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UL 1449 4<sup>th</sup> Edition SPD

**TPS3 09**

User Manual - USA



[usa.siemens.com/spd](http://usa.siemens.com/spd)



# **WARNING - Hazardous Voltage & Shock Hazard**

Failure to Follow These Instructions Could Result in Death or Serious Injury

- Only qualified licensed electricians should install or service SPDs
- Hazardous voltages exist within SPDs
- SPDs should never be installed or serviced when energized
- Use appropriate safety precautions including Personal Protection Equipment
- Failure to follow these instructions can result in death, serious injury, and/or equipment damage.
- This manual shall be read in entirety prior to installing

## **Bonding and Grounding Hazard**

Verify that the neutral conductor in the service entrance equipment is bonded to ground in accordance with the National Electrical Code (NEC®) and all applicable codes.

Verify that the neutral terminal (XO) on the secondary side of distribution transformers are grounded to the system ground in accordance with the NEC® and all applicable codes.

During installation into an electrical system the SPD must not be energized until the electrical system is completely installed, inspected and tested. All conductors must be connected and functional including the neutral (if required). The voltage rating of the SPD and system must be verified before energizing the SPD.

Failure to follow these guidelines can lead to abnormally high voltages at the SPD. This may cause the SPD to fail. The warranty is voided if the SPD is incorrectly installed and/or if the neutral conductor in the service entrance equipment or downstream of separately derived systems is not bonded to ground in accordance with the NEC®.

## **Do Not Hi-Pot Test SPDs**

Any factory or on-site testing of power distribution equipment that exceeds normal operating voltage such as high-potential insulation testing, or any other tests where the suppression components will be subjected to higher voltage than their rated Maximum Continuous Operating Voltage (MCOV) must be conducted with the SPD disconnected from the power source. For 4-wire systems, the neutral connection at the SPD must also be disconnected prior to performing high-potential testing and then reconnected after test completion.

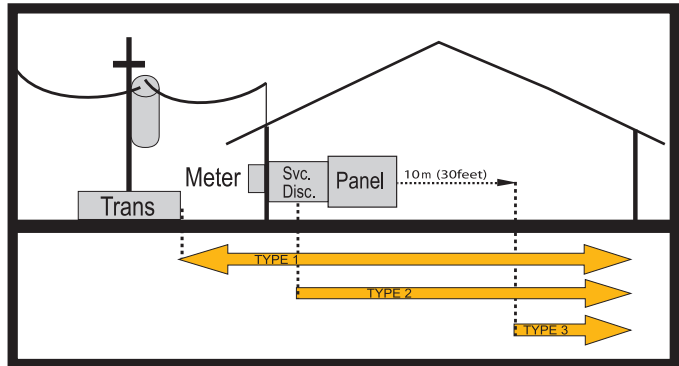
Failure to disconnect SPD and associated components during elevated voltage testing will damage the SPD and will void the warranty.

## Introduction

Thank you for choosing a Siemens TPS3 09 Surge Protective Device (SPD). It is a high quality, high energy surge suppressor designed to protect sensitive equipment from damaging transient overvoltages. TPS3 09 is parallel connected such that circuit ampacity is unlimited. Proper installation is important to maximize performance. Please follow steps outlined herein. This entire Operation and Maintenance Manual should be read prior to beginning installation. These instructions are not intended to replace national or local codes. Follow all applicable electrical codes to ensure compliance. Installation of this SPD should only be performed by qualified electrical personnel.

Siemens SPDs are extensively tested in accordance with industry standards such as ANSI/IEEE C62.41.1, C62.41.2, C62.45, C62.62, C62.72, UL1449, UL 1283, IEC 61643, CSA C22.2 No. 269, etc.

Figure 1: SPD Types - NEC® Article 285 & UL 1449-4



SPD Types: Types 1, 2, & 3

Based on Location within electrical distribution system

(also coincides with ANSI/IEEE C62.41.2 - 2002 Categories C, B & A)

## ⚠ WARNING

### Hazardous Voltage & Shock Hazard

- Only qualified licensed electricians should install or service SPDs.
- SPDs should never be installed or serviced when energized or during electrical storms.
- Use appropriate safety precautions including Personal Protection Equipment.
- Failure to follow these instructions can result in death, serious injury, and/or equipment damage.
- When used in outdoor applications, customer must seal the conduit nipple using watertight fittings (not included) to ensure a watertight connection.
- Read this manual in entirety prior to installing.

## Industry Nomenclature Changes

In the late 2000's, there were significant nomenclature changes associated with a revision to UL 1449 and 2008 NEC® Article 285. TPS3 09 complies with the latest regulatory actions and is UL 1449 & CSA 22.2 No. 269, Listed as such (VZCA.E321351). There is an emphasis on installation location, identified as Types 1, 2 and 3, outlined below.

**Type 1 SPD:** Installation on the line side or load side of the service disconnect overcurrent device. Type 1 SPDs may be used in Type 2 installations. Examples: surge arrestors, lightning arrestors, meter hubs, metering cabinets, ran out of breaker positions, etc.

**Type 2 SPD:** Downstream of service disconnect; probably will connect via breaker. Examples: switchboards, power panels, panelboards, equipment, motors, pumps, etc.

**Type 3 SPD:** Point of Use SPD, sometimes plug-connected SPD.

**Type 4 SPD:** Has different contexts in UL 1449 and CSA 22.2 No. 269. Call for assistance.

The TPS3 09s are available as Type 1 or Type 2 SPDs per UL 1449 and CSA 22.2 No. 269. (Construction is identical for Type 1 and Type 2 Model 425s.) Type 1 SPDs are evaluated more rigorously by UL 1449 for NEC® Article 285 and CEC compliance. Type 1 SPDs and their connecting leads have been evaluated for line side applications without need for supplemental overcurrent protection. Type 1 SPDs include internal overcurrent protection. As a generalization, it is more practical to install SPDs on the load side of the main overcurrent protection device for maintenance and serviceability reasons. When connected on load side of main disconnect, we suggest connecting via a 30A circuit breaker due to 10 AWG conductors. The circuit breaker serves as a disconnect switch and provides NEC® imposed short circuit protection to the conductors in Type 2 applications. A change in the 2014 NEC® Ten Foot Tap Rule may be useful in certain applications: 240.21(B)(1)(b) Exception:

*"When listed equipment, such as a surge protective devices(s) [SPD(s)], is provided with specific instructions on minimum conductor sizing, the ampacity of the tap conductors supplying that equipment shall be permitted to be determined based on the manufacturer's instructions."*

TPS3 09 SPDs have demonstrated 200kA Short Circuit Current Ratings (SCCR). 120V and 120/240V Model 425s have demonstrated 100kA SCCR. Confer to label on unit.

## Simplified Explanation of Operation

SPDs sense overvoltage and create a momentary low impedance path to redirect harmful surge energy. They reset automatically and wait for the next surge. This is similar to the pressure relief valve on a water heater: pressure goes up, valve opens to relieve pressure and then resets. In an electrical system, an SPD senses overvoltage, reduces impedance which equalizes damaging voltages and then resets. SPDs are capable of repeating this function thousands of times.

## Parts List and Inspection

Items included in the package consist of the following:

- 1 TPS3 09 SPD including 3' (1-m) conductors
- 1 User's Manual (this document)

\*See figure 4 for installation

If the Flush Mount Kit was ordered, additional parts are supplied as follows:

- 1 Flush Mount Plate
- 4 Mounting Screws

TPS3 09 has demonstrated 200kA or 100kA Short Circuit Current Ratings (SCCR) including leads. See UL Label markings on SPD or see Data Sheet for specs.) Supplemental overcurrent protection is not required to protect this SPD. However, NEC® and CEC convention requires that connecting conductors have overcurrent protection in Type 2 applications. Follow applicable codes.

This device features internal overcurrent and overtemperature protection that will disconnect affected surge suppression components at the end of their useful life, but will maintain power to the load – now unprotected. If this situation is undesirable for the application, follow these instructions for replacing the device. TPS3 09 is ultrasonically welded closed and contains no user serviceable parts.

Figure 2: Dimensions & Weight

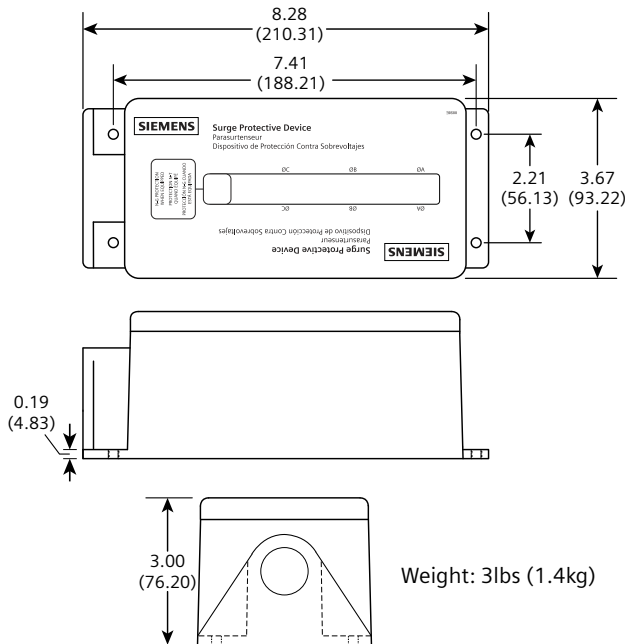


Table 2: Specifications

| Specifications                                      |  |
|---|--|
| Temperature Operating                               | -40°C (-40°F) to 60°C (+140°F)                       |
| Temperature Storage                                 | -55°C (-67°F) to 65°C (+149°F)                       |
| Wire Size & Installation Torque                     | 10 AWG; 18 inch-pounds                               |
| Appropriate Circuit Breaker based on conductor size | 30A (SPD includes internal OCP)                      |
| NEMA 250 Enclosure Rating                           | Type 4X with appropriate sealing & sealing condulets |

## Voltage Rating & Application

Before installing SPD, verify the nameplate voltage has the same voltage rating as the power distribution system. If unsure, call Siemens TPS Tech Support at 1.888.333.3545 before proceeding. The SPDs specifier or user should be familiar with the configuration and arrangement of the power distribution system. The system is defined by 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. SPDs should be installed per the distribution system, not per a load or motor's wiring connection.

For example, suppose a 480V three phase motor appears to be connected as a 480V Delta. In actuality, the serving distribution system might be a 480Y/277V grounded Wye, with or without a neutral pulled to the motor or MCC. The system is still a 480Y/277V Wye, even though the load is connected as a Delta. A grounded Wye has a defined reference to ground (i.e., neutral is bonded to ground). In contrast, some Delta systems are ungrounded, which have no reference to ground.

Table 3: Model Number Decoder

| Model   | Voltage Code | Service Voltage                            |
|---------|--------------|--|
| TPS3A09 | A            | 240/120V 1Ø, 3W Plus Ground,               |
| TPS3B09 | B            | 240/120V 3Ø, 4W Plus Ground High Leg Delta |
| TPS3C09 | C            | 208Y/120V 3Ø, 4W Plus Ground               |
| TPS3D09 | D            | 240V 3Ø, 3W Plus Ground                    |
| TPS3E09 | E            | 480Y/277V 3Ø, 4W Plus Ground               |
| TPS3F09 | F            | 480V 3Ø, 3W Plus Ground                    |
| TPS3G09 | G            | 600V 3Ø, 3W Plus Ground                    |
| TPS3K09 | K            | 380Y/220V 3Ø, 4W Plus Ground               |
| TPS3L09 | L            | 600Y/347V 3Ø, 4W Plus Ground               |
| TPS3S09 | S            | 400Y/230V 3Ø, 4W Plus Ground               |

## SPDs on Ungrounded Systems

**Caution** – Ungrounded systems are inherently unstable and can produce excessively high line-to-ground voltages during certain fault conditions. During these fault conditions, any electrical equipment including an SPD, may be subjected to voltages which exceed their designed ratings. This information is being provided to the user so that an informed decision can be made before installing any electrical equipment on an ungrounded power system.

# NOTICE

**CONDUCTING DIELECTRIC AND/OR HI-POTENTIAL TESTING WILL CAUSE INTERNAL DAMAGE TO TPS3 UNIT.**

Do not perform dielectric or high potential tests with the TPS3 unit installed.



# DANGER

**Hazardous voltage. Will cause death or serious injury.**

Keep Out.  
Qualified personnel only.  
Disconnect and lock off all power before working on this equipment.

## TPS3 09 Installation Instructions

Pre-Plan your installation. You need to accomplish the following:

- **Meet all National and Local codes** (NEC® Article 285 and UL 1449 address SPDs).
- **Confirm System voltage to SPD voltage** (120V SPD will fail instantly on 240V, 277V, etc.).
- **Mount SPD as close to panel or equipment as possible to keep leads short** (long leads hurt performance substantially).
- **Ensure leads are as short and straight as possible, including neutral and ground. If using a breaker, use a breaker position that is close to the SPD and the panel's neutral & ground.**
- **If using a breaker, recommended breaker size is 30A due to 10 AWG conductor.**
- **Make sure system is grounded per NEC® and clear of faults before energizing SPD** (inadvertent system problem may fail SPD).
- **Never Hi-Pot test Any SPD** (will prematurely fail SPD).
- **Do not install the TPS3 09 through the bottom of a NEMA 3R panel. Dripping water will prematurely fail the SPD**  
(a sealed pipe nipple installed in the SPD may be a solution).

1. Use voltmeter to check voltages and ensure correct SPD. See Data Sheet for specs & wire-outs.
2. Determine Mounting location – weather resistant equipment may be required.
3. If SPD has optional Dry Contact and Flush Mount Kit, pre-plan their installation. See Figures 4 & 6. (If flush mounting, be careful to not drop SPD into wall).
4. Remove power from panel/source. Confirm panel/source is deenergized.
5. Identify breaker location and SPD location. Position SPD such that LEDs are best visible.
6. Mount SPD – weather resistant applications require additional sealing, o-rings, etc. (not included).
  - Remove an appropriately sized knockout from panel.
  - Connect conductors as appropriate – short and straight as possible (Hi-Legs are Phase B).
7. Label or mark conductors as appropriate (neutral: white, ground: green, energized: black, hi-leg: orange).
8. Make sure system is bonded per NEC® and is clear of hazards or faults before energizing (N-G bonding not per NEC® will fail SPDs: #1 cause of SPD failures).
9. Energize and confirm proper operation of green LED indicators and/or options.

Figure 3: Panel Installation

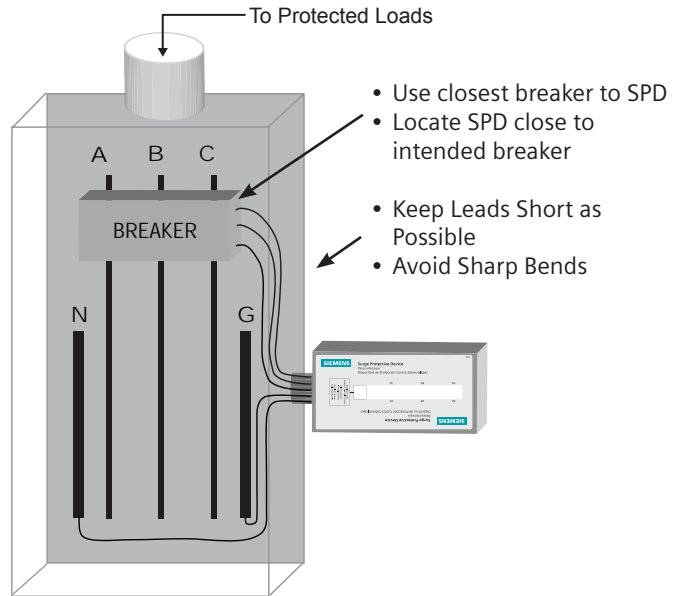


Figure 4: Typical Flush Mount Installation

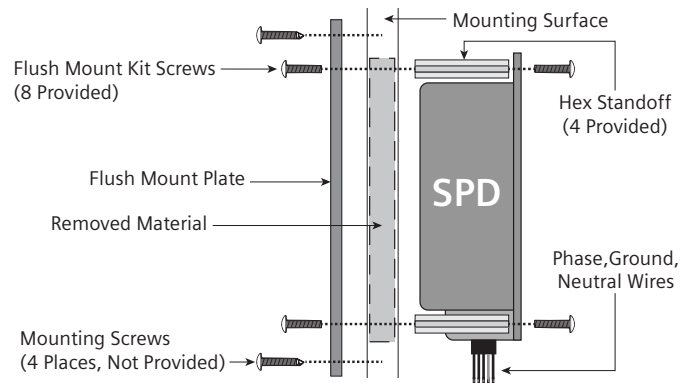
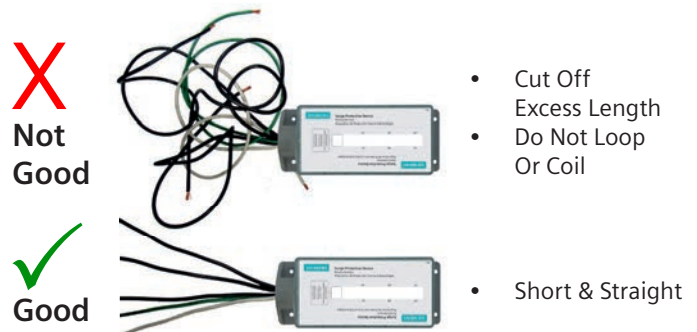


Figure 5: Lead Lengths

Leads: Short & Straight  
Cut Excess; Do Not Coil or Loop



### Connecting Optional Form C Dry Contact & Audible Alarm (“D” suffix near end of model number)

Three (3) 3’ (~1m) 18 AWG wires are included through the nipple with this option. (These are smaller than the 10 AWG SPD conductors.) Gray is Common, Blue is Normally Open and Red is Normally Closed. Normally Open and Normally Closed are based on the ‘Normal’ condition of the unit being energized and operating correctly. When not energized, or not operating correctly, the contacts’ state will be opposite of ‘Normal’. (We generally recommend the Normally Closed configuration because it detects disconnected or failed wiring whereas Normally Open does not.) The contact is rated 250V, 5A. Higher energy applications require supplemental relaying. This option monitors suppression element condition and is not intended for use as phase loss or phase detection monitoring. If the Dry Contacts are not utilized, insulate lead ends, coil and secure. Audible Alarm will still function correctly.

### Remote Indication Option

This is a supplemental diagnostic LED that can be mounted in a conspicuous location if the SPD is installed such that on-board LEDs are not readily visible. A green LED bezel assembly includes two pre-attached wires and two butt-splice connectors. The SPD includes two yellow 18 AWG wires, pre-wired through the SPD’s nipple mounting connection. Pre-plan the installation per normal installation Instructions. Mount the LED assembly in an appropriate conspicuous location. Connect the LED wires to the yellow SPD wires with the provided butt-splice connectors. These are not polarity sensitive. Test by energizing and de-energizing SPD. Operation is straightforward: green LED On = SPD is OK. If the LED is out, the SPD has failed, power is not present, or one of more phases are not energized.

### Normal Operation

#### Green LED Indicators

Each phase’s LED Indicator illuminates when the SPD is energized and operating correctly. Every suppression element is monitored and connected by logic to the LED. Should any suppression element fail, the green LED will extinguish.

#### Form C Dry Contact and Audible Alarm Option

Similar to the Green LEDs above, the dry contact will change state and the audible alarm will sound upon suppression element failure. The audible alarm may be silenced by removing power to the SPD.

Figure 6: Dry Contact

- Normally Closed (suggested):  
Use Gray and Blue
- Normally Open:  
Use Gray and Red



|      |                 |
|------|-----------------|
| Blue | Normally Closed |
| Gray | Common          |
| Red  | Normally Opened |

**NOTICE**

**CONDUCTING DIELECTRIC AND/OR HI-POTENTIAL TESTING WILL CAUSE INTERNAL DAMAGE TO TPS3 UNIT.**

Do not perform dielectric or high potential tests with the TPS3 unit installed.



**⚠ DANGER**

**Hazardous voltage.**  
**Will cause death or serious injury.**  
 Keep Out.  
 Qualified personnel only.  
 Disconnect and lock off all power before working on this equipment.

**Maintenance**

SPDs require minimal maintenance. Periodic inspection of diagnostic indicators is recommended to ensure proper operation.

**Troubleshooting & Service**

Please contact us for any service related issues.

Quality SPDs withstand severe duty and attempt to protect the load until failure. There are electrical anomalies that SPDs cannot protect against. These are generally Sustained Overvoltages also known as Temporary Overvoltages (TOVs). In this context, Sustained Overvoltages may be only a few cycles. Failed SPDs tend to be symptoms, not root causes. A failed SPD is usually a sign of other problems within the electrical distribution system. As a generalization, the single largest cause of SPD failures is reference to ground issues. If the SPD shows problems on startup, there is reasonable chance of bonding/grounding/misapplication issue. This permanently damages the unit. If not corrected, it will happen again.

**Warranty and Customer Service**

**Limited Warranty**

Siemens warrants its AC Panel protection products against defective workmanship and materials for 10 years. Liability is limited to the repair or replacement of the defective product at Siemens' option. A Return Material Authorization number (RA#) must be given by the company prior to the return of any product. Returned products must be sent to the factory with the transportation charges prepaid. In addition, the company also warrants unlimited replacement of modular and component parts within the warranty period previously described.

The company specifically disclaims all other warranties, expressed or implied. Additionally, the company is not be responsible for incidental or consequential damages resulting from any defect in any product or component thereof.

The sales contract contains the entire obligation of Siemens. This instruction manual shall not become part of or modify any prior existing agreement, commitment or relationship.

**Technical Support**

1.888.333.3545

Prior to calling Siemens TPS3 Technical Support for assistance or ordering parts, please have the following information available:

- TPS3 model number: \_\_\_\_\_
- Manufacture date: \_\_\_\_\_
- Date of Purchase: \_\_\_\_\_
- Your order number: \_\_\_\_\_

Return Shipment Address:

Siemens - Attn: RA # \_\_\_\_\_  
 14550 58th Street North  
 Clearwater, FL 33760  
 Clearwater, FL 33760

**Siemens Industry, Inc.**  
**5400 Triangle Parkway**  
**Norcross, GA 30092**

For more information, please contact our Customer Support Center.

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Article-No. XXXX-XXXXX-XXXX

Printed in USA

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