100kA Surge Protective Device
600V Delta 3PH, 50/60Hz - Wire Leads - Type 2 SPD - N4X
Instruction Manual



⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

LOSS OF BRANCH CIRCUIT POWER / LOSS OF SURGE SUPPRESSION

- Ensure that the branch circuit breaker or fuse trip characteristic has been coordinated with the overcurrent protection inside the SPD (See Table 1).
- Perform periodic inspection of the SPD status indicator lights as part of the preventative maintenance schedule.
- Promptly service the SPD when an alarm state exists.
- Use dry contacts to signal an alarm state to the central supervisory system for unmanned, inaccessible, or critical installations.
- Use multiple SPDs to achieve redundancy for critical applications.

Failure to follow these instructions can result in injury or equipment damage.

At end-of-life conditions, Surge Protective Devices (SPDs) can lose their ability to suppress power system transient voltage spikes and attempt to draw excessive current from the line. This SPD is equipped with overcurrent and overtemperature components that will automatically disconnect the surge suppression elements from the mains should the surge suppression elements reach end of life. Tripping of the branch circuit breaker or fuse feeding the SPD can occur. Mitigate the tripping of the branch circuit breaker or fuse feeding the SPD by coordinating the surge suppression elements with the branch circuits.

For the purposes of coordination, the SPD is equipped with overcurrent components that will limit the per phase I^2t, $I_{apparent}$, I_p, and I_{th} values to those listed in Table 1 when connected to a power system with a short-circuit current rating not exceeding 200,000 A.

Table 1:

Per Phase I^2t	$I_{apparent}$	I_p	I_{th}
44 kA^2 seconds	8,500 A RMS	20,000 A RMS	110 A

⚠ CAUTION

LOSS OF SURGE SUPPRESSION

- During installation into an electrical system, SPDs must not be energized until the electrical system is completely installed, inspected, and tested. All conductors must be connected and functional, including the neutral. The voltage rating of the device and system must always be verified before energizing the SPD.
- Any factory or on-site testing of power distribution equipment that exceeds the normal operating voltage, such as high potential insulation testing, or any other tests where the suppression components will be subjected to voltages higher than their rated turn-on voltage must be performed with the suppressor disconnected from the power source. The neutral connection at the SPD must also be disconnected prior to performing high-potential testing and then reconnected upon completion of the test.

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Proper installation is imperative to maximize the effectiveness and performance of the Surge Protective Device (SPD). The installer should follow the steps outlined in this instruction bulletin to ensure proper installation. Read the entire instruction bulletin before beginning the installation. These instructions are not intended to replace national or local electrical codes. Check all applicable electrical codes to verify compliance. Installation of surge suppressors should only be performed by qualified electrical personnel

NOTE: Type 2 SPDs are designed for use on the load side of the service entrance Overcurrent Protection Device (OCPD) only.

Unpacking and Preliminary Inspection

Inspect the entire shipping container for damage or signs of mishandling before unpacking the device. Remove the packing material and further inspect the device for any obvious shipping damage. If any damage is found and is a result of shipping or handling, immediately file a claim with the shipping company.

Storage

The device should be stored in a clean, dry environment. Storage temperature is -40 °F to +149 °F (-40 °C to +65 °C). All of the packaging materials should be left intact until the device is ready for installation.

SPD Location Considerations

Environment

The device is designed to operate in an ambient temperature range of -4 °F to +149 °F (-20 °C to +65 °C) with a relative humidity of 0 to 95% non-condensing. This device has a Type 4X housing.

Audible Noise

The device background noise is negligible and does not restrict the location of the installation.

Mounting

The device has been designed to be surface mounted.

Service Clearance

The service clearance should meet all applicable code requirements.

Equipment Performance

To obtain optimum surge suppression, locate the SPD as close as possible to the circuitry being surge-limited to minimize the wire length. Minimizing the wire length reduces the impedance between the circuitry and the SPD. Although the SPD may be delivered with leads longer than six inches, these leads can be cut back in length.

Refer to the Voltage Protection Rating (VPR) values on the SPD nameplate. These VPR values were obtained by testing the SPD with six-inch long leads (per UL1449 3rd Edition, IEEE Test Waveform: 6kV/3kA 8/20 microseconds). For every additional foot of wire beyond six inches, the effective VPR increases by approximately 160 volts.

Electrical

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Confirm the SPD voltage rating on the module or nameplate label is the same as the operating voltage.

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Voltage Rating

Prior to mounting the SPD, verify that the device has the same voltage rating as the power distribution system in which it is installed. Compare the nameplate voltage or model number on the SPD with the nameplate of the electrical distribution equipment.

The specifier or user of the device should be familiar with the configuration and arrangement of the power distribution system in which the SPD is to be installed. The system configuration of any power distribution system is based strictly on how the secondary windings of the transformer supplying the service entrance main or load are configured. This includes whether or not the transformer windings are referenced to earth via a grounding conductor. The system configuration is not based on how any specific load or equipment is connected to a particular power distribution system. See Table 2 for the service voltage of your SPD.

Table 2: Voltage Ratings

Service Voltage	Peak Surge Current Rating Per Phase	Catalog Number
600 V Delta, 3 phase, 3 wire + ground	100 kA	MT-SRG-T2SP-BP-3PH-100KA-600D-N4X

Wire Leads

Twenty-four inch leads are provided. The wire leads are 10 AWG stranded copper wire. See Table 3 for wire color.

Table 3: Wire Color

Wye and High-Leg Delta Systems	
Wire	**Color**
Phase 1-3	Black
High-Leg	Orange
Neutral	White
Ground	Green
Delta Systems	
Wire	**Color**
Phase 1-3	Black
Ground	Green

Branch Circuit Overcurrent Protection and Disconnect Means

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- Use conductors rated for the Overcurrent Protection Device (OCPD) per applicable codes.
- Use conductors rated for the application per applicable codes.

Failure to follow these instructions will result in death or serious injury.

A branch circuit Overcurrent Protection Device (OCPD) either in the form of a circuit breaker or fuse must be provided for the SPD. The branch circuit OCPD should either provide or include a disconnecting means.

Since the current drawn by the SPD during normal operation is negligible, the SPD can be connected to a dedicated, separate branch circuit or connected to a suitable existing branch circuit.

When connected to a separate, dedicated branch circuit, the OCPD setting must be selected to protect the conductors feeding the SPD per applicable state and local building codes.

During surge suppression, current will flow through the SPD. The branch circuit OCPD must pass this surge current without tripping for the device to function properly.

For further information concerning coordination of the OCPD with the SPD, refer to the Caution statement “Loss of Branch Circuit Power/Loss of Surge Suppression” on page 1.

Location of Surge Protective Device (SPD)

Install SPDs on the load side of the main overcurrent protection to comply with NEC® Article 285 for Type 2 SPD.

Locate the SPD as close as possible to the circuit being surge-limited to minimize the wire length and optimize SPD performance. Avoid long wire runs so that the device will perform as intended. To reduce the impedance that the wire displays to surge currents, the phase, neutral, and ground conductors (wye and high-leg delta configurations), or phase and ground conductors (delta configurations), must be routed within the same conduit and tightly bundled or twisted together to optimize device performance. Avoid sharp bends in the conductors. See Figures 2 and 3.

Figure 2: SPD Wiring for Wye and High-Leg Delta Configurations

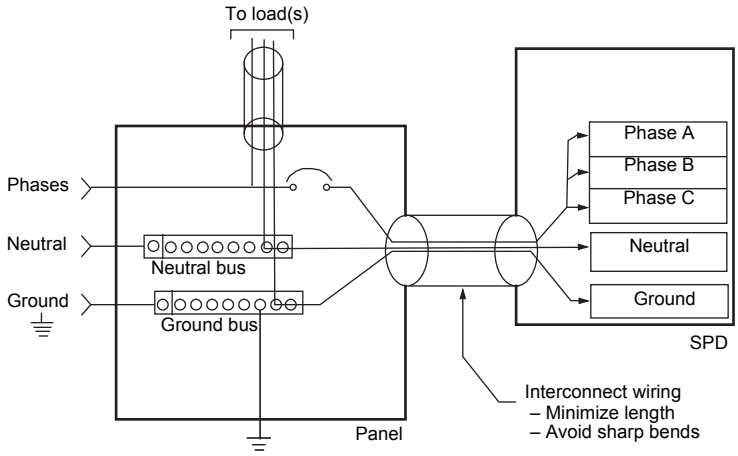
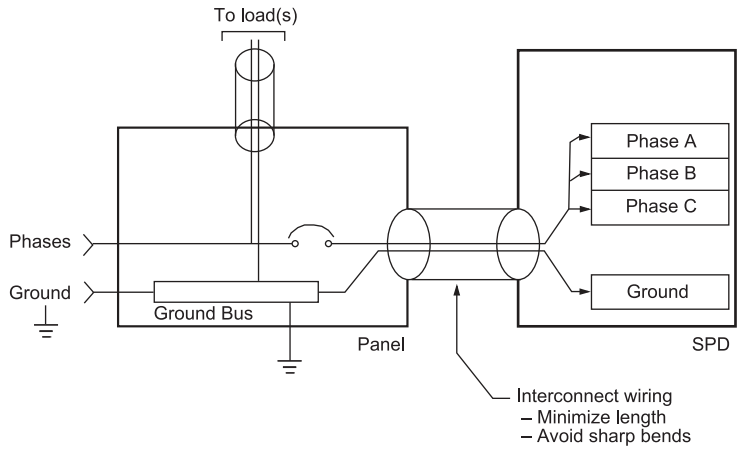


Figure 3: SPD Wiring for Delta Configurations



System Grounding

CAUTION

LOSS OF SURGE SUPPRESSION

- Must be installed on solidly grounded power systems. Do not use on ungrounded systems.
- Verify that the service entrance equipment is bonded to ground in accordance with all applicable codes.
- Verify that the neutral terminals are grounded to system ground in accordance with all applicable codes.

Failure to follow these instructions can result in equipment damage.

An equipment grounding conductor must be used on all electrical circuits connected to the SPD. For the best performance, use a single-point ground system where the service entrance grounding electrode system is connected to and bonded to all other available electrodes, building steel, metal water pipes, driven rods, etc. (for reference, see IEEE 142-2007). The ground impedance measurement of the electrical system should be as low as possible, and in compliance with all applicable codes, for sensitive electronics and computer systems.

When a metallic raceway is used as an additional grounding conductor, an insulated grounding conductor should be run inside the raceway and sized in accordance with all applicable codes.

⚠ WARNING

INADEQUATE RACEWAY ELECTRICAL CONTINUITY

- Ground impedance must be as low as possible and in compliance with all applicable codes for sensitive electronic and computer systems.
- Install an insulated grounding conductor inside a metallic raceway when the raceway is used as an additional grounding conductor. Size the conductor in accordance with all applicable codes.
- Maintain adequate electrical continuity at all raceway connections.
- Do not use isolating bushings to interrupt a metallic raceway run.
- Do not use a separate isolated ground for the SPD.
- Verify proper equipment connections to the grounding system.
- Verify ground grid continuity by inspections and testing as part of a comprehensive electrical maintenance program.

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Installation

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- Always use a properly rated voltage sensing device to confirm power is off.
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Mounting Recommendations

The SPD should be nipple mounted directly to the equipment being surge-limited. The measured torque for tightening the lock nut is not to exceed 100 lb-in. Always use the mounting brackets (provided) as primary support.

Wiring

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Wiring

Follow steps 1 through 7 to make wiring connections.

1. Turn off all power supplying this equipment before working on or inside any enclosure containing this equipment.
2. Confirm SPD is rated for your system by comparing voltage measurements to the Line Voltage (L-L, L-N) on the product label.
3. Identify proper location for the SPD. Locate as close as possible to the panel being surge-limited so the wires are as short as possible. Mount unit securely. See Figure 4 for mounting instructions.

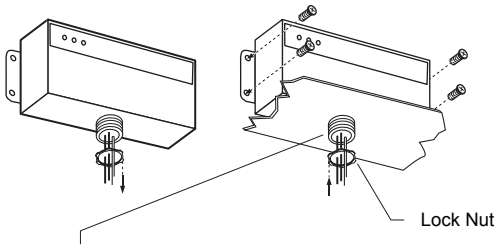
   NOTE: The SPD must be installed in an accessible location (not within walls).
4. Install in accordance with national and local electrical codes and match the branch circuit Overcurrent Protection Device (OCPD) to the wire size.
5. Twist conductors 1/2 turn or more for every twelve inches of length.
6. Do not loop or coil wires. Be sure to maintain adequate wire bending space per NEC® 2008 Article 408.
7. Use on grounded systems only.

   NOTE: On a high-leg delta installation, the high-leg of the power system must be connected to the orange wire of the SPD.

   NOTE: Always install the SPD on the LOAD side of the main disconnect.

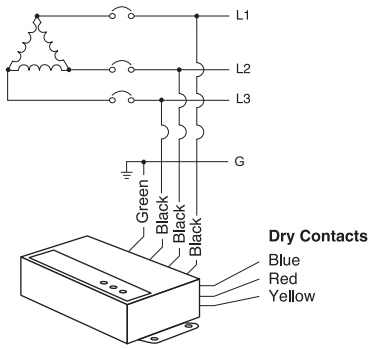
Wiring Diagram

Figure 4: Mounting Unit



0.75 in. [19 mm] knockout (trade size)
Actual hole size 1.0 in. [25 mm]

Figure 8: Three-Phase, 3 Wire, Delta Installation



Operation

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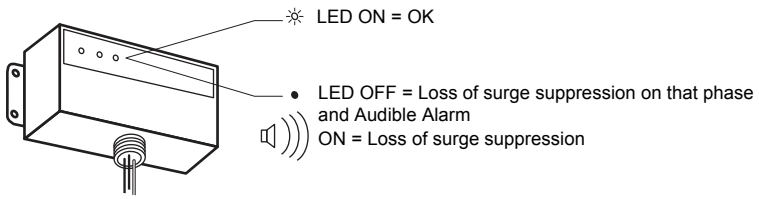
LED Status Indicators

Diagnostic LEDs are located on the front of the SPD. They operate as follows:

- Verify that all phase voltages are present. If any of the LEDs are not illuminated, the device may not be installed correctly. Check the power supply and service voltage. Upon energizing the SPD, check the LED status.
- If all of the LEDs are illuminated, surge suppression is operating.
- If one or more LEDs are not illuminated, there is a loss of surge suppression on that phase.
- If an inoperative condition occurs the device must be replaced by qualified electrical personnel.

Figure 9: Diagnostic Operation



Audible Alarm

The audible alarm does not have a silence switch. Silence the alarm by removing power from the SPD (open the circuit breaker that it is connected to). The alarm indicates that the device needs replacement by qualified electrical personnel.

Dry Contacts

The SPD is provided with dry contacts. The connection for the dry contacts is provided by 24-inch (61 cm) wire leads. The wire leads are 22 AWG stranded copper wire. See Table 5 for wire color and contact state. The unpowered state shall be closed between the red wire (common) and the yellow wire (normally closed). This is also the alarm condition. The opposite state, closed between the red wire (common) and the blue wire (normally open), indicates that power is on to the unit and that no alarm condition exists (See Table 5). These dry contact leads can be used for remote indication of the SPD operating status to a computer interface board or emergency management system. Also, these dry contact leads are designed to work with the SPD remote monitor option described in the following section.

The dry contacts are designed for a maximum voltage of 24 Vdc / 24 Vac and a maximum current of 2 A. Higher energy applications may require additional relay implementation outside the SPD. Damage to the SPD's relay caused by use with energy levels in excess of those discussed in this instruction bulletin are not covered by any warranty.

Table 5: Dry Contact Configuration

Dry Contact Terminal	Wire Color	Power off or Alarm Condition	Power on and no Alarm Condition
N/O (Normally Open)	Blue	Open	Closed
COM Common	Red	Common	Common
N/C Normally Closed	Yellow	Closed	Open

Preventive Maintenance

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Inspect the SPD periodically to maintain reliable system performance and continued transient voltage surge suppression. During this inspection, check the state of the display LED status indicators.

THESE INSTRUCTIONS MAY NOT COVER ALL DETAILS OR VARIATIONS OF THIS PRODUCT FOR YOUR EQUIPMENT OR INSTALLATION REQUIREMENTS. SHOULD FURTHER INFORMATION NOT COVERED BY THESE INSTRUCTIONS BE REQUIRED, PLEASE CONTACT LARSON ELECTRONICS BY EMAIL AT SALES@LARSONELECTRONICS.COM OR BY PHONE AT 1-877-348-9680 FOR FURTHER ASSISTANCE.

PLEASE VISIT LARSONELECTRONICS.COM FOR **WARRANTY** AND **RETURN** INFORMATION.