們的產品不會造成短路或開放性電路。因，此當在設計以安全為第一優先的設備或儀器時，請預先仔細研讀一個開關的單一功能失效對整個設備的影響性，以理解提供一個安全防設計的防護性電路。

3: 假如您想要改變您模組內我們產品的路線時，請通知我們。

[焊接組合至 PC 板程序]

1: 請注意假如在焊接時負荷適用於端子時，在電子的表現上將可能承受毀壞或缺陷。

2: 在處理端子時請務必注意務使用過度的壓力並設計適當的焊接環境。

3: 在實際量產的條件下請辨別焊接環境。

4: 假如您使用的是穿洞的或者是比一般厚度更小的 PC 板時，請預先適切地檢測焊接環境，因為會有更大的熱度壓力。

5: 假如您使用的是比一般厚度更小的 PC 板，在鑲嵌時請務必注意產品的突起變形。

6: 焊接開關與止動裝置於相對的止動位置。將開關焊接於止動裝置的中心點可能使止動裝置的功能變形。

7: 在焊接鎖結構的開關時，先解開鎖。在焊接時若未將鎖結構打開，焊接的高熱將使鎖的結構破壞變形。

8: 在焊接第二次時，請等到第一次和接的部分降溫到常溫狀態。持續地加熱將會使外部變形，端子鬆脫，或可能減低它們的電器特性。

9: 宜避免使用水溶性焊接溶劑或有機酸性溶劑，因為可能品的溶解或毀壞。

[General]

1: The products being introduced in this catalog have been designed and manufactured for automotive electronic devices. In case this products are used for more sophisticated equipment requiring higher safety and reliability, please make verification of conformity or check on us for the details.

2: Although we are exerting our best efforts to maintain the quality of these products, we cannot guarantee that they will never cause short circuiting and open circuitry. Therefore, when designing an equipment or device with which the priority is given to the safety, you will please carefully study the influences to the whole equipment of a single function failure of a switch in advance to make out a fail-safe design providing necessary protective circuits.

3: If you intend to change the way of our products being used on your module, please let us know.

[Soldering and assemble to PC board process]

1: Note that if the load is applied to the terminals during soldering, they might suffer deformation and defects in electrical performance.

2: Always handle the terminals paying attention not to apply excessive stress and design appropriate soldering conditions.

3: Verify soldering conditions under actual mass production conditions.

4: If you use a through-hole PC board or a PC board with smaller thickness than recommended, please previously check the soldering conditions adequately, because there is larger heat stress.

5: If you use a PC board with smaller thickness than recommended, please pay enough attention to rising of products when mounted

6: Solder the switches with detent at the detent position. Soldering switches fixed at the center of the detent may deform the detent mechanisms.

7: Before soldering switches with locking mechanism, release the locks. If they are soldered without releasing the locks, the soldering heat may deform the locking mechanism.

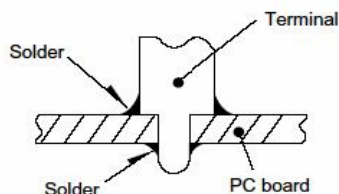
8: When soldering twice, wait until the first soldered portion cools to normal temperature. Continuous heating will deform the external portions, loosen or dislodge terminals, or may deteriorate their electrical characteristics.

9: Use of water-soluble soldering flux or organic acid flux shall be avoided because it may cause corrosion or damage of the products.

10: 當使用自動浸泡機焊接時，特別注意物讓溶劑泡沫滲透產品，因為通常會產生太多泡沫。尤其注意當你有發光二極體或接地端子時。

11: 在 PC 板上的溶劑泡沫不應該緊黏在開關上。

12: 避免使用線路設計以及熱溶劑焊接於 PC 板的上表面因為可能造成接觸不良。



13: 當產品的機板鑲嵌後必須放入烤箱讓接著處硬化時，請與我們諮詢。

[清洗工程]

1: 不要使用溶劑類的物品清洗產品。

[結構設計]

1: 孔的大小以及鑲嵌 PC 板的形式，請參照產品圖記載之建議尺寸。

[使用環境]

1: 因為產品不是密閉的構造，因此外在的灰塵可能造成接觸不良。所以在使用前務必注意使用環境的防塵措施。

2: 假如你在下列環境使用我們的產品時，與空氣接觸部分的硫化及氧化進程會加速，進而造成接觸不良，因此要注意下列環境：

(1)：地處硫磺氣產生的硫磺溫泉，或是位於汽車經常排放廢氣之處。

(2)：假如有下列在開關建立處的模組內的零件，請遵照指示。

*: 材料、塑料、接著劑、合板、捆包材料、機器內部使用的潤滑劑等，不要使用可能會產生硫化或氧化氣體的部分

*: 當你使用矽膠、潤滑油、接著劑以及機油時，記得使用那些不會產生低分子硅.氧.烷.氣，因為會在接觸部分產生矽氧化膜，進而導致接觸不良。

10: Take most care not to let flux foam penetrate the products when you perform auto-dip soldering, which may sometimes produce too much foam. Take special care when you have LED or grounder terminals.

11: Flux from around and above the PC board should not adhere to the switches.

12: Avoid employing wiring designs and soldering methods wherewith molten solder flows over the upper surface of PC board as illustrated in the schematic drawing since it can cause occurrences of imperfect contacts.

13: When the board on which the products are mounted has to be put in the oven so as to harden adhesive for other parts, please consult us.

[Washing process]

1: Do not try to clean the products with a solvent or the like.

[Mechanism design]

1: The dimensions of a hole and pattern for mounting a PC board shall refer to the recommended dimensions in the engineering drawings.:

[Using environment]

1: Since the products do not have sealed structure, it may have contact failure caused by the dust from outside up to the environment. When you use the products, precaution must be taken against the dust.

2: If you use the products in one of the following environmental conditions, progress of sulfuration and oxidization on the contact part will be accelerated, which may cause contact failure. Therefore, be careful about the supposed environment.

(1): Around a sulfurate hot spring where sulfide gas is generated. And in case this product is always used in a place where exhaust gas from automobiles exist.

(2): Follow the directions if you have parts/materials described below within the module where the switch is installed.

*: For parts, rubber materials, adhesive agents, plywood, packing materials and lubricant used for the mechanical part of the device, do not use those ones that may generate gas of sulfurization or oxidization.

*: When you use silicon rubber, grease, adhesive agents and oil, use those that will not generate low molecular siloxane gas. The low molecular siloxane gas may form silicon dioxide coat on the contact part, resulting in the contact failure.

(3): 當你使用化學藥劑如外層塗劑時，請預先讓我們知道。

[儲存方式]

1: 假如你沒有立即使用我們的產品時，請存放於下列環境：存於常溫且避免日曬及腐蝕性氣體。也強烈建議您在六個月之內使用之。

2: 當您拆封後，剩餘部份請用塑膠袋裝好存放於上述環境，並儘速將其用盡。

3: 儘量不要囤積太多存貨。

開關 Switches---

[所有開關的通性]

1: 所有目錄上的產品都被設計並且製造適用於直流電的電阻下。若您使用它種的電阻(誘導性或容量性)請預先讓我們知道。

2: 除非有其他的特別指定，產品若使用 1 伏特電壓以下之直流電或 $10\mu\text{A}$ 電流以下，接觸將變得不穩定。當你要使用這樣的環境時，請預先讓我們知道。

3: 當在使用 SET 鑲嵌程序時請小心保護細小的開關受到外力的破壞。

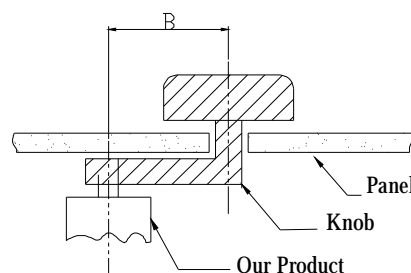
4: 假如使用超過預定的壓力在開關之上，他將會破裂。務必小心別讓開關承受超過預定的壓力。

[滑動開關]

1: 儘量使用接盡總移動量位置的外力總移動量。

2: 將開關水平插入特定的鑲嵌表面，若非水平插入，這些開關將沒有作用。

3: 建議儘量不要使用操作點遠離手把的中線，如下圖所示。B 的尺寸變得越長時，迴轉接觸的影響將更不利。建議您作一個實際環境的測試。



(3): When you apply chemical agents such as coating agents to the products, please let us know beforehand.

[Storage method]

1: If you don't use the products immediately, store it as delivered in the following environment: with neither direct sunshine nor corrosive gas and in normal temperatures. However, it is recommended that you should use it as soon as possible before six months pass.

2: After you break the seal, you should put the remaining in a plastic bag to separate it from the outside and store it in the same environment mentioned above. You should use it up as soon as possible.

3: Do not stack too many goods for storage.

[Comment for all Switches]

1: The products being introduced in this catalog are designed and manufactured assuming that it is to be used with the resistance for direct current. If you use other kinds of resistance (inductive (L) or capacitive (C)), please let us know beforehand.

2: Unless otherwise specified, contact may become unstable if the product is used with a voltage of 1V DC or lower, or a current of $10\mu\text{A}$ or lower. When you use the product for such application, please let us know beforehand.

3: Use care to protect small and thin switches from external forces in the SET mounting process.

4: The switch will be break if you apply a greater stress than that specified. Take great care not to let the switch be subject to greater stress than specified.

[Slide Switches]

1: Use the forced travel as close to the position of the total travel as possible.

2: Insert these switches to the specified mounting surface and mount them horizontally. If not mounted horizontally, these switches will malfunction.

3: It is advisable not to use the operating point away from the center line of the lever as shown. The longer the dimension "B" becomes, the turning touch is influenced unfavorably and we recommend you to conduct a test under actual operation conditions.

[旋轉開關]

1: 使用特定鎖緊工具將鑲嵌螺絲釘旋緊。使用過大的鎖緊工具將使螺絲的紋路破壞或失去效用。

2: 將開關水平插入特定的鑲嵌表面，若非水平插入，這些開關將沒有作用

[按壓式開關]

1: 儘量使用接盡總移動量位置的外力總移動量。

2: 將開關水平插入特定的鑲嵌表面，若非水平插入，這些開關將沒有作用。

[檢波器開關]

1: 儘量使用接盡總移動量位置的外力總移動量。

2: 假如 PC 板變形，他的功能將會改變。仔細設計及安排其格局。

3: 注意這些開關無法在接近操作溫度範圍的上下限長時間使用。工作環境將滿足各種特定環境下的特性。

4: 假如在接近操作溫度範圍的上下限長時間運轉，確認每一個模組的特性是否皆滿足此一運轉情形。

5: 當這些開關設定在開的狀態時，使用這些開關有效地遠離開始位置的移動後位置。

6: 注意開關的迴轉力不能被用來當作牽動任何一套結構的牽引力量。

7: 小心不要在堆積 PC 板的過程或運送途中對運轉中的零件使用橫向的施力。

8: 用軟件設定電路以使任何 SET 不會因那些開關的模式造成的來回或噪音而失去功用。

[Rotary Switches]

1: Tighten the mounting screws by applying the specified torque. Tightening with larger torque than the specified one will result in malfunction or breakage of screws.

2: Insert these switches to the specified mounting surface and mount them horizontally. If not mounted horizontally, these switches will malfunction.

[Push Switches]

1: Use the forced travel as close to the position of the total travel as possible.

2: Insert these switches to the specified mounting surface and mount them horizontally. If not mounted horizontally, these switches will malfunction.

[Detector Switches]

1: Use the forced travel as close to the position of the total travel as possible.

2: If the PC board is warped, its characteristics may change. Carefully design and lay out the patterns.

3: Note that these switches cannot be continuously used for a long time near the upper limit and the lower limit of the operating temperature range. The working conditions shall satisfy the range of each environmental test specified in the specification.

4: In case of continuous operation near the upper limit and the lower limit of the operating temperature, check if the specification of each model satisfies this operation.

5: Use these switches at the travel position sufficiently away from the start position when they are set to ON.

6: Note that the switch-returning force cannot be used as the mechanism driving force of any set.

7: Be careful not to apply transverse force to the operating part while piling up PC board in the process and during transportation.

8: Set circuits (soft setting) so that any SET does not malfunction due to bounce and chattering specified for each model of these switches.

- 1: 假如您使用的是比一般厚度更小的 PC 板，在鑲嵌時請務必注意產品的因外力突起變形。
- 2: 使用特定鎖緊工具將鑲嵌螺絲釘旋緊。使用過大的鎖緊工具將使螺絲的紋路破壞或失去效用。
- 3: 產品若使用 1 伏特電壓以下之直流電或 $10\mu\text{A}$ 電流以下，接觸將變得不穩定。當你要使用這樣的環境時，請預先讓我們知道。
- 4 所有目錄上的產品都被設計並且製造適用於直流電的電阻。若您使用它種的電阻(誘導性或容量性)請預先讓我們知道。:
- 5: 假如使用超過預定的壓力在開關之上，他將會破裂。務必小心別讓開關承受超過預定的壓力。
- 6: 將開關水平插入特定的鑲嵌表面，若非水平插入，這些開關將沒有作用。
- 7: 因為產品不是密閉的構造，因此外在的灰塵可能造成接觸不良。所以在使用前務必注意使用環境的防塵措施。
- 8: [軸的鬆弛]
當長軸被使用時，鬆弛(誤差)將隨著軸長等比例成長。建議在實際操作條件下確認軸的鬆弛。
- 9 : [露水凝結]
請勿在結露或水滴於編碼器樣本表面出現的地方使用本產品，絕緣性降低或短路情形會發生。
- 10 : [化學藥品的使用]
由於使用合成樹脂如 polycarbonate 作為絕緣型態的軸，避免在充滿氣體的環境(含有化學藥品如氨水、胺類，以及鹼水溶液，芳香族碳氫化合物、酮、酯、鹵系碳氫化合物尤其是氣體密度高的環境下)下使用本產品。
- 11 : [在低溫下運轉]
當這些產品被設定使用於低溫的環境下如運用於汽車收音機及汽車音響，我們可以使他們容易更潤滑運轉的移動。在定順序時，指出低溫環境是否為必要。
- 1: Use care to protect small and thin switches from external forces in the SET mounting process.
- 2: Tighten the mounting screws by applying the specified torque. Tightening with large torque than the specified one will result in malfunction or breakage of screws.
- 3: Use of the switches with voltage below 1V DC or current below $10\mu\text{A}$ may make contacts unstable. When using these switches in this way, consult with us beforehand.
- 4: This product is designed and manufactured assuming that it is to be used with the resistance for direct current. If you use other kinds of resistance [inductive (L) or capacitive (C)], consult with us beforehand.
- 5: The switch will be break if you apply a greater stress than that specified. Take great care not to let the switch be subject to greater stress than specified.
- 6: Insert these switches to the specified mounting surface and mount them horizontally. If not mounted horizontally, these switches will malfunction.
- 7: Avoid using these switches in a dusty environment. Dust entering through the openings will result in imperfect contact or malfunction. Take this into account for set design.
- 8: [Looseness of the Shaft]
When long shafts are being employed, the looseness (deviation) tends to grow in proportion to the shaft length. Checking shaft looseness under actual operational conditions is recommended.
- 9: [Dew Condensation]
Do not use this product where dew or water drops might occur on the pattern surface of the encoder, etc. Insulation deterioration or shorting may occur.
- 10 : [Use of Chemicals]
Since synthetic resins such as polycarbonate are being used as the material for the insulated type shafts, avoid using this product under gassy environments containing such chemicals as ammonia, amines, alkaline water solutions, aromatic hydrocarbons, ketones, esters and halogenated hydrocarbons, especially under intensive gas environments
- 11 : [Operation at Low Temperature]
When these products are expected to be used under low temperature environments such as applications for easier and more smooth rotary movements. When placing orders, indicate whether the low temperature specification is necessary or not

12 : [處理有開關的產品]

在包裝或存放有按鍵式開關的解碼器時，避免讓開關的軸是按進去的，小心不要損壞到開關的部分。

12 : [Handling of Products with Switches]

Avoid packaging or storing encoders with push-on switches with their shafts push-in. Be careful not to damage the switch portion.

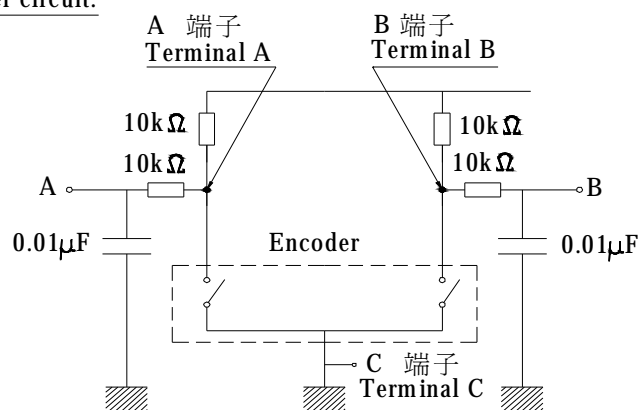
13 : [脈衝計算程序]

有關解碼器的脈衝計算設計、運轉速度、打樣時間、以及光罩時間等應該被納入考量。在使用解碼器之前請務必確認這些要素。在脈衝計算設計時，考慮加上控制繼電器的濾波器於電路上，如下圖所示。

13 : [Pulse count process]

With respect to pulse count design of encoders, operational speed, sampling time, and masking time, etc. should be taken into consideration. Be sure to confirm these factors before using the encoder. For your pulse count design, consider adding C/R filers on your circuit as shown below.

Example of filter circuit:



[建議電路結構]

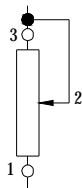
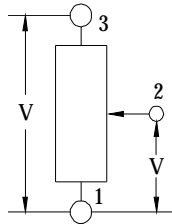
當使用可變電阻時，建議將他們作為電壓調節方法，如圖 A 所示。假如可變電阻如圖 B 作為電路調節方法時，他將會受到在電阻本體以及滑座之間的接觸抵抗影響，視電路設置而定。強烈建議在實際使用條件下作測試。

(圖 A) 電壓調整形

(圖 B) 電流調整形

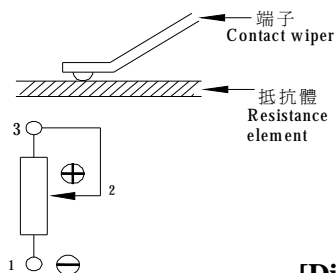
A. Voltage divider type

B. Current controller type



[端子接觸]

應用上當直流電流經電位計的滑桿時，由於有異常增加的電阻抵抗值，可能有陽極氧化的情形產生。在這種情形下，建議將負極線接到抵抗元素，而將陽極線接到滑桿。



[直流電]

當直流電流經此一部分，端子間的絕緣將視使用環境而劣化。這是由於有遷移現象。假如你要在直流電的環境下使用，請與我們聯繫。

[Recommended Circuit Configuration]

When using variable resistors, it is recommended that you use them as voltage adjusting means, as shown in Fig. A. If the variable resistor is used as a current adjusting means as in Fig. B, it may be influenced by the contact resistance between the resistor body and the slide, depending on the set circuit. Conducting a test under actual operating conditions is highly recommended.

[Terminal Connections]

In applications where a direct current is allowed to flow through the potentiometer's sliding arm, there could be a problem of anodic oxidation due to an unusual increase in resistance value. In this case, it is recommended that you connect the negative line to the resistance element and the positive line to the sliding arm.

[Direct Current]

When direct current is flown through this part, terminal to terminal insulation may deteriorate depending on the use environment. This is due to a migration phenomenon. Contact us if you are planning to use this part under direct current.

[殘留抵抗值]

雖然電阻的電極是由鍍銀印刷所造成，我們會提供炭膜覆於銀極上以加強抗硫化的可靠度。

[Reside Resistance]

Although electric poles of resistors are generally formed by sliver printing, we provide carbon coating over the silver poles to enhance reliability against sulfurization. Contact us if you wish to use the part in a low residual resistance state.

[露水凝結]

避免在露水或水滴會出現在電阻表面的地點使用電位計，絕緣劣化或是短路將會產生。

[Dew Condensation]

Avoid using the potentiometer where dew to water drops might occur on the surface of the resistor, etc. Deterioration of insulation or shorting may occur.

[化學藥品的使用]

由於使用合成樹脂如 polycarbonate 作為絕緣型態的軸，避免在充滿氣體的環境(含有化學藥品如氨水、胺類，以及鹼水溶液，芳香族碳氫化合物、酮、酯、鹵系碳氫化合物尤其是氣體密度高的環境下)下使用本產品。

[Use of Chemicals]

Since synthetic resins such as polycarbonate are being used as the material for the insulated type shafts, avoid using this part under gassy environments of such chemicals as ammonia, amines, alkaline water solutions, aromatic hydrocarbons, ketones, esters and halogenated hydrocarbons, especially, under their intensive gas environments.

旋轉電位器 Rotary Potentiometers---

[軸的鬆弛]

當長軸被使用時，鬆弛(誤差)將隨著軸長等比例成長。建議在實際操作條件下確認軸的鬆弛。

[Looseness of the Shaft]

When lengthy shaft lengths are being employed, the looseness (deviation) tends to grow in proportion to the shaft length. Conducting a test under actual operating conditions is recommended.

[底盤鑲嵌]

假如你使用螺帽將此零件鎖到底盤上，過度鎖緊將會影響到運轉接觸的表現，或者毀掉螺紋，故鎖螺帽時請小心操作。

[Chassis Mounting]

In case you are using this part fastening to the chassis using a nut, excessive tightening may deteriorate the rotary contact performance, or strip the threads. Exercise care when tightening the nut

[將可變電阻裝配至開關]

在包裝或存放有按鍵式開關的解碼器時，避免讓開關的軸是按進去的，小心不要損壞到開關的部分。

[Handling of Variable Resistors Equipped with Switches]

Avoid packaging or storing encoders with push-on switches with their shafts pushed-in. Be careful not to damage the switch portion.

滑動電位器 Slide Potentiometers---

[槓桿長度]

設計時盡可能地將基板表面到圓形把手頂端的高度設計得越短越好。越長的鑲嵌高度會使滑動觸感變差。請在實際操作環境條件下確認其表現。

[Lever Length]

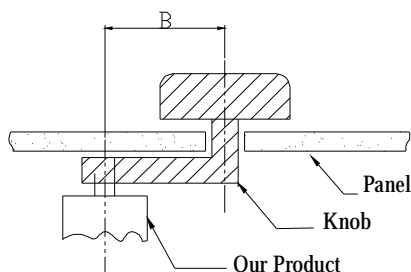
Design the height from the surface of the board up to the top of the knob as short as possible. The longer mounting height will result in worsening of the sliding feel. Verify the performance under actual operational conditions.

[驅動槓桿]

建議儘量不要使用操作點遠離手把的中線，如下圖所示。B 的尺寸變得越長時，迴轉接觸的影響將更不利。建議您作一個實際環境的測試。

[Driving Lever]

It is advisable not to use the operating point away from the center line of the lever as shown., the longer the dimension "B" becomes, the turning touch is influenced unfavorably and we recommend you to conduct a test under actual operation conditions.



[底盤鑲嵌]

避免使用比一般更長的螺絲起子。他們可能會造成更短的移動量以及電位計頂部的損害。

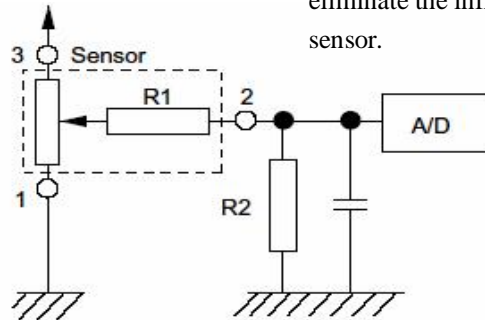
[Chassis Mounting]

Avoid using screws longer than specified. They might cause a shorter travel and the damage in the potentiometer

位置感應器 Position Sensor---

[接觸點阻抗]

因為感應器是被設計來預防輸出端子直接接觸到微電腦的交直流鋪。感應器的內部接觸抵抗被設定在更高的等級。因此，有一個電路的輸出是經由一個如下圖所示電阻接收的，設定這接觸點阻抗(R2)到 1 Mohms (或以上)以消除感應器接觸抵抗值(R1)的影響。



[Connection Impedance]

Since this sensor has been designed on a presumption of connecting its output terminals direct to the A/D port of the microcomputer, the internal contact resistance of the sensor is being set to higher level. Consequently, with a circuit where the outputs are being received through a resistor as in the case exemplified in the drawing given below, set to eliminate the influence of the contact resistance (R2) to 1Mohms or more to eliminate the influence of the contact resistance (R1) of the sensor.

[噪音議題]

當資料由感應器接收時，由於有外部噪音，輸出訊號會受到干擾。為了使這種情形降到最小，建議作以下的測量：

例如)資料必須接收數次並且加以平均，也就是，錯誤取得的資料必須被忽略並重新測量，重複作數次。

[Noise issue]

While data is being received from the sensor, output signal may be disturbed due to some external noise etc. To minimize this situation, the following way of measurement is recommended:

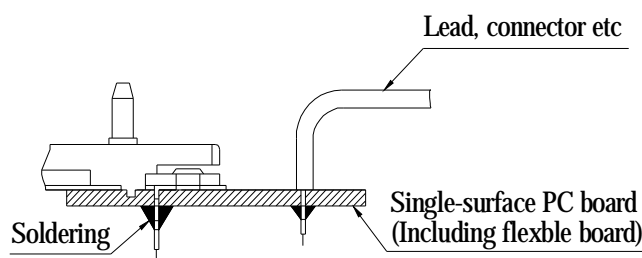
E.g.) Data should be acquired several times and averaged. Also, data which is supposed to be acquired erroneously should be ignored measured again. Repeat this steps.

[焊接]

當焊接端子時，請使用單面或彈性基板。

[Soldering]

When soldering the terminals, employ single-surface PC board or flexible board.



假如雙面基板或鉛被直接焊接，熱度以及焊接物將使端子及電阻間的連結點變鬆，並造成不穩定輸出。(包含使用彈性基板)

If double-face boards or leads are soldered directly, heat and soldering strain may loosen the joints between the resistor and the terminals resulting in unstable outputs. (This includes the cases of using flexible boards.)

[凝結]

在結露會發生或水滴會附著在感應器的電阻表面環境下，請勿使用感應器，因絕緣會劣化或短路會產生。

[Condensation]

Avoid using the sensor under the conditions where condensation might occur or water drops might adhere to the resistor surface of the sensor. Insulation deterioration or shorting may occur.

半固定電位器 Chip Trimmer Potentiometers - -

[洗淨]

焊接之後，我們建議您洗掉附著在焊接接觸點以及電阻表面的鉛錫以及助熔劑，因為會造成其功能喪失。

[迴轉制動裝置]

（1）：無迴轉制動裝置的可變電阻。當軸被轉到超過有效的角度時，兩端子間的電路將會打開。如果 IC 或其他裝置害怕開放性電路造成的傷害時，請提供一個保護性電路或類似的方法。

（2）：有迴轉制動裝置的可變電阻。當軸被轉到超過有效的角度時，迴轉制動裝置會破掉，當這種情形發生，滑座會變形，會碎片會造成某些功能失效。

[Washing]

After soldering, we recommend you to wash out the flux and solder stick to the surface of resistor and contact point of sliding, it may lose the ability.

[Rotation Stopper]

（1）：Variable resistors of the type without rotation stopper. When the shaft is turned beyond the effective turning angle, the circuit between the two terminals will come open. If the IC or other devices are feared to be damaged by this open circuitry, provide a protective circuit or a similar means.

（2）：Variable resistors of the type with the rotation stopper. When the shaft is turned by a force exceeding the specifications, the rotation stopper may break. When this occurs, the slide piece may be deformed or some functional failures caused by frictions may occur.

