- To identify the source and route of surge.
- To decide the connection method of varistor.
- To decide varistor voltage and max. clamping voltage.
- To decide surge current waveform by calculation from surge voltage and surge impedance.
- To check whether the withstanding surge current and surge life of varistor is sufficient or not.
- To check the variation of electric power of protected device.
- To check whether the max. energy and energy life of varistor is enough or not.
- To check the relation:
  Max. withstanding voltage of protected device > Max. clamping voltage of varistor > The real clamping voltage occurred > Breakdown voltage of varistor > Operating voltage of protected device.
- To check whether the loss of capacitance of varistor in operating condition.
- To check whether the problem caused by excessive current of leakage.
- To check the connection method of varistor.
- To check the condition of varistor overload.
- To check any other problems by various operating conditions.
- To test and to verify by real practice.
- To check the connection of the grounding wire.

- 確定突波的來源及其通路。
- 確定壓敏電阻的連接方式。
- 確定所需要的壓敏電壓及最高抑制電壓。
- 依突波電壓和突波阻抗計算出突波電流的波形。
- 檢查壓敏電阻的突波耐量和脈衝壽命是否足夠。
- 檢查受保護電子產品所使用電源的變動(穩定)程度。
- 檢查壓敏電阻的最大能量和能量壽命是否足夠。
- 檢查下列關係是否正確:
  受保護電子產品之最高耐電壓 > 壓敏電阻之最高抑制電壓 > 眞正產生之抑制電壓 > 壓敏電阻之崩潰電壓 > 受保護電子產品之工作電壓
- 檢查壓敏電阻於工作狀態下是否損失其電容值。
- 若出現問題先檢查是否漏電流太大之原因。
- 檢查壓敏電阻連接方式是否適當。
- 檢查壓敏電阻負荷是否過大。
- 檢查壓敏電阻於工作狀態下是否有其他任何問題。
- 受保護電子產品以實際操作來測試及確認所使用之壓敏電阻。
- 檢查接地線之連接狀況。

## EXAMPLES OF APPLICATION

## 應用說明

### Varistor voltage selection in line circuit

| Power supply voltage | Type |
|---|---|
| 100V AC | JVR□□△201K JVR□□△221K<br>JVR□□△241K JVR□□△271K |
| 200V AC | JVR□□△391K JVR□□△431K<br>JVR□□△471K |
| 12V DC | JVR□□△220L |
| 24V DC | JVR□□△390K |

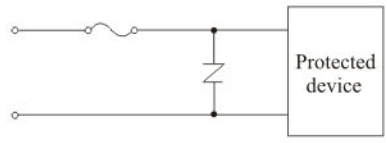
### Varistor voltage selection in line to ground circuit

| Power supply voltage | Type |
|---|---|
| 100V AC, 200V AC | JVR□□△431K JVR□□△471K<br>JVR□□△751K to JVR□□△112K |

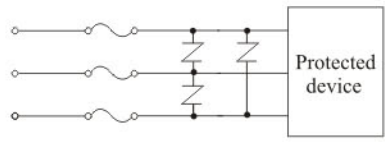
□ : Element size (disc dia.)
△ : Series (N : N series, S : S series, U : U series)

### Line Circuit

AC/DC single-phase circuit




AC three-phase circuit



## Varistor voltage selection in switching circuit protection

| Power supply voltage | Type |
|---|---|
| 12V DC | JVR□□△220L |
| 24V DC | JVR□□△390K |
| 100V DC | JVR□□△151K |
| 100V AC | JVR□□△201K JVR□□△241K<br>JVR□□△221K JVR□□△271K |

## Varistor voltage selection in telecommunication circuit protection

| Power supply voltage | Type |
|---|---|
| 12V DC | JVR□□△220L<br>JVR□□△820K to JVR□□△112K |
| 24V DC | JVR□□△390K<br>JVR□□△820K to JVR□□△112K |

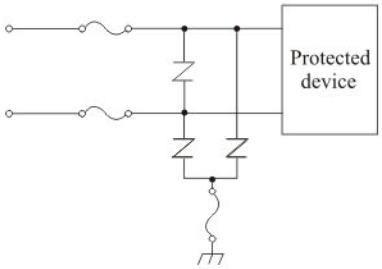
□ : Element size (disc dia.)
△ : Series (N : N series, S : S series, U : U series)

## Fuse current selection if fuse being in series with varistor to protect from follow-on surge current after varistor damaged

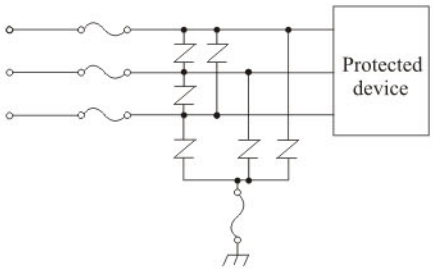
| Varistor | 5 $\phi$ | 7 $\phi$ | 10 $\phi$ | 14 $\phi$ | 20 $\phi$ |
|---|---|---|---|---|---|
| Nominal fuse current | ≦1A | ≦3A | ≦5A | ≦10A | ≦15A |

## Line and Ground

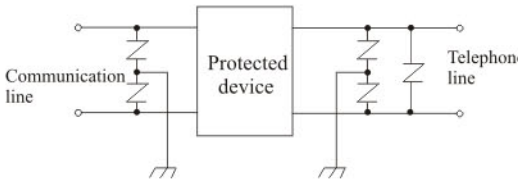
AC/DC single-phase circuit




AC three-phase circuit

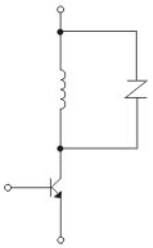



## Telecommunication Circuit Protection

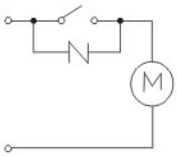



## Switching Circuit Protection

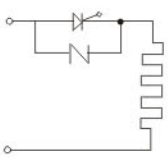
Relay protection



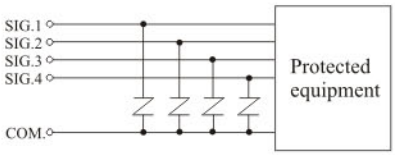
Spark elimination



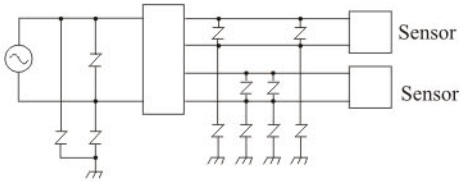

Semiconductor protection



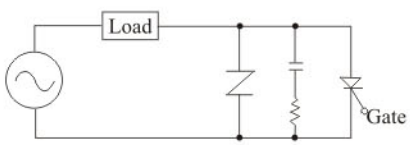
Surge protection of signal line



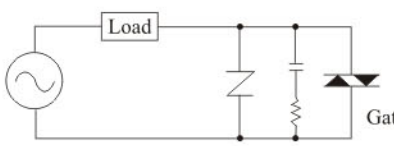

Fire alarm system



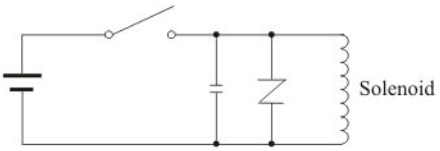

Thyristor protection



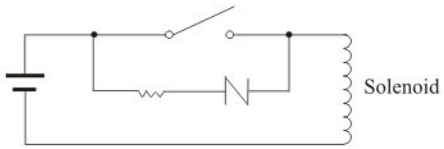

Triac protection



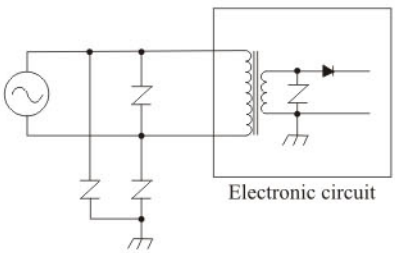
**Solenoid**



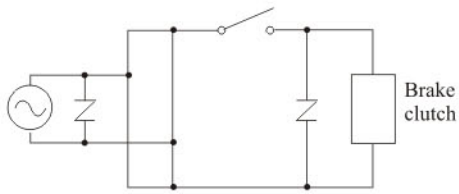

**Contact protection**




**Stove, Boiler**




**Brake, Clutch**




## CHECK LIST IN SERIES AND PARALLEL OPERATION OF VARISTORS

| Item | Series | Parallel |
|---|---|---|
| Objective | Higher voltage capability<br>Higher energy capability<br>(No Selection is required) | Higher current capability<br>Higher energy capability<br>(Selection is required) |
| Application Range | All voltages and currents. | All voltages-but for higher currents, i.e.,>100A |
| Models Applicable | All, must have same withstanding surge current ratings. | All models |
| Precautions | Withstanding surge current ratings must be equal. | Must be identical voltage rated models.<br>Must test and select units for similar V-I characteristics. |
| Effect on Rating | The same current ratings with single unit.<br>Voltage ratings additive.<br>Energy ratings additive.<br>Clamp voltages additive. | Current ratings function of current sharing.<br>The same voltage ratings with single unit.<br>Energy ratings as above in proportion to current sharing.<br>Clamp voltages determined by composite V-I characteristic of matched units. |

## 敏壓電阻器以串聯及並聯方式使用應確認的項目

| 項目 | 串聯 | 並聯 |
|---|---|---|
| 目的 | 較高電壓。<br>較高能量。<br>〈不須挑選〉 | 較大電流。<br>較高能量。<br>〈需要挑選〉 |
| 應用範圍 | 所有電壓及電流 | 所有電壓，但較大電流(>100A) |
| 型號適用性 | 須有相同的額定突波耐量。 | 所有型號。 |
| 注意事項 | 額定突波耐量必須相同。 | 必須是單一額定電壓。<br>必須挑選類似的V-I特性。 |
| 對額定值的影響 | 須與單一元件額定電流相同。<br>額定電壓增加。<br>額定能量增加。<br>殘壓增加。 | 額定電流決定於電流分配方式。<br>須與單一元件額定電壓相同。<br>額定能量與電流分配成正比。<br>殘壓決定於合成之V-I曲線。 |