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Spark Guenchers

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As the development of electronic equipment is going to be more compact and more complex, combined with breakthroughs in semiconductor technology increasing the multi-functional load of equipment, the following problems will be encountered in equipment development:

- The load of electromagnetic or relay switch becomes larger and the contact current becomes larger
- The miniaturization of electronic devices causes a relative decrease in safety distance and insulation strength
- High frequency operation and complicated design lead to more antenna effects and EMI interference

Leading to power failure and circuit sparks causing contact loss or contact arc voltage abnormalities, due to self-inductance or back electromotive force (EMF) caused by wrong actions, relay or electromagnetic switch flutter affects the rectifier (SCR) and relay (SSR), The circuit failure is more likely to cause accidents such as electric shock and fire. Chiefcon spark extinguisher (SPARK QUENCHERS) can suppress the contact arc of one hundred hertz (Hz) and the jitter of abnormal voltage, and filter out trouble on the loop at the lowest cost.

Selected RC data

RC is generally quite complicated to calculate, because the RC combination has a decisive role in integrating the rapid changes of the waveform to a smooth average value, only approximate evaluation is required without complicated calculations. Use the chart or formula to choose the appropriate CHIEFCON Spark Quencher.

| | | LOAD CURRENT - AMPERES | | | | | | | | | | |
|---------|--------|------------------------|------|------|------|-------|-----|-----|-----|----|------|--------|
| | | 0.05 | 0.1 | 0.2 | 0.3 | 0.5 | 1 | 2 | 3 | 5 | | |
| | 125VAC | 0.01 | 0.01 | 0.01 | 0.01 | 0.022 | 0.1 | 0.3 | 0.5 | 1 | MFD | |
| | or | + | + | + | + | + | + | + | + | + | + | |
| Source | 125VDC | 470 | 470 | 220 | 120 | 120 | 47 | 47 | 47 | 10 | OHMs | R+C |
| Voltage | 250VAC | 0.01 | 0.01 | 0.01 | 0.01 | 0.022 | 0.1 | 0.3 | 0.5 | 1 | MFD | Values |
| | or | + | + | + | + | + | + | + | + | + | + | |
| | 250VDC | 470 | 470 | 470 | 470 | 120 | 120 | 120 | 47 | 47 | OHMs | |

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$$C = \frac{1^2}{10} \qquad R = \frac{V}{10\left(1 + \frac{50}{V}\right)I}$$

C= Capacitance
I = Load Current
R= Resistance
V= Source Volta

Spark Quenchers are electronic components that are an easy option. They are mainly used to prevent or greatly reduce the generation of arc and noise in relays and switch contacts. When the RC time constant is delayed and the average surge voltage and oscillation, spark discharge and induced noise is absorbed in a wide range.

| | Arc suppression | At the moment the switch is turned on, the RC combination absorbs and suppresses the energy of the arc by bypassing the switch. | |
|---|--------------------------------------|--|-----------------|
| (| Damping oscillation | The RC assembly absorbs high-frequency oscillations caused by mechanical vibrations, such as relay contact flutter. Similarly, the oscillations generated by the arc are averaged and suppressed by the RC combination, regardless of their source. | VE RC connected |
| | Back electromotive force suppression | The surge voltage peak is prevented by a low impedance test through the RC circuit due to the self-induced back electromotive force. The peak is absorbed by RC's capacitance. The waveform is averaged and smoothed by the time constant of RC. The resulting noise is eliminated or minimized. | V Connected |
| | Dv/dt suppression | The RC combination allows a reduction in dV/dt for "on" and "off" operations of thyristors or similar devices. Such the surge voltage is suppressed and the semiconductor element is protected. Even in the case of zero-crossing circuits such as AC circuits, protection is needed because of harmonic noise that occurs when there is a gap between the current and voltage of the phase or load circuit. | |

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CHIEFCON Spark Quenchers can be quickly used in various applications and have the following characteristics:

1) Large overload capacity.

2) No polarity, so it can be used in AC and DC circuits.

3) Strong ability to suppress the surge voltage caused by contact oscillation and the accompanying oscillation.

4) Effective for stray potentials that are lower than the circuit voltage.

5) Improve the dv/dt ratio.

• An overview of safety capacitor categories

Capacitors are classified by IEC into the following categories:

| Subclass | Peak Voltage on Service (kV) | Peak Voltage Test 1.2/50 µsec. (kV) |
|----------|------------------------------|-------------------------------------|
| X1 | >1.2kVŠ 4.0kV | 4.0kV |
| X2 | Š 2.5kV | 2.5kV |

Structure

Spark Quenchers must have the ability to store surge voltage and current energy and provide protection against induced potentials. Used in spark quenchers, the dielectric material of CHIEFCON capacitors has very high compressive strength. All resistors are non-inductive solid blocks to ensure a high degree of pulse voltage protection. In order to provide additional protection for equipment and users, especially when these components are used in AC applications, all CHIEFCON spark quenchers can meet the requirements of UL-94 Flame Class V-O.

safety standard

Many world standards bodies have recently adopted safety standards for capacitors used in connection with AC power sources. CHIEFCON Spark Quenchers have fully tested these standards (see picture). In addition, Chiefcon can also provide some 300/330/440/480/500 VAC products.

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• Type



Related application of spark arrester





Standard example in AC circuits.



For phase control

Standard example in DC circuits.

Measured indication of absorption

The following figure shows the operation examples of various commonly used magnetic relays and contactors with and without Spark Quenchers. It illustrates Spark Quencher's ability to integrate peak power surges and suppress high-frequency oscillations.

Without Spark Quencher in the circuit, the surge voltage is 10 to 30 times larger than the normal circuit voltage, and the noise frequency is close to 10 MHz. Spark Quenchers effectively absorb high-frequency oscillations caused by contact oscillations and attenuate peak surge voltages.

Generally, inductive load circuit failures are caused by component insulation breakdown caused by excessively high peak potentials or accompanied by highfrequency oscillations due to rapid voltage changes. Spark Quenchers effectively prevent two types of failures from occurring.

We have identified improvements in several situations where Chiefcon's RC products have been used.



Example 1. Magnetic relay closed in 12VDC circuit.





Example 4. Large magnetic relay opened in 120VAC circuit.



Example 5. Magnetic contactor opened in 240VAC circuit.





Example 7. Motor timer opened in 120VAC circuit.



Example 8. Induction motor opened in 240VAC circuit.

