

壓敏電阻器規格承認書

APPROVAL SPECIFICATION FOR VARISTORS

客戶
CUSTOMER 立創

客戶料號
CUSTOMER P/N C2974817

客戶規格描述
CUST. _____

規格描述
DESCRIPTION 07D471K/F5.08/外彎/TB/環氧(藍)/ZNR

產品編碼
PART NUMBER RM07D471KC8PE100

日期
DATE 2022/2/15

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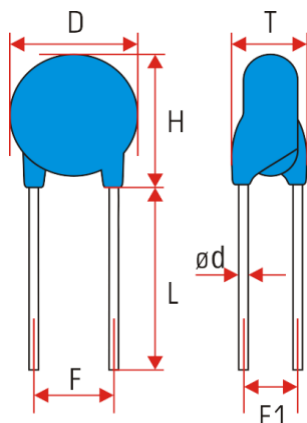
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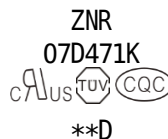
請確保我們的產品安裝到您的產品上前，已根據您的需求進行了評估。
Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
請您在使用我們的產品時，不要偏離此標準。
You are requested not to use our product deviating from this specification.

壓敏電阻器規格承認書

APPROVAL SPECIFICATION FOR VARISTORS

 1. 規格表
DATA SHEET


本體顏色: 藍色
 Body color: Blue
 包封層: 環氧樹脂 (UL94 V-0)
 Coating: Epoxy resin (UL94 V-0)
 導線: CP線
 Lead wire: CP wire
 印字: ZNR
 Marking: 07D471K



| | | |
|----------------------------------------------|------------------------------------|-------------------------------------------------------------------------------|
| 產品編碼 Part number | RM07D471KC8PE100 | |
| 客戶料號 Customer P/N | C2974817 | |
| 最大連續工作電壓 Max continuous operating voltage | AC300V (max) DC385V (max) | |
| 壓敏電壓, VN Varistor voltage, VN | 470V ±10% @ 1mA 30ms | |
| 標稱脈衝電流, Ip Nominal pulse current, Ip | 10A @ 8/20 μs | |
| 最大抑制電壓, VC Maximum clamping voltage, VC | 775V (max) @ Ip | |
| 耐衝擊電流 Withstanding surge current | 最大脈衝電流 Maximum pulse current | 1250A (1 time) @ 8/20 μs 600A (2 times) @ 8/20 μs (5 minute interval) |
| | 重複脈衝電流 Repetitive pulse current | 450A (10 times), @ 8/20 μs (90 sec. interval) |
| | 衝擊壽命 Impulse life | 75A (10 000 times) @ 8/20 μs (10 sec. interval) |
| 最大耐受能量 Maximum energy | 29J @ 10/1000 μs | |
| 額定功率 Rated power | 0.25W | |
| 最大漏電流 Maximum leakage current | 20 μA @ 75% VN | |
| 最大電容量 Maximum capacitance | 105pF @ 1kHz 1.0Vrms | |
| 工作溫度範圍 Operating temperature range | -40°C ~ +85°C | |
| 尺寸 Dimensions | D (Diameter) | 9.5mm max |
| | T (Thickness) | 3.8mm ± 0.8mm |
| | H (Height) | 15mm max |
| | F (Lead spacing) | 5.08mm ± 1.0mm |
| | F1 (Lead malposed spacing) | 2.51mm ± 0.5mm |
| | P0 (Feed hole pitch) | P0=12.7mm; 編帶尺寸規格見第9節 (15頁) For taping specifications, see Section 9 (P15) |
| | ød (Lead diameter) | 0.58mm ± 0.10mm |

壓敏電阻器規格承認書

APPROVAL SPECIFICATION FOR VARISTORS

2. 概述

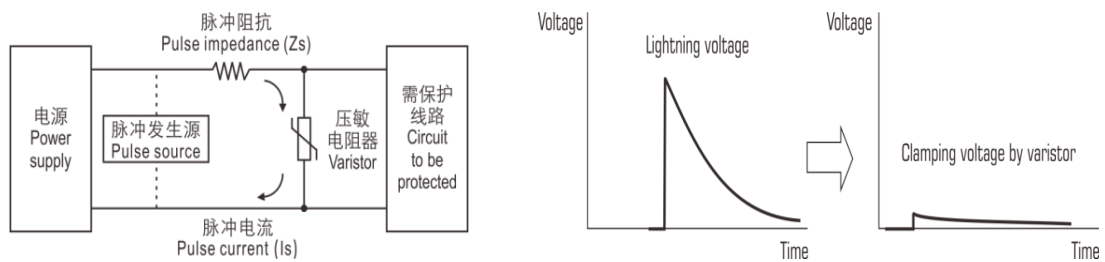
INTRODUCTION

壓敏電阻是一種具有在一定的電壓條件下支援電流急速流出的電壓-電流特性的產品。

A varistor has the volt-ampere characteristics in which current suddenly starts to flow through the device at a certain voltage.

壓敏電阻的作用：保護在電子線路中的電子元器件免受過電壓的影響。如下圖所示，壓敏電阻並聯在電路中起保護作用。當有脈衝（脈衝電流 I_s ：由脈衝電壓 V_s 和阻抗 Z_s 決定）施加在電路上時，脈衝電流（ I_s ）限制脈衝電壓在壓敏電阻的限制電壓 V_c 之內。

The varistors are used to protect components in electronic and electric circuits from overvoltage. As shown in following figure, a varistor is inserted in parallel with a circuit to be protected. When a pulse is applied to the circuit, pulse current I_s , which is determined by pulse voltage V_s and pulse impedance Z_s , flows to limit the pulse voltage to the varistor limit voltage V_c .



壓敏電阻器對脈衝的吸收
PULSE ABSORPTION BY VARISTOR

相互的關係可以用下面的公式來解釋：

The relation can be expressed by the equations as follows:

$$V_s = I_s \times Z_s + V_c$$

$$\therefore V_c = V_s - I_s \times Z_s$$

因為 V_s 遠遠大於 V_c ，脈衝電流 I_s 可以用以下公式求得

The pulse current I_s are easily obtained by the following equation because of V_s much larger than V_c .

$$I_s \approx V_s \div Z_s$$

所以，由於可承受電壓大於最大的限定電壓，電路可以長時間的免於脈衝電壓的損壞。

Thus, the circuit can be protected from being damaged by pulse voltages as long as it has withstand voltage larger than the maximum limit voltage.

由於吸收異常電壓和電流脈衝的特性，壓敏電阻可非常高效的保護電子器件。

Owing to the characteristic, the varistors are extremely effective as protecting devices of electronic and electric equipment by absorption of abnormal voltages and lightening pulses.

壓敏電阻器規格承認書

APPROVAL SPECIFICATION FOR VARISTORS

3. 應用

APPLICATION

- 消費電子產品：電視機、音訊輸出設備、安全插座、機上盒等**
 Consumer electronics products: television, audio output device, safety plug, STB etc.
- 工業產品：馬達、半導體元件、繼電器、電磁開關、電源線路、三相整流線路、自動控制線路等**
 Industrial products: motor, semiconductor component, relay, electromagnetic switch, power circuit, three-phase rectifier circuit, automatic control circuit etc.
- 通信設備：電話機、傳真機、交換機等**
 Communication equipment: Telephone, facsimile, exchanger etc.
- 電腦：電腦、顯示器、印表機、掃描器、電源、電源適配器等**
 Computer: computer, displayer, printer, scanner, power supply, adapter etc.
- 汽車電子產品**
 Automotive electronics products

適用範圍

APPLICATIONS SCOPE

| 主要用途 Recommended Applications | 規格 Specifications | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------|---------|---------|---------|---------|
| 用於低壓電路，如用於保護半導體器件、汽車電子產品、DC48V以下的繼電器與電磁閥、靜電放電設備、行動電話等 For the low voltage circuit, Such as for the protection of semiconductor devices, automotive electronics, DC48V following relays and solenoid valves, electrostatic discharge equipment, mobile phones, etc. | 05D180K | 07D180K | 10D180K | 14D180K | 20D180K | |
| | 05D220K | 07D220K | 10D220K | 14D220K | 20D220K | |
| | 05D270K | 07D270K | 10D270K | 14D270K | 20D270K | |
| | 05D330K | 07D330K | 10D330K | 14D330K | 20D330K | |
| | 05D390K | 07D390K | 10D390K | 14D390K | 20D390K | |
| | 05D470K | 07D470K | 10D470K | 14D470K | 20D470K | |
| | 05D560K | 07D560K | 10D560K | 14D560K | 20D560K | |
| | 05D680K | 07D680K | 10D680K | 14D680K | 20D680K | |
| | 用於電話，DC48V通信電路電線 Telephone, communication line (DC48V) | 05D820K | 07D820K | 10D820K | 14D820K | 20D820K |
| | | 05D101K | 07D101K | 10D101K | 14D101K | 20D101K |
| 05D121K | | 07D121K | 10D121K | 14D121K | 20D121K | |
| 05D151K | | 07D151K | 10D151K | 14D151K | 20D151K | |
| 用於AC100V線與線間(如日本) AC100V line-line applications (Japan etc.) | 05D181K | 07D181K | 10D181K | 14D181K | 20D181K | |
| | 05D201K | 07D201K | 10D201K | 14D201K | 20D201K | |
| | 05D221K | 07D221K | 10D221K | 14D221K | 20D221K | |
| 用於AC100~120V線與線間(如日本、美國等) AC100V~120V, line-line applications (Japan, US etc.) | 05D241K | 07D241K | 10D241K | 14D241K | 20D241K | |
| | 05D271K | 07D271K | 10D271K | 14D271K | 20D271K | |
| | 05D301K | 07D301K | 10D301K | 14D301K | 20D301K | |
| 用於AC100~120V線與線間，用於電話(應對250V絕緣阻抗測試) AC100V~120V, line-line applications, telephone line applications (for DC250V insulation resistance test) | 05D331K | 07D331K | 10D331K | 14D331K | 20D331K | |
| | 05D361K | 07D361K | 10D361K | 14D361K | 20D361K | |
| | 05D391K | 07D391K | 10D391K | 14D391K | 20D391K | |
| 用於AC200~220V線與線間、線與大地間 AC200V~220V, line-line and line-ground applications | 05D431K | 07D431K | 10D431K | 14D431K | 20D431K | |
| | 05D471K | 07D471K | 10D471K | 14D471K | 20D471K | |
| | 05D511K | 07D511K | 10D511K | 14D511K | 20D511K | |
| 用於AC240V線與線間、線與大地間(如英國、澳洲等) AC240V, line-line and line-ground applications (UK, Australia etc.) | 05D561K | 07D561K | 10D561K | 14D561K | 20D561K | |
| | 05D621K | 07D621K | 10D621K | 14D621K | 20D621K | |
| | 05D681K | 07D681K | 10D681K | 14D681K | 20D681K | |
| 用於AC380V線與線間、線與大地間 AC380V, line-line and line-ground applications | 05D751K | 07D751K | 10D751K | 14D751K | 20D751K | |
| | | 07D781K | 10D781K | 14D781K | 20D781K | |
| | | 07D821K | 10D821K | 14D821K | 20D821K | |
| 用於AC415V線與線間、線與大地間 AC415V, line-line and line-ground applications | | | 10D911K | 14D911K | 20D911K | |
| | | | | | | |
| 用於AC480V線與線間、線與大地間 AC480V, line-line and line-ground applications | | | 10D102K | 14D102K | 20D102K | |
| | | | 10D112K | 14D112K | 20D112K | |
| | | | | 14D122K | 20D122K | |
| | | | | 14D142K | 20D142K | |
| 用於線與大地間(應對AC1200V耐壓測試) line-ground applications (for AC1200V withstanding test) | | | | 14D162K | 20D162K | |
| | | | | 14D182K | 20D182K | |

4. 基本特性

GENERAL CHARACTERISTIC

■ 特性表

Characteristic sheet

| 壓敏電阻器 Varistor voltage | 壓敏電阻器範圍 Varistor voltage range (@ 1mA) | 最大工作電壓 Max operating voltage | | 抑制電壓 Clamping voltage (VC) @ Ip 8/20µs |
|---------------------------|-------------------------------------------|---------------------------------|------|----------------------------------------------|
| | | AC | DC | |
| | | V | V | V |
| 180K | 15.8~20.7 | 11 | 14 | 36 |
| 220K | 19.4~25.3 | 14 | 18 | 43 |
| 270K | 23.7~31.1 | 17 | 22 | 53 |
| 330K | 29.0~36.3 | 20 | 26 | 65 |
| 390K | 35.1~42.9 | 25 | 31 | 77 |
| 470K | 42.3~51.7 | 30 | 38 | 93 |
| 560K | 50.4~61.6 | 35 | 45 | 110 |
| 680K | 61.2~74.8 | 40 | 56 | 135 |
| 820K | 73.8~90.2 | 50 | 65 | 135 |
| 101K | 90~110 | 60 | 85 | 165 |
| 121K | 108~132 | 75 | 115 | 200 |
| 151K | 135~165 | 95 | 125 | 250 |
| 181K | 162~198 | 115 | 150 | 300 |
| 201K | 180~220 | 130 | 170 | 340 |
| 221K | 198~242 | 140 | 180 | 360 |
| 241K | 216~264 | 150 | 200 | 395 |
| 271K | 243~297 | 175 | 225 | 455 |
| 301K | 270~330 | 195 | 250 | 505 |
| 331K | 297~363 | 210 | 275 | 545 |
| 361K | 324~396 | 230 | 300 | 595 |
| 391K | 351~429 | 250 | 320 | 650 |
| 431K | 387~473 | 275 | 350 | 710 |
| 471K | 423~517 | 300 | 385 | 775 |
| 511K | 459~561 | 320 | 415 | 845 |
| 531K | 477~583 | 330 | 435 | 875 |
| 561K | 504~616 | 350 | 460 | 915 |
| 621K | 558~682 | 385 | 505 | 1025 |
| 681K | 612~748 | 420 | 560 | 1120 |
| 721K | 648~792 | 440 | 585 | 1180 |
| 751K | 675~825 | 460 | 615 | 1240 |
| 781K | 702~858 | 485 | 640 | 1290 |
| 821K | 738~902 | 510 | 670 | 1355 |
| 911K | 819~1001 | 550 | 745 | 1500 |
| 951K | 855~1045 | 575 | 765 | 1570 |
| 102K | 900~1100 | 625 | 825 | 1650 |
| 112K | 990~1210 | 680 | 895 | 1815 |
| 122K | 1080~1320 | 750 | 1060 | 2000 |
| 142K | 1260~1540 | 880 | 1140 | 2310 |
| 162K | 1440~1760 | 940 | 1280 | 2640 |
| 182K | 1620~1980 | 1000 | 1465 | 2970 |

| 尺寸規格 Nominal diameter | 等級電流 Class current (Ip) @ 8/20µs | 耐衝擊電流 Withstanding impulse current | | | 額定功率 Rated power W |
|----------------------------------------------|----------------------------------------|---------------------------------------|---------|-----------------------|--------------------------|
| | | 8/20µs | | | |
| | | 1 time | 2 times | 10 ⁴ times | |
| Varistor voltage: 180K ~ 680K (D, T type) | | | | | |
| 05D | 1 | 125 | 50 | 4 | 0.01 |
| 07D | 2.5 | 250 | 125 | 10 | 0.02 |
| 10D | 5 | 500 | 250 | 20 | 0.05 |
| 14D | 10 | 1000 | 500 | 40 | 0.1 |
| 20D | 20 | 2000 | 1000 | 80 | 0.2 |
| Varistor voltage: 180K ~ 680K (V type) | | | | | |
| 05D | 1 | 250 | 100 | 10 | 0.01 |
| 07D | 2.5 | 500 | 250 | 20 | 0.02 |
| 10D | 5 | 1000 | 500 | 40 | 0.05 |
| 14D | 10 | 2000 | 1000 | 80 | 0.1 |
| 20D | 20 | 3000 | 2000 | 120 | 0.2 |
| Varistor voltage: 820K ~ 182K (D, T, K type) | | | | | |
| 05D | 5 | 600 | 200 | 17 | 0.1 |
| 07D | 10 | 1250 | 600 | 75 | 0.25 |
| 10D | 25 | 2500 | 1250 | 120 | 0.4 |
| 14D | 50 | 4500 | 2500 | 150 | 0.6 |
| 20D | 100 | 6500 | 4500 | 190 | 1 |
| Varistor voltage: 820K ~ 182K (V type) | | | | | |
| 05D | 5 | 800 | 400 | 22 | 0.1 |
| 07D | 10 | 1750 | 1200 | 100 | 0.25 |
| 10D | 25 | 3500 | 2500 | 150 | 0.4 |
| 14D | 50 | 6000 | 4500 | 200 | 0.6 |
| 20D | 100 | 10000 | 6500 | 250 | 1 |
| Varistor voltage: 391K ~ 112K (J type) | | | | | |
| 07D | 10 | 1800 | 1250 | 120 | 0.25 |
| 10D | 25 | 4000 | 3000 | 175 | 0.4 |
| 14D | 50 | 8000 | 6000 | 220 | 0.6 |
| 20D | 100 | 15000 | 10000 | 400 | 1 |
| Varistor voltage: 391K ~ 182K (Q type) | | | | | |
| 10D | 25 | 4000 | 3000 | 175 | 0.4 |
| 14D | 50 | 8000 | 6000 | 220 | 0.6 |
| 20D | 100 | 13000 | 8000 | 300 | 1 |

Note:

K type: General type

D type: Standard type

T type: Hi-temperature (125°C) type, based on D type

V type: Hi-energy type

J type: Withstanding surge type

Q type: Appendix Q (IEC 60950-1, 6KV/3KA)

4. 基本特性

GENERAL CHARACTERISTIC

- 符合RoHS 2.0、REACH及無鹵
Comply with rohs 2.0, reach, halogen-free available.
- 安規認證
Safety certification

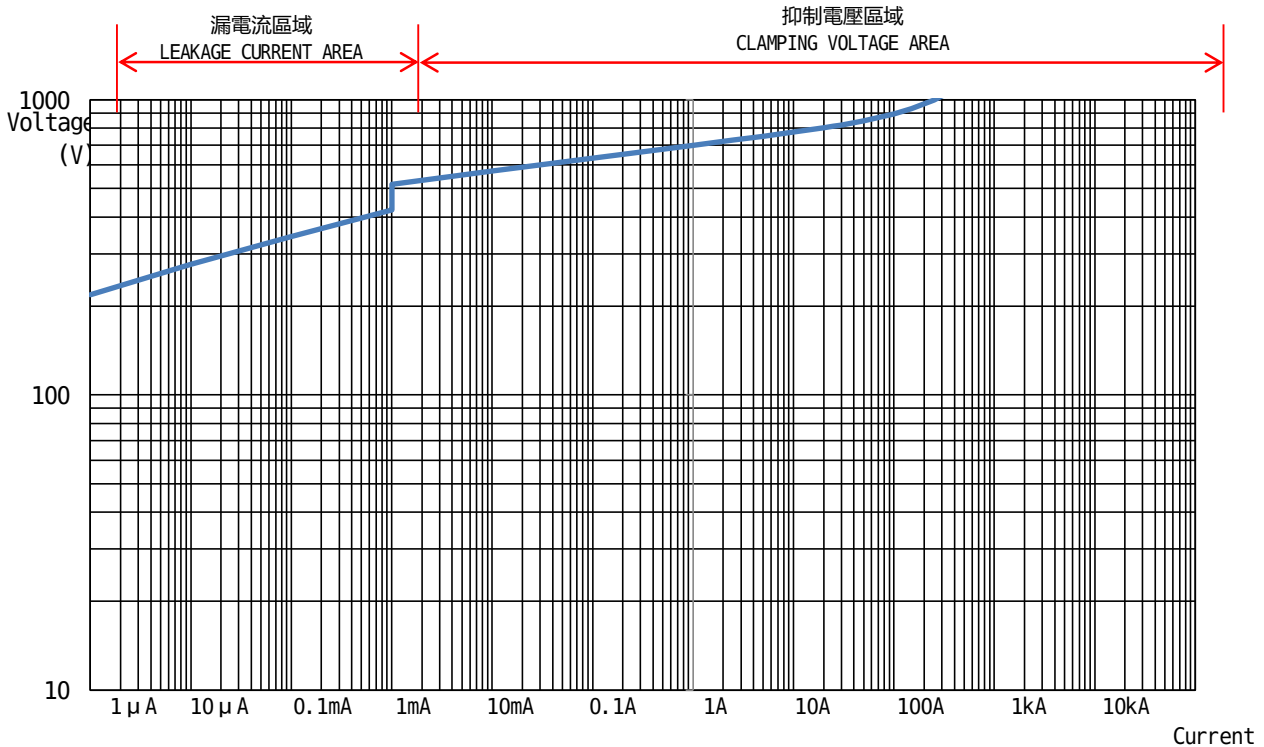
| 認證機構 CERTIFICATE AUTHORITY | 認證標準 APPROVAL STANDARD | 證書編號 CERTIFICATE NO. | 認證範圍 CERTIFICATION RANGE | | |
|----------------------------------|----------------------------------------------------------------------|-------------------------|-----------------------------|-----------------------------|-----------------------------------------------------------|
| | | | 規格 SPECS | 壓敏電壓 VARISTOR VOLTAGE | 最大連續交流電壓 MAXIMUM CONTINUOUS OPERATING VOLTAGE A. C. |
| CQC | GB/T 10193-1997 GB/T 10194-1997 | CQC14001104814 | 07D | 18V-820V | 11VAC-510VAC |
| | | CQC16001149384 | 10D | 18V-1100V* | 11VAC-680VAC |
| | GB 4943.1-2011 GB 8898-2011 GB/T 10193-1997 GB/T 10194-1997 | CQC16001149385 | 14D | 18V-1800V* | 11VAC-1000VAC |
| | | CQC16001149386 | 20D | 18V-1800V* | 11VAC-1000VAC |
| TÜV SÜD | EC 61051-1:2018 IEC 61051-2:1991/A1:2009 IEC 61051-2-2:1991 | B 096835 0001** | 07D | 18V-820V | 10VAC-510VAC |
| | | | 10D | 18V-1100V | 10VAC-680VAC |
| | | | 14D | 18V-1800V | 10VAC-1000VAC |
| | | | 20D | 18V-1800V | 10VAC-1000VAC |
| UL (cUL) | UL 1449 (4th edition) | E485399 | 07D | 18V-820V | 11VAC-510VAC |
| | | | 10D | 18V-1100V | 11VAC-680VAC |
| | | | 14D | 18V-1800V | 11VAC-1000VAC |
| | | | 20D | 18V-1800V | 11VAC-1000VAC |

*: 18V~360V is only applicable to GB/T 10193-1997, GB/T 10194-1997

** : Additional test for 10D, 14D, 20D series: Annex Q of IEC 60950-1:2005/A2:2013, clause 14.13 of IEC 60065:2014 and clause G.8.1 of IEC 62368-1:2018.

■ 典型的07D471K抑制電壓特性曲線(供參考)

Typical 07D471K clamping voltage characteristic curve (for reference)

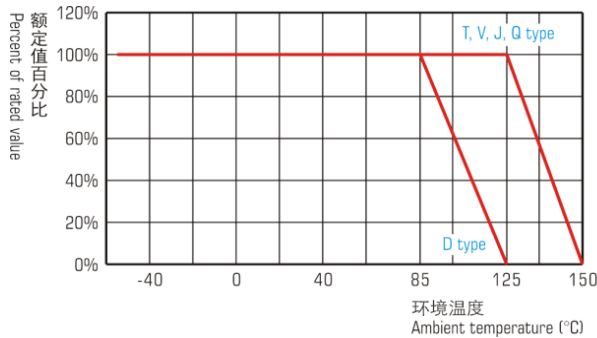


壓敏電阻器規格承認書

APPROVAL SPECIFICATION FOR VARISTORS

| | |
|------------|--------------|
| 編號DOC NO.: | DEC-SA-WI007 |
| 版本REV.: | B/1 |
| 日期DATE: | 2022/2/15 |
| 頁碼PAGE: | 7 / 15 |

■ 工作溫度降額曲線(見下圖)
Operating temperature derating curve (see fig below)



标准型85°C到125°C降额系数为2.5%/°C
D type: 85°C to 125°C derating factor: 2.5% per °C

D type: 标准型
Standard type
T type: 高温型
High temperature type
V type: 高能型
High energy type
J type: 耐浪涌冲击型
Withstanding surge type
Q type: 附录Q型
Annex Q (IEC 60950-1, withstanding 6kV/3kA combination wave testing) type



請注意：額定特性包括最大連續工作電壓、耐衝擊電流、能量耐量及額定功率，降幅2.5%/°C
Please note: rated characteristic includes maximum continuous operating voltage, withstanding surge current, maximum energy and rated dissipation power, 2.5%/°C reduction.

- 壓敏電壓溫度係數
Temperature coefficient of varistor voltage: 0 to -0.05 %/°C max.
- 儲存溫度範圍
Storage temperature range: -55°C~+125°C
- 絕緣電壓
Insulation voltage: 2500V 60s (body Insulation)

5. 名詞解釋

DEFINITIONS

- 1) 最大連續工作電壓：在環境溫度25°C下，允許連續施加在壓敏電阻器上的最大工頻正弦電壓有效值Uac(總諧波失真小於5%)或直流電壓值Udc。
Maximum continuous operating voltage: maximum ac RMS voltage Uac or maximum dc voltage Udc which can be applied continuously at a temperature of 25°C. Uac shall be a substantially sinusoidal voltage (less than 5% total harmonic distortion).
- 2) 壓敏電壓：直流參考電流流過壓敏電阻器時，壓敏電阻器兩端的直流電壓值。
Varistor voltage: dc voltage across the varistor when the dc reference current flows through the varistor.
- 3) 標稱脈衝電流：是一個電流峰值，它是以每分鐘2次的方式用8/20 μs脈衝電流衝擊100次，壓敏電阻器可以通過的電大峰值電流的1/10。
Nominal pulse current: it is a current peak value. It is pulsed 100 times with 8/20 μs pulse current in 2 times per minute, and the varistor can pass 1/10 of the peak current.
- 4) 抑制電壓：是指在標準大氣條件下，壓敏電阻器中通過標稱脈衝電流時，其兩端呈現的電壓峰值。
Clamping voltage: refers to the voltage peak appearing between the two terminals of a varistor when passing a nominal pulse current under standard atmospheric conditions.
- 5) 耐衝擊電流：壓敏電阻器允許通過的規定波形的每個脈衝的最大電流值。
Withstanding surge current: the maximum current value of each pulse of the specified waveform that the varistor is allowed to pass.
- 6) 能量耐量：能被壓敏電阻器吸收指定波形的最大單個脈衝能量，除非另有規定應使用10/1000 μs脈衝。
Maximum energy: the maximum single pulse energy of the specified waveform that can be absorbed by the varistor. Unless otherwise specified, 10/1000 μs pulses should be used.
- 7) 額定功耗：在25°C的環境溫度下的最大允許功耗。
Rated power: the maximum allowable power dissipation of varistors at an ambient temperature of 25°C.
- 8) 漏電流：在25°C或規定的其他溫度下，施加最大直流電壓時，通過壓敏電阻器中的電流。
Leakage current: the current through the varistor at the maximum dc voltage applied at 25°C or other specified temperature.

壓敏電阻器規格承認書

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編號DOC NO.: DEC-SA-WI007

版本REV.: B/1

日期DATE: 2022/2/15

頁碼PAGE: 8 / 15

6. 產品編碼

PART NUMBER

| | | | | | | | | | |
|--------------|--------------------------|-------------|--------------------------|-----------------|--------------------|------------------|-------------------------------------------------------------|--------------------------|-------------------------------|
| RM | 07 | D | 471 | K | C | 8 | P | E | 100 |
| 系列 Series | 標稱直徑 Nominal diameter | 形狀 Shape | 壓敏電壓 Varistor voltage | 誤差 Tolerance | 腳距 Lead spacing | 腳型 Lead style | 編帶包裝 或散裝腳長 Taping packing or Lead length (bulk) | 包封材質 Coating material | 類別和標 誌 Type and marking |

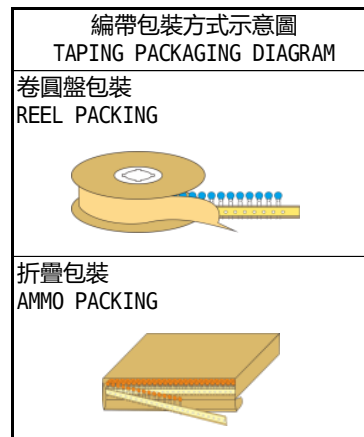
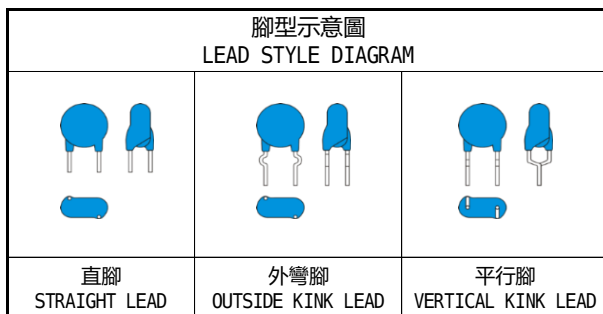
| 序號 No. | 名稱 Field name | 表達內容 Expression |
|-----------|---------------------------|-----------------------------------------------------------|
| 1 | 系列 Series | RM: 壓敏電阻器 ZnO (Zinc oxide) Varistors |
| 2 | 標稱直徑 Nominal diameter | 07: 7mm |
| 3 | 形狀 Shape | D: 圓形 Disc |
| 4 | 壓敏電壓 Varistor voltage | 471: 470V |
| 5 | 誤差 Tolerance | K: ±10% |
| 6 | 腳距 Lead spacing | C: F=5.08mm |
| 7 | 腳型 Lead style | 8: 外彎 Outside kink Leads |
| 8 | 編帶包裝或散裝腳長 (bulk) | P: 編帶折疊包裝 Taping, Ammo packing |
| 9 | 包封材質 Coating material | E: 環氧(藍) Epoxy (Blue) |
| 10 | 類別和標誌 Type and marking | 100: 標準型, 打印ZNR商標 Standard type, printed ZNR trademark |

常用標稱直徑有:

Common nominal diameters are: 5mm, 7mm, 10mm, 14mm, 20mm

常用壓敏電壓有:

Common varistor voltage are: 18V, 22V, 27V, 33V, 39V, 47V, 56V, 68V, 82V, 100V, 120V, 150V, 180V, 200V, 220V, 240V, 270V, 300V, 330V, 360V, 390V, 430V, 470V, 510V, 560V, 620V, 680V, 750V, 780V, 820V, 910V, 1000V, 1100V, 1200V, 1800V.



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7. 測量與試驗

MEASUREMENT AND TESTING

如無特殊需要，壓敏電阻器應在下列環境條件下進行試驗：

If there is no special need, varistor measurement and testing should be conducted under the following environmental conditions:

| | | |
|-------------------|---------------------------|--------------------------------|
| 溫度 Temperature | 相對濕度 Relative humidity | 大氣壓力: Atmospheric pressure: |
| 25°C±5°C | 30%~70% | 86kpa~106kpa |

| 序號 No. | 檢驗項目 Item | 要求 Specification | 試驗方法 Testing method |
|-----------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | 外觀與尺寸 Appearance And dimension | 外觀形狀沒有明顯的缺點，尺寸在標準範圍內。 No marked defect on appearance form and dimensions are within specified range. | 壓敏電阻器必須用目視檢查其明顯的缺點。 The varistors should be visually inspected for evidence of defect. 尺寸用遊標卡尺測量。 Dimensions should be measured with slide calipers. |
| 2 | 標誌 Marking | 清晰易於識別。 To be easily legible. | 目視檢查。 The capacitor should be visually inspected. |
| 3 | 抑制電壓 Clamping voltage | 滿足額定值 To meet the specified value. | 使用波形為8/20μs的標稱脈衝電流施加在壓敏電阻器引出端上，同時測試抑制電壓的峰值。 A nominal pulse current of 8/20μs waveform was applied to the varistor terminals and the clamping voltage peak was tested. |
| 4 | 壓敏電壓 Varistor voltage | 在誤差範圍內。 Within specified tolerance. | 將壓敏電阻器固定在無銹蝕的夾具上，按“規格表”規定的條件進行測試壓敏電阻器引出端的電壓。 The varistor is fixed on the fixture without rust, and the voltage of the varistor terminal is tested according to the conditions specified in the "Data sheet". |
| 5 | 電容量 Capacitance | 滿足額定值 To meet the specified value. | 在標準大氣條件下，使用1kHz、1V的條件進行測量。 Measurement at 1kHz, 1V under standard atmospheric conditions |
| 6 | 漏電流 Leakage current | 滿足額定值 To meet the specified value. | 在25°C時施加75%的最大連續直流電壓，測量其漏電流。 Apply a maximum continuous dc voltage of 75% to the varistor at 25°C and measure its leakage current. |
| 7 | 電流衝擊 穩定性 Impulse testing stability | 重複脈衝 電流 Repetitive pulse current | 試驗過程中壓敏電阻器應無擊穿、閃絡，外觀不應有任何機械損傷 The varistor should have no breakdown or flashover during the test, and the appearance should not have any mechanical damage 衝擊後，應在常溫下恢復2h，測量壓敏電壓，其值相對於初始值的變化率應小於10% After the impulse, it should be stored at room temperature for 2 hours. Measure the varistor voltage. The rate of change should be less than 10% of the initial value. |
| | | 方波電流 Square wave current | 對壓敏電阻器施加1次方波電流衝擊(2ms或者10/1000μs)的衝擊，方嚮任意。 The varistor is subjected to a square wave current impulse (2ms or 10/1000μs), in any direction. |
| 8 | 最大脈衝電流 Max pulse current | 在8/20μs波形下，對壓敏電阻器施加1次最大脈衝電流衝擊，方嚮任意。 Under 8/20μs waveform, the varistor is subjected to a max pulse current impulse, in any direction. | 在8/20μs波形下，對壓敏電阻器施加10次重複脈衝電流，每個方嚮衝擊各5次，相鄰兩次衝擊的間隔為90s。 Under 8/20μs waveform, the varistor was subjected to 10 times of repetitive pulse current, and the impulses was 5 times in each direction. The interval between two adjacent impulses was 90 s. |
| 9 | 耐電壓 Withstand voltage | 試驗過程中壓敏電阻器無擊穿、電弧、閃絡等現象，外觀不應有任何機械損傷 The varistor should have no breakdown, arcing or flashover during the test, and the appearance should not have any mechanical damage. | 首先，將壓敏電阻器的端子摺在一起，然後將金屬箔包在壓敏電阻器離端子3-4mm的本體，接著將壓敏電阻器插入盛著直徑為1mm的金屬球的容器中，最後施加2500V的電壓60秒種。 First, the terminals of the varistor should be connected together. Then, a metal foil should be closely wrapped around the body of the varistor to the distance of about 3 to 4mm from each terminal. Then, the varistor should be inserted into a container filled with metal balls of about 1mm diameter. Finally, 2500v voltage is applied for 60 sec. Between the varistor lead wires and metal balls |

壓敏電阻器規格承認書

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↘ 續上表

Continued on the table

| 序號 No. | 檢驗項目 Item | 要求 Specification | 試驗方法 Testing method |
|-----------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | 最大能量 Maximum energy | 滿足額定值 To meet the specified value. | 在10/1000μs電流波下，壓敏電阻器能承受的最大能量。 The maximum energy that the varistor can absorb under the 10/1000μs current wave. |
| 11 | 衝擊壽命 Impulse life | 試驗後壓敏電阻器外觀不應有任何機械損傷，壓敏電壓變化率不應超過10% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 10% | 常室溫下，將指定的脈衝電流間隔10秒接通10000次，在1小時至2小時時間段內測定其特性。 The change of varistor voltage shall be measured after the specified impulse current is applied 10000 times continuously with the interval of 10 seconds at room temperature. |
| 12 | 額定功率 Rated power | 滿足額定值 To meet the specified value. | 在環境溫度25°C下施加連續脈衝電流時，壓敏電阻器可以耗散的最大平均功率。 Maximum allowable average power dissipation when subjected to the stress of successive impulses and at the temperature of 25°C. |
| 13 | 壓敏電壓溫度係數 Temperature coefficient of varistor voltage | 滿足額定值 To meet the specified value. | $\frac{V_{n2}-V_{n1}}{V_{n1}} \times 1/60 \times 100(\%/^{\circ}\text{C})$ 式中，VN1是25°C下的壓敏電壓值，VN2是85°C下的壓敏電壓值 Where VN1 is varistor voltage at 25°C and VN2 is varistor voltage at 85°C |
| 14 | 導線抗張強度 Terminal tensile strength | 導線無折斷，壓敏電阻器無破損。 Lead wire should not be cut off. Varistor should not be broken. | 固定壓敏電阻器的本體，使壓敏電阻器每支導線均承受10N(1.0mm導線直徑為20N)垂直力，保持10±1秒鐘。 Fix the body of the varistor and apply a tensile weight gradually to each lead wire in the radial direction of the capacitor up to 10N (1.0mm lead wire diameter is 20N) and keep it for 10±1 s. |
| 15 | 導線抗折強度 Terminal bending strength | 導線無折斷，壓敏電阻器無破損。 Lead wire should not be cut off. Varistor should not be broken. | 壓敏電阻器導線應承受5N(1.0mm導線直徑為10N)重量，然後彎外彎折成90°，然後回復到原來位置；接著往反方向彎折90°，再復原；彎折一次2-3秒鐘。 Each lead wire should be subjected to 5N (1.0mm lead wire diameter is 10N) weight and then a 90° bend, at the point of egress, in one direction, return to original position, and then apply a 90° bend in the opposite direction at the rate of one bend in 2 to 3 s. |
| 16 | 可焊性 Solderability of leads | 導線必須有3/4以上的面積均勻附著焊錫。 Lead wire should be soldered with uniform coating on the axial direction over 3/4 of the circumferential direction. | 將壓敏電阻器的導線浸入焊料中2±0.5秒鐘，浸入深度離導線根部1.5-2.0mm。 The lead wire of a varistor should be dipped into molten solder for 2±0.5 s. The depth of immersion is up to about 1.5 to 2.0mm from the root of lead wires. 焊錫溫度: 245±5°C Temp. of solder: 245±5°C |
| 17 | 耐焊接熱 Soldering effect | 試驗後壓敏電阻器外觀不應有任何機械損傷，壓敏電壓變化率不應超過5% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 5%. | 導線浸入離導線根部1.5-2.0mm處，錫溫為260±5°C錫槽中10±1秒。試驗後，壓敏電阻器應在室溫中恢復2小時。 The lead wires should be immersed in solder of 260±5°C up to 1.5 to 2.0mm from the root of terminal for 10±1.0 s. After the test, the varistor should recover at room temperature for 2h. |
| 18 | 振動 Vibration resistance | 試驗後壓敏電阻器外觀不應有任何機械損傷，壓敏電壓變化率不應超過5% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 5%. | 將壓敏電阻器導線焊穩和調整振動頻率範圍為10-55Hz、總振幅為1.5mm，振動從10Hz到55Hz，然後再回到10Hz，大約一分鐘。總時間六個小時，每兩小時在相互垂直方向來回三次。 The varistor should be firmly soldered to the supporting lead wire and vibrated at a frequency range of 10 to 55Hz, 1.5mm in total amplitude, with about a 1 minute rate of vibration change from 10Hz to 55Hz and back to 10Hz. Apply for a total of 6h., 2h each in 3 mutually perpendicular directions. |

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↘ 續上表

Continued on the table

| 序號 No. | 檢驗項目 Item | 要求 Specification | 試驗方法 Testing method | | | | | | | | | |
|-----------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|------|---|---------------------------|-------|---|----------------------------|-------|
| 19 | 耐濕負荷 Humidity loading | 試驗後壓敏電阻器外觀不應有任何機械損傷，壓敏電壓變化率不應超過10% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 10%. | 壓敏電阻器保持在溫度為 $40 \pm 2^\circ\text{C}$ 、相對濕度為90%~95%條件下施加最大連續交流電壓 500 ± 12 小時。 Apply the max continuous operating ac voltage for 500 ± 12 h. At $40 \pm 2^\circ\text{C}$ in 90% to 95% relative humidity. 試驗結束後，壓敏電阻器應在室溫下恢復2小時。 After the test, the varistor should recover at room temperature for 2h. | | | | | | | | | |
| 20 | 高溫負荷 High temperature loading | 試驗後壓敏電阻器外觀不應有任何機械損傷，壓敏電壓變化率不應超過10% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 10%. | 應給壓敏電阻器施加最大連續交流電壓，儲存最高工作溫度下 1000 ± 12 小時。 The maximum continuous ac voltage should be applied to the varistor and stored at a maximum operating temperature of 1000 ± 12 h 試驗結束後，壓敏電阻器應在室溫下恢復2小時。 After the test, the varistor should recover at room temperature for 2 h. | | | | | | | | | |
| 21 | 溫度迴圈 Temperature cycle | 試驗後壓敏電阻器外觀不應有任何機械損傷，壓敏電壓變化率不應超過10% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 10% | 溫度迴圈試驗按以下條件進行試驗和測量 Temperature cycling shall be measured in the following test. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>$-40 \pm 2^\circ\text{C}$</td> <td>30min</td> </tr> <tr> <td>2</td> <td>$+125 \pm 2^\circ\text{C}$</td> <td>30min</td> </tr> </tbody> </table> 迴圈次數：5次 Cycle numbers: 5 cycles 試驗結束後，壓敏電阻器應在室溫下恢復2小時。 After the test, the varistor should recover at room temperature for 2 h. | Step | Temperature | Time | 1 | $-40 \pm 2^\circ\text{C}$ | 30min | 2 | $+125 \pm 2^\circ\text{C}$ | 30min |
| Step | Temperature | Time | | | | | | | | | | |
| 1 | $-40 \pm 2^\circ\text{C}$ | 30min | | | | | | | | | | |
| 2 | $+125 \pm 2^\circ\text{C}$ | 30min | | | | | | | | | | |
| 22 | 阻燃性 Passive flammability | 火焰撤去後30秒內，燃燒應能自熄 The burning of the sample shall be self-extinguishing within 30 s after removing the needle flame. | 按[IEC 60695-11-5]對MOV進行針狀火焰試驗。火焰施加部位為電阻體樣品的側面，施加時間為5秒。 The MOV shall be subjected to the needle-flame test of [IEC 60695-11-5]. The needle-flame application shall be on the side surface of the samples for 5 s. | | | | | | | | | |

8. 標誌說明

MARKING DESCRIPTION

公司商標
Company trademark
德爾創商標：
Dersonic's trademark:

壓敏電阻規格
Varistor specifications, ex.: 20, Nominal chip diameter 20mm
D, disc chip,
511, varistor voltage 510V (51×101)
K, varistor voltage tolerance $\pm 10\%$

安規標誌
Safety certification marking

生產週期和內部識別碼
Production cycle and internal identification code, ex.:

| | | |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A | 9 | Q |
| 生產年份 Production year A, 2020 B, 2021 : Z, 2045 A, 2046 | 生產月份 Production month 1, Jan.; 2, Feb.; : 9, Sept.; 0, Oct.; N, Nov.; D, Dec. | 識別碼 Production ID D, Standard type; K, General type T, Hi-temperature (125°C) type; V, Hi-energy type; J, Withstanding surge type (07D, 2.5kV/40 times; 10D, 4kV/40 times); Q, Appendix Q (IEC 60950-1, 6KV/3KA) type |

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9. 安全注意事項

SAFETY PRECAUTIONS

使用壓敏電阻器時，壓敏電阻器周圍條件（設備設計中的材料、環境、電源條件、電路條件等）發生異常時，則可能引發火災、觸電、燒傷、以及產品故障。

In case that a varistor is used, if an abnormality takes place because of peripheral conditions of the varistor(material, environments, power source conditions, circuit conditions, etc. In equipment design), fire, electric shock, burn, or product failure may be occur.

下列內容為使用時的相關注意事項，請認真確認後再行使用。如對未及事項有疑議，請速與我公司擔當部門聯繫。

The precautions for this product are described below; understand the content thoroughly before usage. For more questions, contact us.

9.1. 嚴格遵守事項

Precautions to be strictly observed

9.1.1. 額定性能確認

Confirmation of performance ratings

請遵守壓敏電阻器的最大連續工作電壓、耐衝擊電流、最大能量耐量、浪湧壽命、額定功率和操作溫度範圍等額定性能的規定，在規定範圍內使用。

Use the varistor within its rated range of performance such as the maximum continuous operating voltage, withstanding surge current, maximum energy, impulse life, rated power and operating temperature range.

超出規定範圍使用，則會造成壓敏電阻器性能劣化，破壞元件，嚴重可引起壓敏電阻器冒煙或起火。

If used outside the range, the varistor can be degrade and have element fracture, which may result in smoking and ignition.

9.1.2. 為避免意外現象發生，請採用如下對策

To avoid accidents due to unexpected phenomena, take the following measures

- 1) 壓敏電阻器受損時，可能出現破碎飛散，因此要對整合式產品加保護蓋或外盒。

In the event of fracture of the varistor, its pieces may scatter; hence, put the case or cover of the set product in place.

- 2) 請勿安裝在可燃物品（塑膠電線、樹脂合成物等）附近。若無法避免，請使用不燃性保護外殼。

Do not install the varistor near combustible substances (polyvinyl chloride wires, resin moldings, etc.). If it's difficult to do, install a nonflammable cover.

- 3) 線間使用

Across-the-line use

線上間使用時，將保險絲與壓敏電阻器串聯。

When the varistor is used across a line, put a current fuse in series with the varistor.

- 4) 線-地間使用

Use between line to ground

- a) 線上-地間使用時，壓敏電阻器短路時會產生接地電阻，電流保險絲不會熔斷，可能引起壓敏電阻器外塗層樹脂冒煙或起火。

If the case that the varistor is used between a line to the ground, the short circuit of the varistor may not blow the current fuse because of grounding resistance, which may cause smoking and ignition of the varistors exterior resin.

為避免上述情況，請在電源端安裝漏電斷路器。如無漏電斷路器，則需將電流保險絲與溫度保險絲串聯使用。

As the measure against it, install an earth leakage breaker on the power supply side of the varistor position. If no earth leakage breaker is installed, use a thermal fuse together with a current fuse in series.

- b) 在帶電部件與金屬部件之間使用壓敏電阻器時，壓敏電阻器短路時有觸電危險，故請將金屬部件接地或勿與人體接觸。

If the case that the varistor is used between a live parts to metal case, an electric shock may develop at a shortcircuit of the varistor; hence, ground the metal case to the ground or keep it from the human body.

9.2. 使用注意事項

Application notes

9.2.1. 注意下列事項，可能導致壓敏電阻器壽命縮短或引發故障

Pay attention to the following items to avoid the shortened life and failure of the varistor.

- 1) 電路條件

Circuit conditions

- a) 選定的壓敏電阻器的電壓最大值在最大連續工作電壓值之上。

Select a varistor of which the maximum voltage including fluctuations in source voltage allows for the maximum permissible circuit voltage.

- b) 短間隔性地施加浪湧時（施加抗幹擾類比試驗電壓時），不可超過壓敏電阻器的額定功率。

In cases that surges are intermittently applied at short intervals (for example, in case that the voltage of the noise simulator test is implemented etc.), do not let them exceed the varistors rated power.

- c) 選定壓敏電阻器時，須按照表1的標準產品型號

Select a varistor recommended in table 1.

- ① 線間使用

Across-the-line use

單相三線式連線時單獨配線負荷導致負荷不平衡、電壓線和中性線短路、中性線欠損、容量性負荷情況下開閉時的共振等，將導致電源電壓的上升，可能使用表1中標有*的產品型號。

If possible, use a part no. Marked with * in case of voltage temporarily rises load unbalance of separately-wired loads, short between hot and neutral-line, open of neutral line in single-phase-three-wired system, and due to resonance at switching for a capacitive, inductive load.

- ② 線-地間使用

Used between line to ground

出現故障時，對地電壓將上升，因此，請使用附表1中推薦的產品型號。

Use a different part no. From "across-the-line use" as table 1, because of raising voltage in case of "line to ground fault".

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表1 - 壓敏電阻器的適用範例
Table 1 - example of varistor application

| 類別 Type | 線間使用 Across-the-line use | 線-地使用 Use between line to ground | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------|------------------|------|--------|-------------|--------|-------------|------|--------|-------------|--------|-------------|--------|-------------|--------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------------|------------------|------|--------|-------------------------------------|--------|--|------|--------|--------------------------------|--------|--|--------|--------------------|
| DC / AC 單相 DC/AC single-phase 連接線例 Connections example | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AC 三相 AC 3-phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 壓敏電阻 選型舉例 Example of varistor | <table border="1"> <thead> <tr> <th>MOV</th> <th>電源電壓 Source voltage</th> <th>壓敏電阻 Varistor</th> </tr> </thead> <tbody> <tr> <td rowspan="2">MOV1</td> <td>AC100V</td> <td>201 ~ 361 *</td> </tr> <tr> <td>AC120V</td> <td>241 ~ 431 *</td> </tr> <tr> <td rowspan="4">MOV3</td> <td>AC200V</td> <td>431 ~ 561 *</td> </tr> <tr> <td>AC220V</td> <td>471 ~ 621 *</td> </tr> <tr> <td>AC240V</td> <td>511 ~ 621 *</td> </tr> <tr> <td>AC380V</td> <td>821</td> </tr> </tbody> </table> | MOV | 電源電壓 Source voltage | 壓敏電阻 Varistor | MOV1 | AC100V | 201 ~ 361 * | AC120V | 241 ~ 431 * | MOV3 | AC200V | 431 ~ 561 * | AC220V | 471 ~ 621 * | AC240V | 511 ~ 621 * | AC380V | 821 | <table border="1"> <thead> <tr> <th>MOV</th> <th>電源電壓 Source voltage</th> <th>壓敏電阻 Varistor</th> </tr> </thead> <tbody> <tr> <td rowspan="2">MOV2</td> <td>AC100V</td> <td>471, 511, 621 *, 821 **, 182 ***</td> </tr> <tr> <td>AC220V</td> <td></td> </tr> <tr> <td rowspan="3">MOV4</td> <td>AC230V</td> <td>511, 621 *, 821 **, 182 ***</td> </tr> <tr> <td>AC240V</td> <td></td> </tr> <tr> <td>AC380V</td> <td>112 **, 182 ***</td> </tr> </tbody> </table> | MOV | 電源電壓 Source voltage | 壓敏電阻 Varistor | MOV2 | AC100V | 471, 511, 621 *, 821 **, 182 *** | AC220V | | MOV4 | AC230V | 511, 621 *, 821 **, 182 *** | AC240V | | AC380V | 112 **, 182 *** |
| MOV | 電源電壓 Source voltage | 壓敏電阻 Varistor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MOV1 | AC100V | 201 ~ 361 * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | AC120V | 241 ~ 431 * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MOV3 | AC200V | 431 ~ 561 * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | AC220V | 471 ~ 621 * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | AC240V | 511 ~ 621 * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | AC380V | 821 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MOV | 電源電壓 Source voltage | 壓敏電阻 Varistor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MOV2 | AC100V | 471, 511, 621 *, 821 **, 182 *** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | AC220V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MOV4 | AC230V | 511, 621 *, 821 **, 182 *** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | AC240V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | AC380V | 112 **, 182 *** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

進行設備的絕緣電阻試驗 (DC500V) 時, 請使用表1中推薦的標有 ** 的產品型號。使用不可清除絕緣性能試驗的壓敏電阻電壓時, 在一定的電路條件下, 試驗時可將壓敏電阻器從電路上取下。

Use a varistor marked with ** in table 1, in case of the insulation resistance test (500Vdc) for equipment. When using a part of the varistor voltage that the insulation efficiency examination can not be cleared, there is a case where the varistor can be done by removing it from the circuit depending on the circuit condition.

進行設備的耐電壓試驗 (AC1000V或AC1200V) 時, 請使用表1中推薦的標有 *** 的產品型號。

Use a varistor marked with *** in table 1, in case of the withstanding voltage test (1000Vac or 1200Vac) for equipment.

d) 關於電流保險絲

Concerning current fuse

- ① 所用壓敏電阻器與電流保險絲的額定電流, 一般推薦按下表進行選定。此外, 在用戶端, 當壓敏電阻器損壞時, 確認其設備是否會發生2次傷害。

We recommend selecting a varistor and the rated current of a current fuse as follows. Finally, please be sure that there is no danger if the varistor mounted on the equipment breaks.

| 規格 specs | 05D | 07D | 10D | 14D | 20D |
|-------------------------------|-----|-----|-----|------|------|
| 保險絲額定電壓 Fuse rated current | ≤2A | ≤5A | ≤5A | ≤10A | ≤10A |

- ② 保險絲的插入部位建議按表1操作。

The recommended fuse position is shown in table 1.

e) 溫度保險絲

Concerning thermal fuse

將壓敏電阻器與溫度保險絲連接時, 使用者端請儘量選用熱結合較好的保險絲。

Set a thermal fuse to get high thermal conductivity with varistor.

9.2.2. 使用環境

Operating environments

- 1) 壓敏電阻器不可在室外使用。

The varistor is designed to be used indoors. Do not use it exposed outdoors.

- 2) 不可在陽光直射場所、發熱源附近或溫度超過使用溫度範圍的場所使用。

Do not use the varistor in places exposed to temperatures beyond the operating temperature range, such as places exposed to sunlight and vicinities of heating equipment.

- 3) 不可在淋雨、蒸汽、高濕度的場所使用。

Do not use the varistor in places exposed to high temperatures and high humidity, such as places exposed directly to rain, wind, dew condensation, and vapor.

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- 4) 不可在粉塵或鹽分較多的場所以及被腐蝕性氣體汙染的環境中使用。
Do not use the varistor in dusty and salty places and atmospheres polluted by corrosive gases.

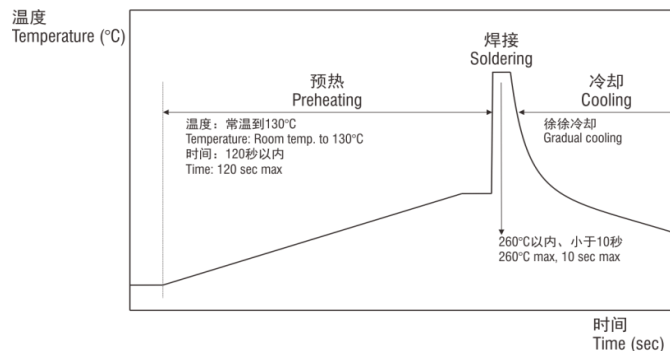
9.2.3. 加工條件 Processing conditions

- 1) 不可採用可能導致外塗層樹脂劣化的溶劑（稀釋劑、丙酮等）進行清洗。
Do not wash the varistor by such solvents (thinner, acetone, etc) as its exterior resin deteriorates.
- 2) 不可施加可能導致外塗層樹脂或元件出現破損的衝擊或撞擊、壓力。
Do not apply a strong vibration or shock (by falling, etc) to the varistor, cracking to its exterior resin and element may
- 3) 將壓敏電阻器進行樹脂鍍膜（含護膜塑模）時，不可使用可能導致壓敏電阻器劣化的樹脂。
When coating the varistor with resin (including molding), do not use such resin.
- 4) 壓敏電阻器外塗層樹脂附近的引線部位不可進行強烈折彎或施加外力。
Do not bend the varistor lead wires at the position close to its varistor exterior resin, or apply external force to the position.
- 5) 焊接時，請在如下條件下進行。且不可將構成壓敏電阻器的焊接部位或絕緣材料熔化。
When soldering the varistor lead wires, follow the recommended conditions and do not melt the solder and insulating materials constituting the varistor.

| 焊接方式 Soldering method | 推薦條件 Recommended condition | 注意事項 Attention item |
|--------------------------|--------------------------------------|---------------------------------------------------------|
| 波峰焊 Flow soldering | 260°C, 10秒以內 260°C, within 10 sec | 引線型不是回流焊物件產品 Lead wires type is not reflow soldering |

上述以外的條件下使用時，請用戶端自行確認。
For use other than the above conditions, please the client to confirm.
僅限進行1次返工，烙鐵溫度350°C以下，時間控制在5秒以內。
Only 1 times rework, soldering iron temperature should not exceed 350°C and should not be applied for more than 5 sec.

■ 推薦焊接條件 Soldering temperature-time profile to recommend



9.2.4. 長期保管 Long-term storage

- 1) 壓敏電阻器不可保存在高溫、高濕場所。保存場所室溫40 °C以下，濕度75%RH以下，保存期限為1年。
Do not store the varistor under high temperature and high humidity. Store it at a temperature up to 40 °C and at humidity below 75% RH, and use it within 1 year.
長期間保管（1年以上）時，使用時請確認產品的可焊性。
Before using the varistor that has been stored for a long period (1 years or longer), confirm the solderability.
- 2) 不可保存在腐蝕性氣體（硫化氫、亞硫酸、氯氣、氨氣等）環境中。
Avoid atmospheres full of corrosive gases (hydrogen sulfide, sulfurous acid, chlorine, ammonia, etc).
- 3) 保存場所避免陽光直射、結露等。
Avoid direct sunlight and dew condensation.

9.3. 說明 Notices

用於可靠性要求極高的設備（航空航太設備、醫療設備等）時，請事先至本公司諮詢使用型號和保護措施等相關事宜。
In cases that the varistor is used in equipment (aerospace equipment, medical equipment, etc) requiring extremely high reliability, ask us for a selection of part no., and protection coordination, etc in advance.
若未按照產品規格書記載事項進行操作，並由此導致出現異常時，本公司不負任何責任。
Note that we do not take any responsibility for faults and abnormalities resulting from the use not in conformity with the contents of entries in the delivery specification.
出現使用電路電壓的異常上升、超高浪湧的侵入等不可預期因素時，可能導致壓敏電阻器起火。為防止延燒到使用設備上，外部結構材料需使用阻燃材料進行多重保護。
There is a possibility that the varistor will unexpectedly cause smoke or ignite because of an abnormal rise of the circuit voltage and invasion of excessive surge. To prevent that accident from spreading over the equipment and not to expand the damage, use multiplex protection such as the adoption of frame-retardant materials for housing parts and structural parts.

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10. 編帶標準

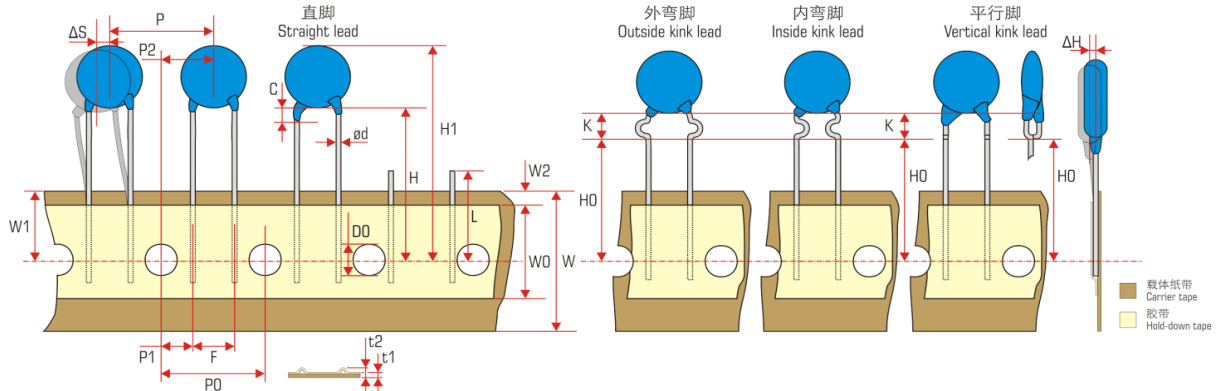
TAPING SPECIFICATIONS

方式一 Method 1

孔距(P0)與元件間距離(P)均為12.7mm

或者, 孔距(P0)與元件間距離(P)均為15.0mm

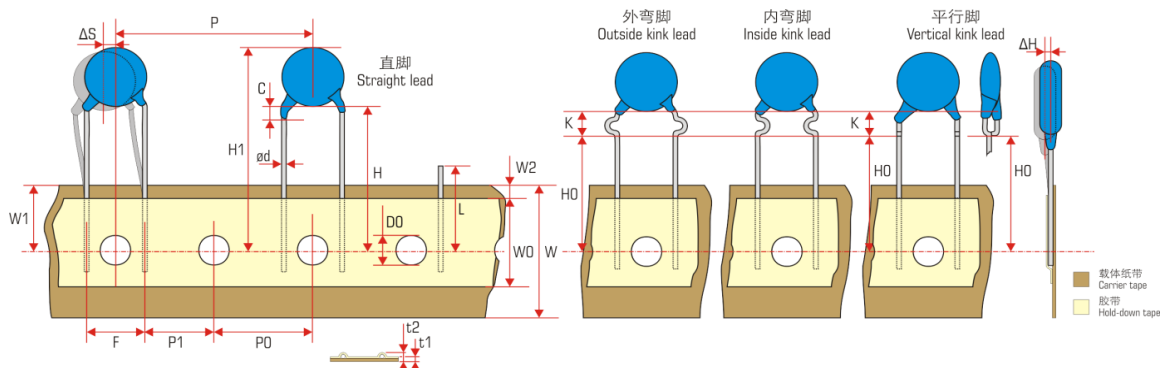
12.7mm by feed hole pitch (P0) and components pitch (P) or, 15.0mm by feed hole pitch (P0) and components pitch (P)



方式二 Method 2

孔距(P0)為12.7mm, 元件間距離(P)為25.4mm

Feed hole pitch (P0) with 12.7mm and components pitch (P) with 25.4mm



| 項目 Item | 代碼 Symbol | 方式一 Method 1 | | 方式二 Method 2 | 誤差 Tolerance |
|----------------------------------------------|--------------|----------------------|------|-----------------|-------------------|
| | | 標準 Specifications | | | |
| 彎腳架高 Height of kink | K | 5.0 | | | max |
| 塗裝腳長度 Coating run on leads | C | 3.0 | | | max |
| 剪切長度 Snipped length | L | 11.0 | | | max |
| 編帶總厚度 (含導線) Total tape and lead wire | t2 | 1.5 | | | max |
| 編帶厚度 Total tape thickness | t1 | 0.9 | | | max |
| 進料孔直徑 Feed hole diameter | D0 | 4.0 | | | ± 0.3 |
| 元件總高度 Component height | H1 | 40.0 | | | max |
| 彎腳類 Kink lead type | H0 | 16.0 | | | ± 0.5 |
| 直腳類 Straight lead | H | 18.0 | | | $+2.0$ -0 |
| 膠帶位置 Hold-down tape position | W2 | 3.0 | | | max |
| 孔位 Hole position | W1 | 9.0 | | | $+0.75$ -0.5 |
| 膠帶寬 Tape width | W0 | 7.0 | | | min |
| 紙帶寬 Tape width | W | 18.0 | | | $+1.0$ -0.5 |
| 導線直徑 Lead wire diameter | ϕd | 0.55 | | | ± 0.1 |
| 進料孔與元件間距離 Hole center to component center | P2 | 6.35 | 7.5 | --- | ± 1.3 |
| 進料孔與導線間距離 Feed center to lead center | P1 | 3.85 | 3.75 | 3.85 | ± 0.7 |
| 孔距 Feed hole pitch | P0 | 12.7 | 15.0 | 12.7 | ± 0.3 |
| 元件間距離 Component pitch | P | 12.7 | 15.0 | 25.4 | ± 1.0 |
| 腳距 Lead to lead distance | F | 5.0 | 7.5 | 10.0 | ± 0.8 |