The type of signal protection for 120 V AC digital input/output (I/O) signals is different if the signal source neutral line is shared or isolated. Each solution requires protection to ensure the PLC/controller is not damaged by surges. This document explains why a product is recommended, how it’s wired, and how to remotely monitor the status.

Both types of signal protection offer remote monitoring with local indication of a failure. Plugs are hot-swappable without interruption of the signal.

In a shared source application, follow-currents are possible. Follow-currents can pass through systems with gas tube type protection, possibly causing downstream fuses to trip that would require manual resetting. In this application, a PT 2X1 VA is used (see Figure 1) and only MOVs are connected between the signal lines and ground.

For isolated 120 V AC circuits, the MAINS-PLUGTRAB PT2-PE/S-120AC is recommended (see Figure 2). This product includes a gas discharge tube, but is not used independently in a common mode surge event, eliminating the follow-current issue. In this application, the neutral/return for the 120 V AC source could be at a different potential so it needs to be isolated from the ground with a gas tube. This assures optimum personnel and equipment safety while providing effective surge protection for each circuit.

Figure 1. Circuit diagram with PT 2X1 VA

Figure 2. Circuit diagram with PT 2-PE/S-120AC
Figure 3. Shared 120 V AC input connections

Figure 4. Shared 120 V AC output connections

Figure 5. Isolated 120 V AC input connections

Figure 6. Isolated 120 V AC output connections
Monitoring can be daisy-chained so only one alert is sent to the PLC/Controller. An LED on the plug identifies which plug needs replaced.

Only one base element is used for protection of 120 V AC signals. The grounding and remote monitoring are the same for both types of signals.