

## Surge Arresters

### Tech Notes

## How to Use ESD/surge Protection Devices : Surge Arresters



Surge arresters are GDT (gas discharge tube) voltage protection devices. TDK offers a strong lineup of products with a variety of surge current capabilities ranging from lightning protection for power lines to lightning protection for signal lines.

### How surge arresters work

Gas-filled surge arresters operate on the principle of an arc discharge. Electrically, they act as voltage-dependent switches. As soon as the voltage applied to the arrester exceeds the spark-over voltage, an arc is formed within the hermetically sealed discharge chamber in a matter of nanoseconds. The arc forms a short circuit over which the entire current flows, instantaneously eliminating the overvoltage. When the discharge has dissipated, the arrester extinguishes and the internal resistance immediately returns to values of several 100 M $\Omega$ .

In this way surge arresters almost perfectly fulfill all requirements made on a protection element.

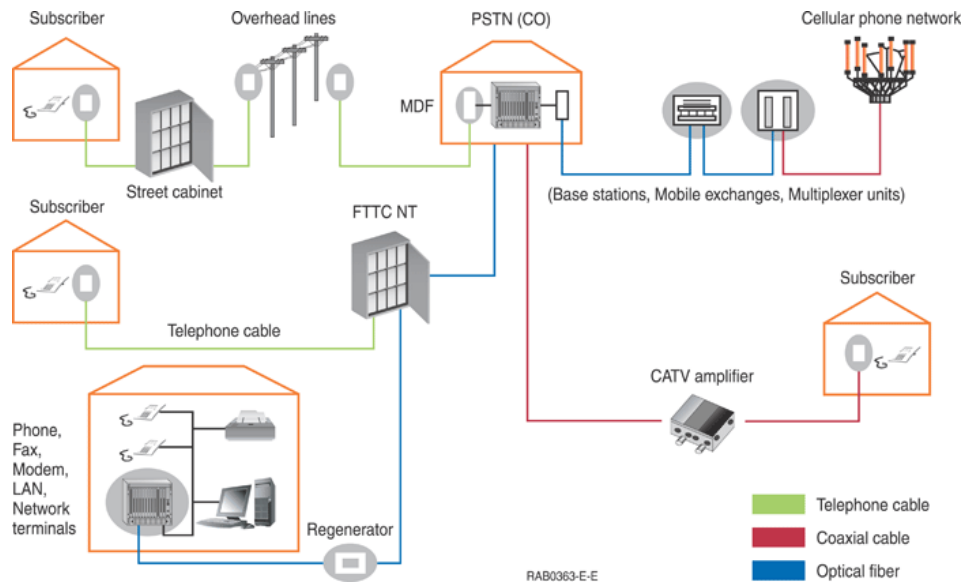
They reliably limit the overvoltage to permissible levels, and – under normal operating conditions – their high insulation resistance and the low capacitance mean that there is virtually no impact on the system to be protected.

### Sample application: Telecom Applications

#### Telecom applications

Gas-filled surge arresters are classic components for the protection of telecommunication installations. In order to protect IT and telecommunication systems with their sensitive electronic circuits surge arresters are used at the connection points to telecommunication lines. In addition, these protection components are indispensable for protecting base stations in mobile telephone systems and extensive cable television (CATV) networks with their repeaters and distribution systems as well as sensitive equipment and systems in other sectors:

Figure 1 Major places where surge arresters are used in communication systems



CATV

Unlike varistors, surge arresters has a small capacitance (0.2 pF at the minimum) and do not affect high-frequency signals. They are therefore suitable for the surge protection for CATV and high-speed communication lines. Shown below are examples of protection circuits with a 2-electrode arrester and a 3-electrode arrester.

Figure 2 Example of a protection circuit with a surge arrester (2-electrodes) for a coaxial cable of CATV

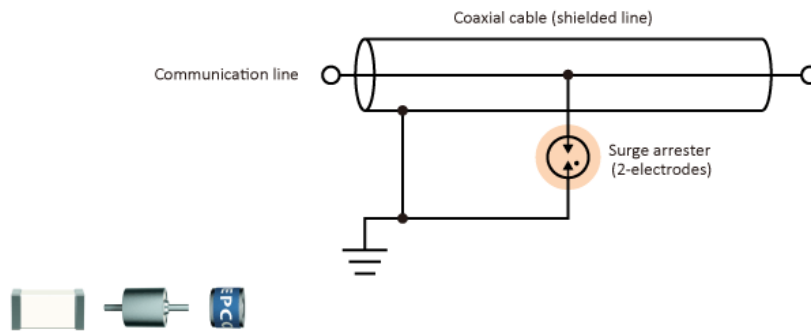
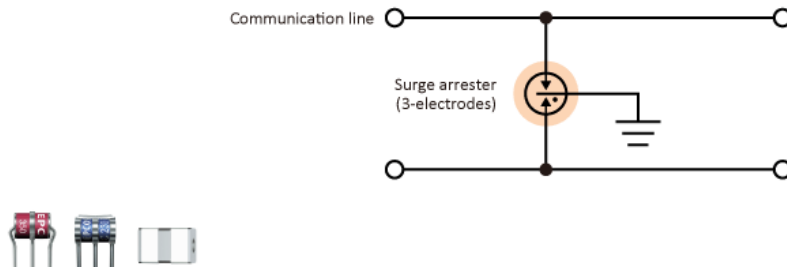


Figure 3 Example of a protection circuit with a surge arrester (3-electrodes) for a high-speed communication line



### Sample application: Surge protection device (SPD) for power supplies

Surge protection devices (SPDs) for power supplies, which protect devices from lightning surges and other high transients, employ surge arresters in addition to varistors. The following are examples of connections to a single-phase AC power line and a three-phase AC network. Plug-in SPDs are frequently used for power distribution boards and power switchboards and varistors and surge arresters are used inside of the devices.

Figure 4 SPD for power supply (Single-phase AC)

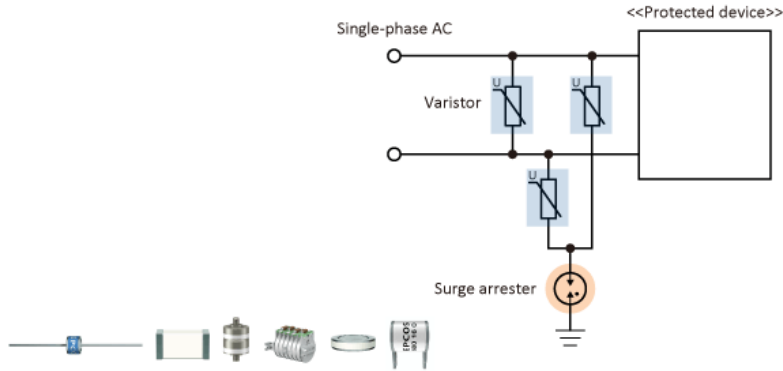
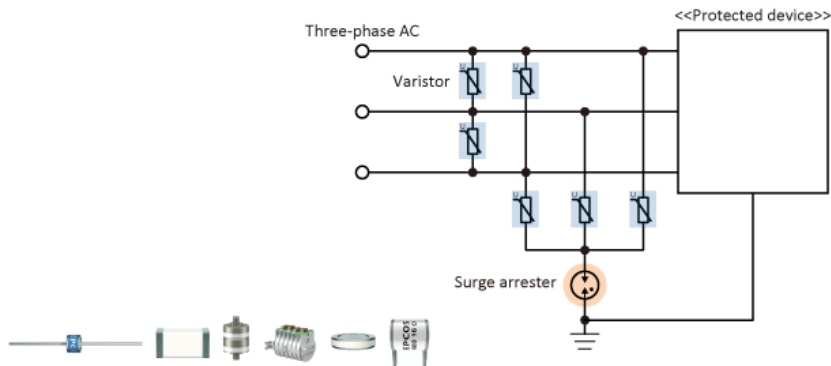


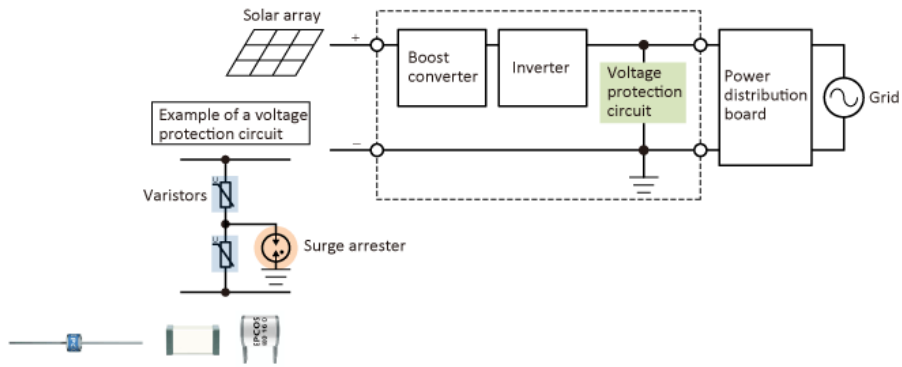
Figure 5 SPD for power supply (Three-phase AC)



### Sample application: Protection circuit for solar power conditioners generation systems

A power conditioner in a solar power generation system is an application of surge protection for a DC power supply. DC current generated by solar panels is fed to the power conditioner, boosted in a DC-DC converter, converted into AC electricity by an inverter, and then fed into the power grid. To protect power conditioner circuit from an inductive lightning surge and other strong transients, a voltage protection circuit using a combination of varistors and arresters is connected to the input part of the power conditioner.

Figure 6 An application of surge protection for a solar power generation system



Sample application: Overvoltage protection of Ethernet interfaces

TDK offers EPCOS surge arresters with 2- and 3-electrodes that are especially designed to protect data interfaces. These components feature small SMD housings, high current capability, high insulation resistance and low capacitance.

Typical applications are Ethernet interfaces in routers and switches, patch panels, modems, PCs and laptops, set-top boxes, IP-TV, CCTV, WLAN-AP.

Figure 7 Overvoltage protection of Ethernet interfaces

