Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

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Application note 3193

Effective July 2015
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BUSSMANN SERIES

North American UL Type 1, 2 and 4, and data signal surge protective devices

Bussmann
by EATON

Contents

The need for surge protection

Today's world is full of electronic products and electrical devices that are susceptible to damage from overvoltage surges.

Surges caused by static discharge, capacitive and inductive loads or lightning can quickly destroy sophisticated electronic equipment and components used in industrial and commercial applications. These surges cripple operations – particularly the data and communication systems that virtually every enterprise relies upon today, including UL 508A panels with their reliance on control circuits.

Also, updates to the 2014 NEC® 700.8 requires a listed SPD to be installed in or on all emergency system switchboards and panelboards.

Bussmann offers a wide selection of surge protection products that help assure power quality by eliminating damaging surges.

Surge protection case studies and references for industrial and commercial applications

- G.W. Allen and D. Segall with IBM – Two year study at over 200 location in 25 cities – 88.5% of AC power problems are transient voltage related.
- 2011 Erimar Systems Integration - A lightning strike entered the metals fabricating facility and destroyed $20,000 worth of control panels, electrical infrastructure and Cisco infrastructure. Loss of data system also cost 11 days of production.
- IEEE Emerald Book and NFPA 780 both recommend using surge protection as a part of a building's lightning protection system. Suppressors at the service entrance only reduce, but not completely eliminate, the high-energy transient. A second surge protective device must be applied upstream of critical equipment. All SPDs should comply with UL 1449 3rd Edition or later.
- 1999-2001 Electric Power Research Institute (EPRI) Study – Concluded downtime from power sags, surges and transients cost US industry:
  - $50 Billion+ in 1999
  - $100 Billion+ in 2000
  - $200 Billion+ in 2001
  - Continues to escalate as more electronic equipment is used
- *Plant Services Magazine* – 35% of lost production hours can be attributed to transient voltage problems.
- Florida Light and Power 1999 Study - Sources of Facility Surge and Overvoltage Events:
  - ~60% Internally Generated
  - ~40% Externally Generated

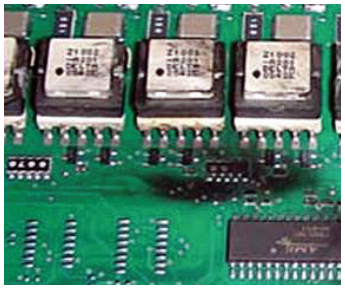
Causes and relevance of transients and surges

- **Lightning Strikes** - Large scale impact, high current and voltage, but least common occurrence.
- **Power Switching** - Increasing occurrences:
  - Utility and Customer Load Switching – Motors, large loads, faults, capacitor banks, fuse and circuit breaker operation*, etc.
  - Source Switching - Smart grid, gensets, photovoltaic power systems and wind power generation, etc.

* During overcurrent events, both circuit breakers and fuses can produce arc voltages 2-3 times the system voltage in accordance with the UL standards.

Damaging effects of transients and surges

- **Disruptive** – A voltage transient enters an electronic component and it interprets the transient as a valid logic command, resulting in system lock-up, malfunction, faulty output or corrupted files.
- **Dissipative** – Associated with short duration repetitive low energy level surges, resulting in equipment failure over time including electronic components, ballasts, motors and controllers, service entrance equipment, panelboards and switchgear.
- **Destructive** – Associated with high level energy surges, resulting in immediate equipment failure including electronic components, ballasts, motors and controllers, service entrance equipment, panelboards and switchgear.



Internal damage - PCB destroyed by a surge

Service entrance destroyed by a surge

UL and NEC® SPD definitions

Both UL and the NEC® define surge protective device *Types*, but they are NOT the same. They differ significantly by the following.

UL SPD standards

SURGE PROTECTIVE DEVICES - UL 1449, 3rd Edition, Section 1 effective September 29, 2009, states the following on UL Types:

- 1.1 These requirements cover Surge Protective Devices (SPDs) designed for repeated limiting of transient voltage surges as specified in the standard on 50 or 60 Hz power circuits not exceeding 1000 V and designated as follows:
  - Type 1 – Permanently connected SPDs intended for installation between the secondary of the service transformer and the lineside of the service equipment overcurrent device, as well as the loadside, including watt-hour meter socket enclosures and intended to be installed without an external overcurrent protective device.
  - Type 2 – Permanently connected SPDs intended for installation on the loadside of the service equipment overcurrent device; including SPDs located at the branch panel.
  - Type 3 – Point of utilization SPDs, installed at a minimum conductor length of 10 meters (30 feet) from the electrical service panel to the point of utilization, for example cord connected, direct plug-in, receptacle type and SPDs installed at the utilization equipment being protected. See marking in 64.2. The distance (10 meters) is exclusive of conductors provided with or used to attach SPDs.
  - Type 4 Component Assemblies – Component assembly consisting of one or more Type 5 components together with a disconnect (integral or external) or a means of complying with the limited current tests in 39.4.
  - Type 1, 2, 3 Component Assemblies – Consists of a Type 4 component assembly with internal or external short circuit protection.

NEC® SPD installation/connection*

NEC® Article 285, Surge-Protective Devices (SPDs), 1kV or Less states the following on where in an electrical system SPDs can be installed and or connected.

III. Connecting SPDs

285.21 Connection. Where an SPD device is installed, it shall comply with 285.23 through 285.28.

285.23 Type 1 SPDs. Type 1 SPDs shall be installed in accordance with 285.23(A) and (B).

(A) Installation. Type 1 SPDs shall be installed as follows:

(1) Type 1 SPDs shall be permitted to be connected to the supply side of the service disconnect as permitted in 230.82(4) or

(2) Type 1 SPDs shall be permitted to be connected as specified in 285.24.

(B) At the Service. When installed at services, Type 1 SPDs shall be connected to one of the following:

(1) Grounded service conductor

(2) Grounding electrode conductor

(3) Grounding electrode for the service

(4) Equipment grounding terminal in the service equipment

285.24 Type 2 SPDs. Type 2 SPDs shall be installed in accordance with 285.24(A) through (C).

(A) Service-Supplied Building or Structure. Type 2 SPDs shall be connected anywhere on the loadside of a service disconnect overcurrent device required in 230.91, unless installed in accordance with 230.82(8).

(B) Feeder-Supplied Building or Structure. Type 2 SPDs shall be connected at the building or structure anywhere on the loadside of the first overcurrent device at the building or structure.

(C) Separately Derived System. The SPD shall be connected on the loadside of the first overcurrent device in a separately derived system.

285.25 Type 3 SPDs. Type 3 SPDs shall be permitted to be installed on the loadside of branch-circuit overcurrent protection up to the equipment served. If included in the manufacturer's instructions, the Type 3 SPD connection shall be a minimum 10 m (30 ft) of conductor distance from the service or separately derived system disconnect.

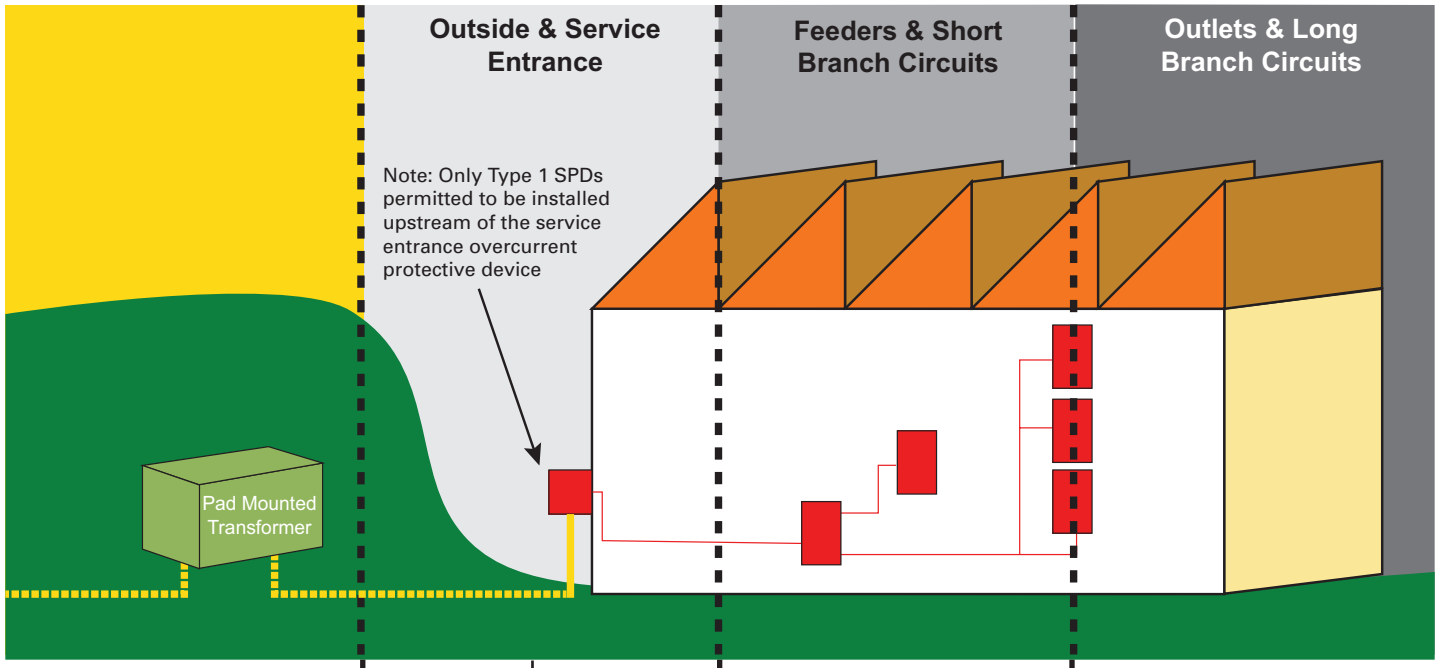
285.26 Conductor Size. Line and grounding conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum.

285.27 Connection Between Conductors. An SPD shall be permitted to be connected between any two conductors — ungrounded conductor(s), grounded conductor, equipment grounding conductor, or grounding electrode conductor. The grounded conductor and the equipment grounding conductor shall be interconnected only by the normal operation of the SPD during a surge.

285.28 Grounding Electrode Conductor Connections and Enclosures. Except as indicated in this article, SPD grounding connections shall be made as specified in Article 250, Part III. Grounding electrode conductors installed in metal enclosures shall comply with 250.64(E).

* From the NFPA 70® National Electrical Code® 2014 Edition.

North American application of UL SPD Types by NEC® location



NEC® 285 Type 1

Type 1 SPDs (surge arresters*) shall be installed as follows:

(1) Type 1 SPDs (surge arresters) shall be permitted to be connected to the supply side of the service disconnect as permitted in 230.82(4) or... as well as the loadside, including watt-hour meter socket enclosures and intended to be installed without an external overcurrent protective device.

(2) Type 1 SPDs (surge arresters) shall be permitted to be connected as specified in 285.24.

Service entrance

UL Type 1 SPD

*Lineside **or** loadside of service entrance overcurrent protective device*

Feeder circuit

Branch circuit

Device

UL Type 1 SPD

Loadside of service entrance overcurrent protective device

UL Type 1 SPD

≥ 30 feet (10m) from the service entrance overcurrent protective device

UL Type 2 SPD

Loadside of service entrance overcurrent protective device

UL Type 2 and Type 4 SPDs

≥ 30 feet (10m) from the service entrance overcurrent protective device

NEC® 285 Type 2 **

Type 2 SPDs shall be installed in accordance with 285.24(A) through (C).

(A) Service-Supplied Building or Structure. Type 2 SPDs shall be connected anywhere on the loadside of a service disconnect overcurrent device required in 230.91, unless installed in accordance with 230.82(8).

(B) Feeder-Supplied Building or Structure. Type 2 SPDs shall be connected at the building or structure anywhere on the loadside of the first overcurrent device at the building or structure.

(C) Separately Derived System. The SPD shall be connected on the loadside of the first overcurrent device in a separately derived system.

NEC® 285 Type 3**

Type 3 SPDs shall be permitted to be installed on the loadside of branch-circuit overcurrent protection up to the equipment served. If included in the manufacturer's instructions, the Type 3 SPD connection shall be a minimum 10 m (30 ft) of conductor distance from the service or separately derived system disconnect.

* Note: UL now refers to these only as "Surge Protective Devices."

** Includes Type 4 component assemblies for use in Type 2 and Type 3 applications

UL power, control and data signal SPD product lineup

Type 1 UL Listed

BSPD

- For switchgear and power distribution panels
- Configured product from catalog number system
- NEMA 1 and 4X enclosures
- AC voltages 120 to 600Vac
- Surge current capacity 120kA to 400kA
- Three configuration levels:
  - Basic
  - Standard (Form C contact, EMI/RFI Filter)
  - Standard with Surge Counter (Form C contact, EMI/RFI Filter, counter)

SurgePOD™ HEAVY DUTY (black label)

- For critical commercial and industrial applications
- Defined catalog numbers
- NEMA 4X enclosure
- AC voltages 120 to 600Vac
- Surge current capacity 50kA

SurgePOD™ PRO (grey label)

- For residential and light commercial applications
- Defined catalog numbers
- NEMA 4X enclosure
- AC voltages 120 to 480Vac
- Surge current capacity 40kA

Type 2 and 3 DIN-Rail UL Recognized

Type 2 high SCCR (black label)

- 1-, 2-, 3-, and 4-pole Type 2 versions
- 200kA SCCR
- Voltages up to 600Vac

Type 4 low voltage power (blue label)

- 1-pole Type 4* power versions for Type 2 applications
- Non SCCR rated
- AC and DC voltages from 48 to 600V

* See *UL Types* on page 63 for definitions.

Type 4 low voltage control (blue label)

- 2-pole Type 4* control voltage versions for Type 3 applications
- Non SCCR rated
- AC and DC voltages from 24 to 230V

* See *UL Types* on page 63 for definitions.

UL 497B data signal

DIN-Rail universal 4 wire

- For nominal voltages up to 180V

DIN-Rail BNC 50/75Ω coaxial cable

- For nominal voltages up to 5V

Inline BNC 50/75Ω coaxial cable

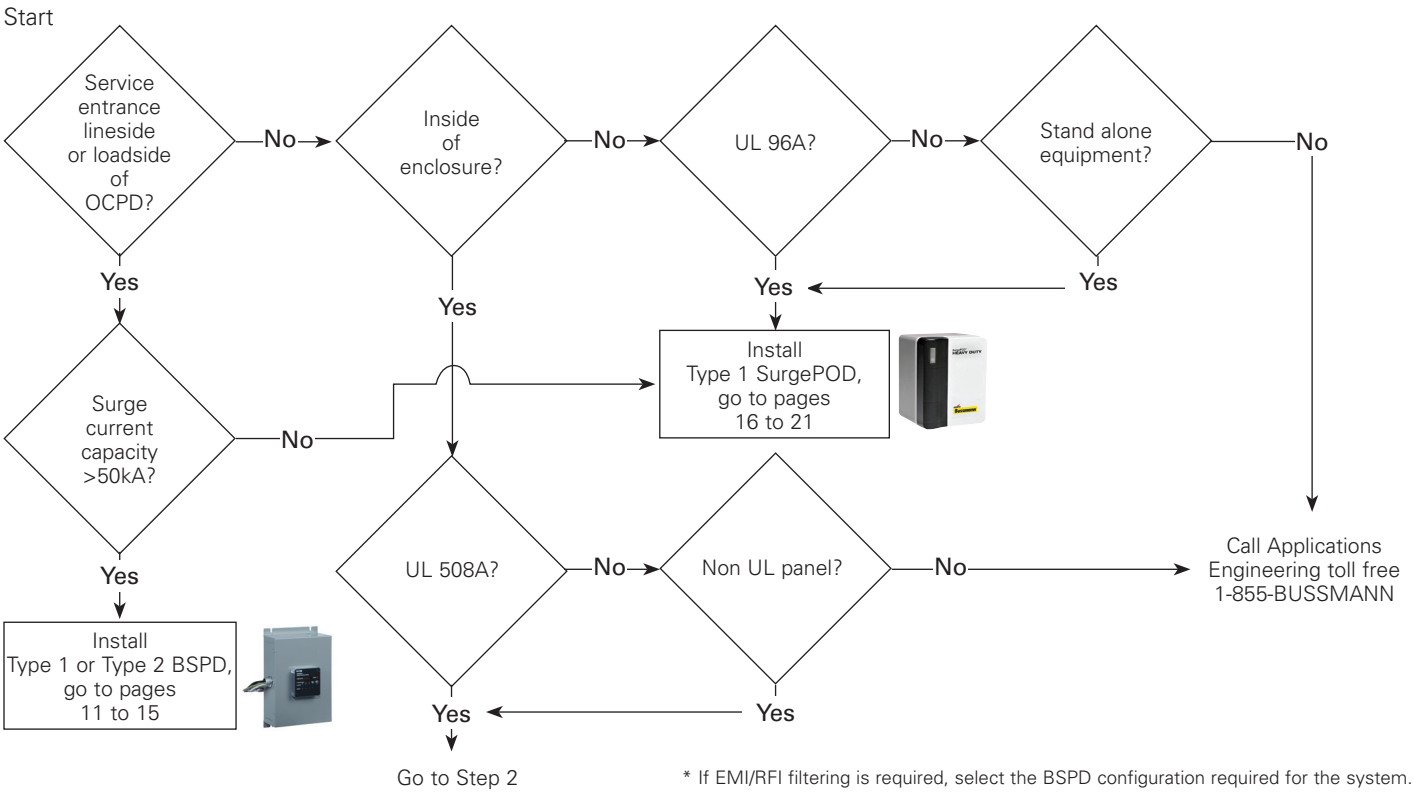
- For nominal voltages up to 5V

DIN-Rail RJ45/Ethernet cable

- For nominal voltages up to 48V

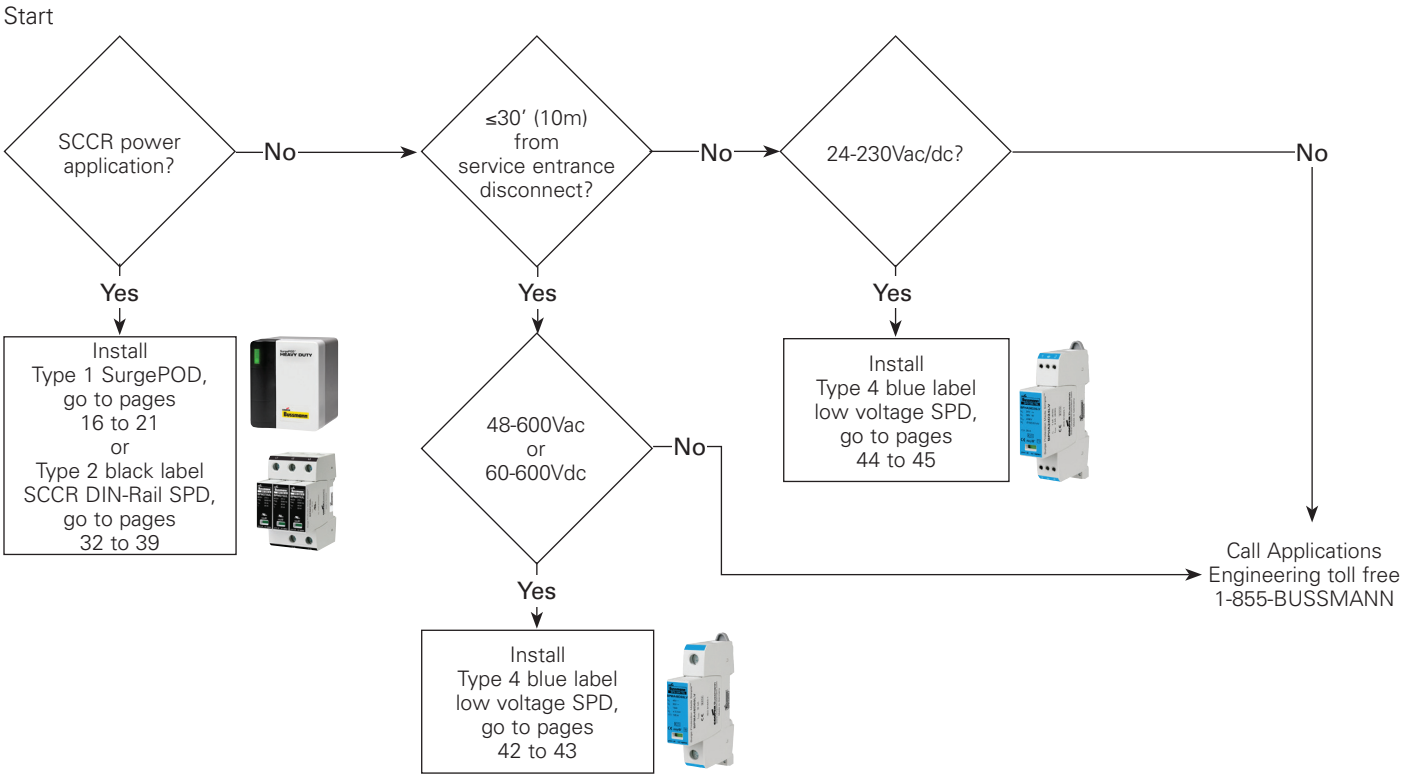
UL power and control SPD Type 1, 2 and 3 selection flowchart for ≤600V systems

Step 1. Determine location and suitable type*



* If EMI/RFI filtering is required, select the BSPD configuration required for the system.

Step 2. Determine Type 1, or Type 2 and Type 3 DIN-Rail SPD



UL Types	UL Listed Type 1 and Type 2	DIN-Rail UL Recognized Type 2 and Type 4	
Markets	UL Listed Type 1 and Type 2 SPDs SCCR rated 120-600Vac SurgePOD™ Module MOV (HD) and thermal disconnect MOV (Pro) technology	UL Recognized Type 2 SPDs SCCR rated black label 120-600Vac MOV technology	UL Recognized Type 4 power and control blue label SPDs 24-600Vac/dc MOV or hybrid technology
Agriculture	• Pump panels requiring SCCR ratings • Service panels	• Pump panels requiring SCCR ratings	• AC/DC Pump panels not requiring SCCR ratings
Commercial - institutional	• Elevator control • Emergency generator control • Feeders • Fire pump control • HVAC • Lighting panels • Main switchgear • Motor control centers • Step down transformer primary • UL 508A panels requiring SCCR ratings • UPS	• Elevator control • Emergency generator control • Fire pump control • HVAC • Mission critical panelboards • UPS • UL 508A panels requiring SCCR ratings • VFD	• Elevator control • Emergency generator control • Fire alarm • Fire pump control • HVAC • Security systems • UPS
Contractor	• Installation on outside of enclosure or ahead of service entrance disconnect	—	—
Data centers	• Emergency generator control • Feeders • HVAC • Main switchgear • Power distribution unit • Remote power panel • UPS	• Emergency generator control • HVAC • Power distribution unit • Remote power panel • UPS	• Emergency generator control • HVAC • Servers • UPS
Industrial	• Emergency generator control • HVAC • Lighting panels • Main switchgear • Motor control centers • Step down transformer primary • UL 508A panels requiring SCCR ratings • UPS • VFD	• Conveyor systems • Crane control • HVAC • Power supplies • Step down transformer primary • UL 508A panels requiring SCCR ratings • VFD	• Discrete control • HMI • HVAC • PLCs • Power supplies • Sensors
OEM	• Installation on outside of enclosure • UL 508A panels requiring SCCR ratings	• I/Os • PLCs • Power supplies • Step down transformer primary • UL 508A panels requiring SCCR ratings • VFD	• HMI • I/Os • PLCs • Power supplies • Sensors • Step down transformer primary
Oil and gas	• Emergency generator control • Lighting panels • Main switchgear • Motor control centers • Step down transformer primary • UL 508A panels requiring SCCR ratings • UPS • VFD	• Conveyor systems • Crane control • Power supplies • Step down transformer primary • UL 508A panels requiring SCCR ratings • VFD	• Discrete control • HMI • PLCs • Power supplies • Sensors
Residential	• Service entrance	N/A	N/A
UL 508A shops	• Installation on outside or inside of enclosure or ahead of service entrance disconnect	• I/Os • Installation on the lineside of the enclosure disconnect OCPD • PLC • Power supplies • Step down transformer primary • VFD	• HMI • I/Os • PLCs • Power supplies • Sensors • Step down transformer primary
Waste water - water treatment	• Main switchgear • Motor control centers • UL 508A panels requiring SCCR ratings	• Control panels • UL 508A panels requiring SCCR ratings • VFD	• PLC • Power supplies • Sensors

General application of Bussmann Type 1, Type 2 and Type 4 SPD products by surge current capacity (I_{max})

Product	Installation location	Surge current capacity (I_{max})
BSPD Type 1 and Type 2	Switchboards, service entrance	200kA to 400kA
BSPD Type 2	Large panelboards	120kA to 200kA
SurgePOD™ HEAVY DUTY Type 1	Panelboards, control panels	50kA
SurgePOD™ PRO Type 1	Panelboards, control panels	40kA
1-, 2-, 3- and 4-pole high SCCR Type 2 (black label)	Control panels	40kA
1-pole non SCCR Type 4 (blue label)	Control panels (power)	25kA-40kA
2-pole non SCCR Type 4 (blue label)	Control panels (control)	1kA-3kA

Type 1 SPDs for UL Listed 1449 3rd Edition loadside and lineside protection

- Type 1 UL Listed 1449 3rd Edition SPDs are easily selected and installed on the loadside or lineside of the service entrance overcurrent protective device
- Voltage specific models precisely match and protect electrical systems and equipment better than "One-Size-Fits-All" SPDs
- NEMA 4X enclosures for indoor or outdoor installation
- NEMA 1 enclosure for indoor installation
- LED status indication provides surge protection status at a glance

BSPD

Type 1* SPDs provide ultimate surge protection for high surge current capacity critical commercial and industrial applications.

- NEMA 1 or 4X enclosures
- 120/208, 240, 277/480 and 600Vac
- 200kA SCCR
- Up to 400kA surge current capacity
- Wye and Delta systems
- Bussmann SurgePOD thermal disconnect MOV technology
- Optional Form C contact
- Optional EMI/RFI filtering
- Optional surge counter with reset button
- Ten-year warranty

* *Basic* configuration only. *Standard* and *Standard with Surge Counter* configurations are Type 2.

SurgePOD™ HEAVY DUTY

Robust Type 1 SPDs provide ultimate surge protection for critical commercial and industrial applications

- NEMA 4X enclosure
- 120 to 600Vac
- 200kA SCCR
- 50kA Surge current capacity
- Single-phase, split-phase, Wye, Delta and Highleg Delta systems
- Bussmann SurgePOD thermal disconnect MOV technology
- Five-year warranty

SurgePOD™ PRO

Type 1 SPDs provide optimal surge protection for light commercial and residential applications

- NEMA 4X enclosure
- 120 to 480Vac
- 200kA SCCR
- 40kA Surge current capacity
- Single-phase, split-phase, Wye, Delta systems
- Thermal disconnect MOV technology
- Two-year warranty

BSPD, SurgePOD™ HEAVY DUTY and SurgePOD PRO comparisons

SPD model / color	BSPD - grey	HEAVY DUTY - black	PRO - grey
Markets	Commercial and industrial with high surge current	Commercial and industrial	Residential, light commercial and UL 508A panels
Product warranty	10 years*	5 years*	2 years*
System types	Delta and Wye	Single, Split, Delta, Highleg Delta and Wye**	Single, Split, Delta and Wye
Nominal system voltages	120/208, 240, 277/480, 480, 600	120, 208, 240, 277, 347, 480, 600	120, 208, 240, 480
Max. continuous operating AC voltage (MCOV) [V_C]	Sized to nominal voltage (150V to 640V)	Sized to nominal voltage (150V to 550V)	Sized to nominal voltage (150V to 550V)
SCCR	200kA	200kA	200kA
Nominal discharge current (8x20µs) I_n	20kA	20kA	10kA
Surge current capacity (8x20µs) I_{max}	120, 200, 300, 400kA	50kA	40kA
Installation connections	3, 5 Wires	2, 3, 4, 5 Wires	2, 3, 4 Wires
N-G protection	Yes	Yes	No
Response time (ns) t_A	<25ns	<25ns	<25ns
Frequency	50/60Hz	50/60Hz	50/60Hz
Operating status/fault indication	One red and green LED per phase	One bi-color LED Green (Good) / Red (Replace)	One bi-color LED Green (Good) / Red (Replace)
Conductor gauge / length	10AWG stranded copper / 48 inches	10AWG Stranded copper/ 18 inches	10AWG Stranded copper/ 18 inches
Mounting	Chase nipple (NEMA 1) internal hub (NEMA 4X)	Chase nipple or customer supplied bracket	Chase nipple or customer supplied bracket
Enclosure rating	NEMA 1 or NEMA 4X	NEMA 4X - UL 94-5VA	NEMA 4X - UL 94-5VA
Degree of protection (installed state)	IP20 (finger-safe)	IP20 (finger-safe)	IP20 (finger-safe)
Circuit location	Lineside/loadside***	Lineside/loadside	Lineside/loadside
Standards/agency information	UL 1449 3rd Edition Type 1 Listed SPD, UL 1283 Type 2 Recognized, CSA Certified	UL 1449 3rd Edition Type 1 Listed SPD, cULus, CSA**, RoHS Compliant	UL 1449 3rd Edition Type 1 Listed SPD, cULus, RoHS Compliant
Operating temperature	-40˚C to +50˚C	-40˚C to +85˚C	-40˚C to +65˚C
Operating altitude	16,000 Feet	16,000 Feet	12,000 Feet
Options***	Form C contact relay	—	—
	EMI/RFI filter (up to 50db 10kHz to 10MHz)		
	Surge counter		
Data sheets	10209	2163	10033

* See Bussmann SPD Limited Warranty Statement (3A1502) for details at www.cooperbussmann.com/surge.

** 600V Wye versions not CSA Certified.

*** BSPD models ordered with Form C contact relay and/or surge counter options are UL Type 2 SPDs and cannot be located on the lineside of the service entrance overcurrent protective device.

SurgePOD™ SPD module technology

At the heart of the BSPD Type 1 and Type 2, and SurgePOD HEAVY DUTY Type 1 SPDs is the Bussmann SurgePOD™ Module. These are board-mounted devices with a voltage clamping feature that becomes conductive upon encountering an overvoltage condition and safely shunts the surge to ground.

Capable of meeting the highest NEC® requirements each module has a maximum surge current rating of 50kA and SCCR of 200kA. The SurgePOD module features patented thermal disconnect technology that eliminates the need for additional overcurrent protection.

Each SurgePOD module is UL 1449 3rd Edition Recognized for use in Type 1 or Type 2 SPD assemblies. Each module features an internal element that safely disconnects the device upon reaching an overvoltage breakdown condition.

Agency information

- UL 1449 3rd Edition Recognized Type 1 Surge Protective Device; File E340782.

Traceability and environmental

- All SurgePOD devices are individually marked with a serial number for easy identification and tracking.
- Flammability rating UL 94-V0
- Operating and storage temperature range -40°C to 85°C

See data sheet # 1170 for details.

BSPD

Description

BSPD Surge Protective Devices (SPDs) are UL Listed 1449 3rd Edition Type 1 or UL Recognized 1283 5th Edition Type 2 surge protectors, depending on the configuration. The BSPD is available for installation external to an electrical enclosure or panelboard. Application of BSPD units throughout a facility will help ensure that equipment is protected.

BSPD units are available for common Delta and Wye voltage systems in a variety of surge current capacity ratings from 120kA through 400kA. Available in three configurations, the BSPD's configurations and options make it easy to specify units for many electrical applications; including service entrances, distribution switchboards, panelboards and point-of-use.

- *Basic*, *Standard* and *Standard with Surge Counter* configurations UL Listed 1449 3rd Edition File E316410 Guide VZCA, CSA Certified Notice 516 File 243397
- Standard and Standard with Surge Counter configurations are also UL Recognized 1283 5th Edition File E316410 Guide VZCA2, CSA Component Acceptance Std. C22.2
- RoHS compliant
- Uses Bussmann SurgePOD™ thermally protected Metal Oxide Varistor (MOV) technology
- 20kA nominal discharge current (I_n) rating (maximum rating assigned by UL)
- 120kA through 400kA per phase surge current capacity (I_{max}) ratings
- 200kA Short-Circuit Current Rating (SCCR)
- Two color LED status indicators for each phase on Delta and Wye units, plus N-G on Wye units
- 10-Year warranty

Configurations

The BSPD provides users with the option of selecting between three configurations:

- *Basic* (Type 1)
- *Standard* with Form C contact and EMI/RFI filter (Type 2)
- *Standard with Surge Counter* (Type 2)

The appropriate configuration can be specified from the catalog number system based on the application's requirements or specifications.

NEMA 1 steel enclosure
120kA and 200kA maximum surge current capacity

NEMA 1 steel enclosure
300kA and 400kA maximum surge current capacity

NEMA 4X 304 Stainless Steel enclosure, all surge current capacities

Catalog number system

The catalog numbering system permits specifying any combination to meet requirements.

BSPD 200 480D 2 K

Series
BSPD

kA Rating per phase
120kA
200kA
300kA
400kA

Voltage/system type code
208Y = 120/208 Wye (4W + G)
480Y = 277/480 Wye (4W + G)
600Y = 347/600 Wye (4W + G)
240D = 240 Delta (3W + G)
480D = 480 Delta (3W + G)
600D = 600 Delta (3W + G)

Enclosure rating
K = NEMA 1
P = NEMA 4X

Configurations

1 = Basic
Green and red LEDs per phase to indicate protection status
Green and red LEDs on Wye units to indicate protection status of the Neutral-to-Ground mode

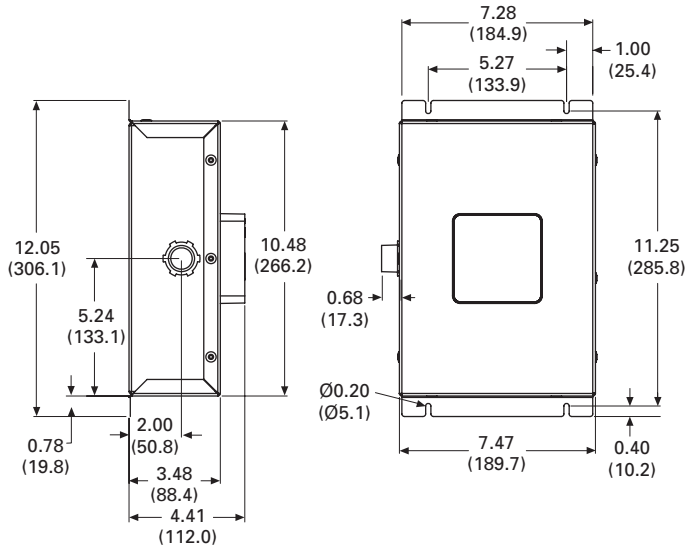
2 = Standard
Green and red LEDs per phase to indicate protection status
Green and red LEDs on Wye units to indicate protection status of the Neutral-to-Ground mode
Audible alarm with Silence button
Form C contact relay. See Table 3, Specifications
EMI/RFI filtering providing up to 50dB of noise attenuation from 10kHz to 100MHz

3 = Standard With Surge Counter
Green and red LEDs per phase to indicate protection status
Green and red LEDs on Wye units to indicate protection status of the Neutral-to-Ground mode
Audible alarm with silence button
Form C contact relay
EMI/RFI filtering providing up to 50dB of noise attenuation from 10kHz to 100MHz
Surge counter with reset button

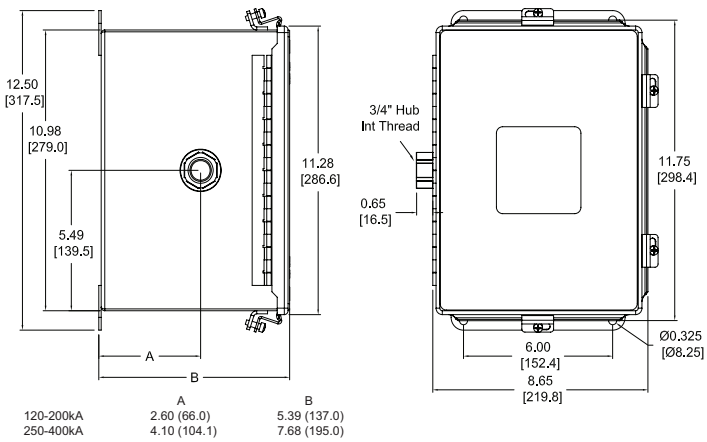
BSPD configuration comparisons

Features	Configuration		
	Basic (Type 1)	Standard (Type 2)	Standard with Surge Counter (Type 2)
Surge protection using Bussmann SurgePOD™ MOV technology	X	X	X
Two color LED protection status indicators for each phase	X	X	X
Two color LED protection status indicators for the neutral-ground protection mode (Wye systems only)	X	X	X
Audible alarm with silence button		X	X
Form C contact relay		X	X
EMI/RFI filtering, providing up to 50dB of noise attenuation from 10kHz to 100MHz		X	X
Surge counter with reset button			X

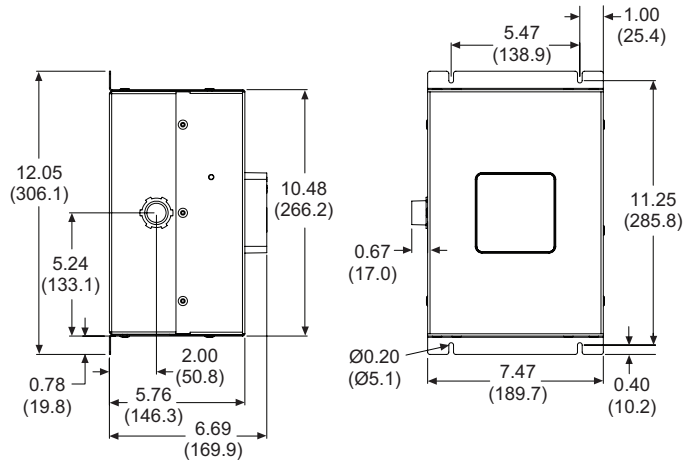
Dimensions - in (mm)



120kA and 200kA Units/NEMA 1

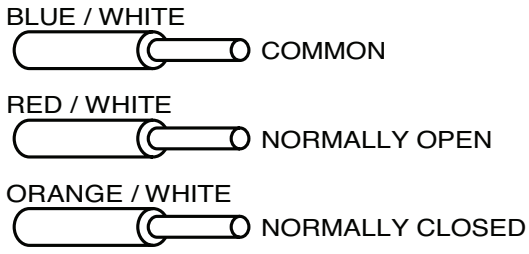


120kA to 400kA Units/NEMA 4X



300kA and 400kA Units/NEMA 1

Form C Contact Relay Wire Color Codes



BSPD specifications

Description	Specification
Available system voltages	
Three-phase Wye	120/208, 277/480 and 347/600
Three-phase Delta	240, 480 and 600
Input power frequency	50/60Hz
Maximum Continuous Operating Voltage (MCOV)	
208Y, and 240D voltage/system type codes	150 L-N,150 L-G, 150 N-G, 300 L-L
480Y Voltage/system type code	320 L-N, 320 L-G, 320 N-G, 640 L-L
600Y Voltage/system type code	420 L-N, 420 L-G, 420 N-G, 840 L-L
480D Voltage/system type code	640 L-G, 640 L-L
600D Voltage/system type code	840 L-G, 840 L-L
Short-Circuit Current Rating (SCCR)	200kA
Nominal discharge current (I_n)	20kA
Surge current capacity per phase (I_{max})	120kA, 200kA, 300kA and 400kA ratings available
SPD Types	Type 1 (*Basic* configuration, can also be used in Type 2 applications) Type 2 (*Standard* and *Standard With Surge Counter* configurations)
Enclosure types	NEMA 1, NEMA 4X 304 Stainless Steel
Ports	1
SPD Conductor length/gauge	48" (1.22m) 10AWG Stranded copper
Form C contact relay (*Standard* and *Standard With Surge Counter* configurations only)	
Contact ratings	150Vac or 125Vdc, 1A maximum
Lead length/gauge	48 inches (1.22m) / 14AWG
Contact logic	Power ON, normal state; N.O. contact = OPEN, N.C. contact = CLOSED Power OFF, fault state; N.O. contact = CLOSED, N.C. contact = OPEN
Power consumption	
Basic configuration	
208Y and 240D voltage/system type codes	0.5W
480Y and 480D voltage/system type codes	1.1W
600Y and 600D voltage/system type codes	1.3W
Standard and Standard with Surge Counter configurations	
208Y and 240D voltage/system type codes	0.6W
480Y, and 480D voltage/system type codes	1.7W
600Y and 600D voltage/system type codes	2.1W
Protection modes	Three-phase Delta; L-G, L-L Three-phase Wye; L-N, L-G, N-G, L-L
Operating temperature / humidity	-40 to +50°C (-40 to +122°F) / 5% to 95%, non-condensing
Operating altitude - ft (m)	16,000 (5000)
EMI/RFI filtering attenuation	Up to 50dB from 10kHz to 100MHz (*Standard* and *Standard With Surge Counter* configurations)
Weight - lbs (kg)	NEMA 1: 120kA-200kA - 6.8 (3.1), 300kA- 400kA -13.5 (6.1) NEMA 4X: 120kA-200kA - 14.6 (6.6), 300kA-400kA - 21.0 (9.5)
Agency information	- *Basic, Standard* and *Standard with Surge Counter* configurations UL Listed 1449 3rd Edition File E316410 Guide VZCA, CSA Certified Notice 516 File 243397 - *Standard* and *Standard with Surge Counter* configurations are also UL Recognized 1283 5th Edition File E316410 Guide VZCA2, CSA Component Acceptance Std. C22.2 No. 8-M1986 File 243397
RoHS compliant	Yes
Seismic withstand capability	Meets or exceeds the requirements specific to I.B.C. 2006, C.B.C. 2007 and U.B.C. Zone 4
Warranty	10 Years (see warranty statement 3A1502 for details at www.cooperbussmann.com/surge)

Voltage protection ratings

ANSI/UL 1449 3rd Edition voltage protection ratings

Voltage Protection Rating (V_{PR}) data for all units is included in the following tables, The data varies based upon the configuration and NEMA enclosure. V_{PR} values for the *Basic* configurations are on the left-hand side of the page. Tables on the right-hand side contain VPR values for the *Standard* or *Standard with Surge Counter* configurations.

NEMA 1: Basic (cat. nos. ending with 1K)

120-200kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	700	700	700	1200
480Y	1200	1200	1200	2000
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	2000	—	2500
600D	—	2500	—	2500

300kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	700	700	700	1000
480Y	1200	1200	1200	1800
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	1800	—	2000
600D	—	2500	—	2500

400kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	700	700	700	1000
480Y	1200	1200	1200	1800
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	1800	—	2000
600D	—	2500	—	2500

NEMA 1: Standard or Standard w/ Surge Counter (cat. nos. ending with 2K or 3K)

120-200kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	600	800	600	1000
480Y	1200	1200	1200	1800
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	2500	—	2500
600D	—	2500	—	2500

300kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	600	700	600	1000
480Y	1000	1200	1000	1800
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	1800	—	2000
600D	—	2500	—	2500

400kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	600	700	600	1000
480Y	1000	1200	1000	1800
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	1800	—	2000
600D	—	2500	—	2500

NEMA 4X: Basic (cat. nos. ending with 1P)

120–200kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	700	800	700	1200
480Y	1200	1200	1000	2000
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	2000	—	2500
600D	—	2500	—	2500

300kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	700	800	700	1200
480Y	1200	1200	1200	2000
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	1800	—	2000
600D	—	2500	—	2500

400kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	700	800	700	1200
480Y	1200	1200	1200	2000
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	1800	—	2000
600D	—	2500	—	2500

NEMA 4X: Standard or Standard w/ Surge Counter (cat. nos. ending with 2P or 3P)

120–200kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	900	900	700	1500
480Y	1200	1200	1000	2500
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	2500	—	2500
600D	—	2500	—	2500

300kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	800	900	700	1500
480Y	1200	1200	1000	2000
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	2000	—	2000
600D	—	2500	—	2500

400kA

Voltage/ System Code	Protection Mode			
	L-N	L-G	N-G	L-L
208Y	800	900	700	1500
480Y	1200	1200	1000	2000
600Y	1500	1500	1500	2500
240D	—	1000	—	1000
480D	—	2000	—	2000
600D	—	2500	—	2500

SurgePOD™ HEAVY DUTY

Description

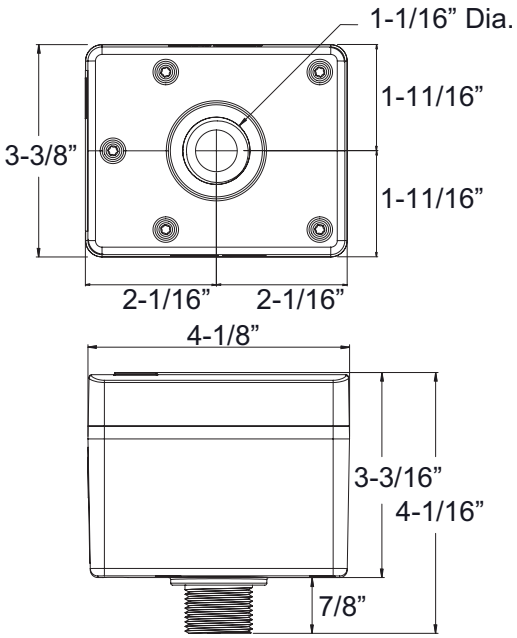
The Bussmann SurgePOD HEAVY DUTY is a Type 1 UL Listed 1449 3rd Edition surge protective device suitable for installation on the lineside or loadside of the service entrance overcurrent protective device.

Available in voltage and system specific versions to match electrical requirements, the SurgePOD HEAVY DUTY delivers optimum surge protection using the advanced, patented SurgePOD™ Module with thermal disconnect technology.

Parallel connection to the electrical system permits the SurgePOD HEAVY DUTY SPD to be installed on any ampacity panel.

- Type 1 UL Listed 1449 3rd Edition SPDs are easily selected and installed on the lineside or loadside of the service entrance overcurrent protective device
- Voltage specific models precisely match and protect electrical systems and equipment up to 600Vac
- Compact NEMA 4X for indoor or outdoor applications
- *easy*ID™ LED status indicators provide surge protection status at a glance

Dimensions - in



LISTED SPD Type 2 RoHS

*easy*ID™ LED Status Indicator

5 YEAR WARRANTY

Available catalog numbers

Below are the available SurgePOD HEAVY DUTY catalog numbers. See catalog number explanation below for details.

SPH50SP1120SN	SPH50SP2480PN	SPH50SP3208WYG
SPH50SP1240SN	SPH50SP3240PNG	SPH50SP3480WYG
SPH50SP1347SN	SPH50SP3480PNG	SPH50SP3600WYG
SPH50SP2120SNG	SPH50SP3240DLG	SPH50SP4208WYNG
SPH50SP2240SNG	SPH50SP3480DLG	SPH50SP4480WYNG
SPH50SP2347SNG	SPH50SP4240HLG	SPH50SP4600WYNG
SPH50SP2240PN	SPH50SP4480HLG	

Catalog number explanation

SPH 50S Px xxx xxx

SPH = Product series

Surge rating

50kA surge current capacity

Number of wires

P1 = 1, P2 = 2, P3 = 3, P4 = 4

System voltage (Vac)

120, 208, 240, 347, 480, 600

System type/wires and connection points

SN = Single-phase 2 wire, 2 connection points
SNG = Single-phase 2 wire + G, 3 connection points
PN = Split-phase 3 wire , 3 connection points
PNG = Split-phase 3 wire + G, 4 connection points
DLG = Three-phase Delta 3 wire + G, 4 connection points
HLG = Three-phase Highleg Delta 4 wire + G, 5 connection points
WYG = Three-phase Wye 3 wire, 4 connection points
WYNG = Three-phase Wye 3 wire + G, 5 connection points

*easy*ID™ LED status indicator

The *easy*ID LED status indicator will illuminate when the unit is properly installed and the system or equipment being protected is energized. The following LED color/status indicates:

GREEN LED = Good

The circuit is energized and protected.

RED LED = Replace

The circuit is energized and unprotected.

The unit needs replacing.

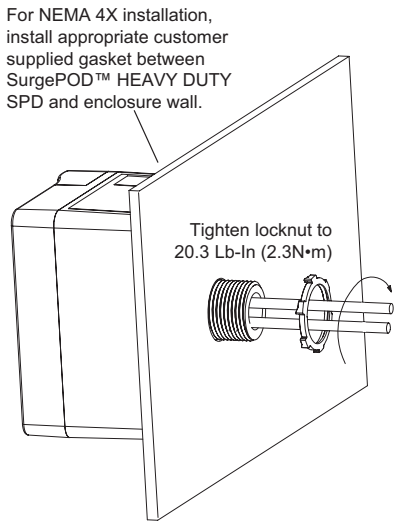
LED is Out / Unlit:

- The circuit is most likely deenergized
- The unit's leads are disconnected
- The unit is damaged

Authorized personnel should follow all prescribed lockout/tagout and safety procedures in troubleshooting the cause for the above conditions. Opening SurgePOD HEAVY DUTY enclosure will void the warranty.

Mounting

SurgePOD HEAVY DUTY is a panel mount device. It may also be mounted using a customer supplied bracket or directly onto a female threaded conduit fitting.



SurgePOD HEAVY DUTY technical information

Catalog number	Nominal system voltage	Max. continuous operating AC voltage (MCOV) (V_c)	System type	Connection points
SPH50SP1120SN	120V	150V	Single-phase 2 Wire	2
SPH50SP1240SN	240V	320V	Single-phase 2 Wire	2
SPH50SP1347SN	347V	420V	Single-phase 2 Wire	2
SPH50SP2120SNG	120V	150V	Single-phase 2 Wire + G	3
SPH50SP2240SNG	240V	320V	Single-phase 2 Wire + G	3
SPH50SP2347SNG	347V	420V	Single-phase 2 Wire + G	3
SPH50SP2240PN	120/240V	150V	Split-phase 3 Wire	3
SPH50SP2480PN	240/480V	320V	Split-phase 3 Wire	3
SPH50SP3240PNG	120/240V	150V	Split-phase 3 Wire + G	4
SPH50SP3480PNG	240/480V	320V	Split-phase 3 Wire + G	4
SPH50SP3240DLG	240V	320V	Three-phase Delta 3 Wire + G	4
SPH50SP3480DLG	480V	550V	Three-phase Delta 3 Wire + G	4
SPH50SP4240HLG	120/240V	150/320V	Three-phase Highleg Delta 4 Wire + G	5
SPH50SP4480HLG	240/480V	320/550V	Three-phase Highleg Delta 4 Wire + G	5
SPH50SP3208WYG	208V	150V	Three-phase Wye 3 Wire + G	4
SPH50SP3480WYG	480V	320V	Three-phase Wye 3 Wire + G	4
SPH50SP3600WYG†	600V	420V	Three-phase Wye 3 Wire + G	4
SPH50SP4208WYNG	208Y/120V	150V	Three-phase Wye 4 Wire + G	5
SPH50SP4480WYNG	480Y/277V	320V	Three-phase Wye 4 Wire + G	5
SPH50SP4600WYNG†	600Y/347V	420V	Three-phase Wye 4 Wire + G	5

† 600V Wye version is not CSA Certified.

SurgePOD™ HEAVY DUTY technical information

Specifications (for all SurgePOD HD units)	Values
Short-Circuit Current Rating (SCCR)	200kA
Nominal discharge current (8x20µs) (I_n)	20kA
Surge current capacity (8x20µs) (I_{max})	50kA
Response time (t_A)	<25ns
Frequency	50/60Hz
Operating state/fault indication	Bi-color LED - Green (good) / Red (replace)
Conductor length / gauge	18 inches, 10 AWG stranded copper
Mounting	Chase nipple / bracket*
Enclosure / flammability ratings	NEMA 4X - UL 94-5VA
Degree of protection (installed state)	IP20 (finger-safe)
SPD install location	Indoor/outdoor
Circuit location	Lineside or loadside of service entrance overcurrent protective device
Operating temperature	-40˚C to +85˚C
Maximum operating altitude	16,000FT
Agency information	cULus, CSA**, RoHS Compliant
Standard	UL 1449 3rd Edition Type 1 Listed SPD
Warranty	Five Years***

* Customer-supplied bracket.

** 600V Wye version is CSA Certified.

*** See Bussmann SPD Limited Warranty Statement (3A1502) for details at www.cooperbussmann.com/Surge.

Voltage Protection Ratings (VPR)

Catalog number	Rated system voltage (V_o)	MCOV (V_c)	Voltage Protection Ratings (VPR)			
			L-N	L-L	L-G	N-G
SPH50SP1120SN	120V	150V	700	—	—	—
SPH50SP1240SN	240V	320V	1200	—	—	—
SPH50SP1347SN	347V	420V	1500	—	—	—
SPH50SP2120SNG	120V	150V	700	—	1200	700
SPH50SP2240SNG	240V	320V	1200	—	2500	1200
SPH50SP2347SNG	347V	420V	1500	—	2500	1500
SPH50SP2240PN	120V/240V	150V	700	1200	—	—
SPH50SP2480PN	240V/480V	320V	1200	2500	—	—
SPH50SP3240PNG	120V/240V	150V	700	1200	1200	700
SPH50SP3480PNG	240V/480V	320V	1200	2500	2500	1200
SPH50SP3240DLG	240V	320V	—	2500	1200	—
SPH50SP3480DLG	480V	550V	—	3000	1800	—
SPH50SP4240HLG	120/240V	150V/320V	700/1200	1200/2500	1200/2500	700/1200
SPH50SP4480HLG	240/480V	320V/550V	1200/1800	2500/3000	2500/3000	1200/1800
SPH50SP3208WYG	208V	150V†	—	1200	700	—
SPH50SP3480WYG	480V	320V†	—	2500	1200	—
SPH50SP3600WYG††	600V	420V†	—	2500	1500	—
SPH50SP4208WYNG	208Y/120V	150V	700	1200	1200	700
SPH50SP4480WYNG	480Y/277V	320V	1200	2500	2500	1200
SPH50SP4600WYNG††	600Y/347V	420V	1500	2500	2500	1500

† SPD voltages are measured from Line-to-Neutral, or Line-to-Ground on systems where there is no Neutral present. These units do not have a Line-to-Neutral, so the Line-to-Ground voltage is 120V for the 208V Wye L-G, 277V for the 480V L-G and 347V for the 600V Wye L-G, making the norman voltage applied to the unit less than the MCOV values listed in the table.

†† 600V Wye version is not CSA Certified.

SurgePOD™ PRO

Description

The Bussmann SurgePOD PRO is a Type 1 UL Listed 1449 3rd Edition surge protective device suitable for installation on both the lineside or loadside of the service entrance overcurrent protective device.

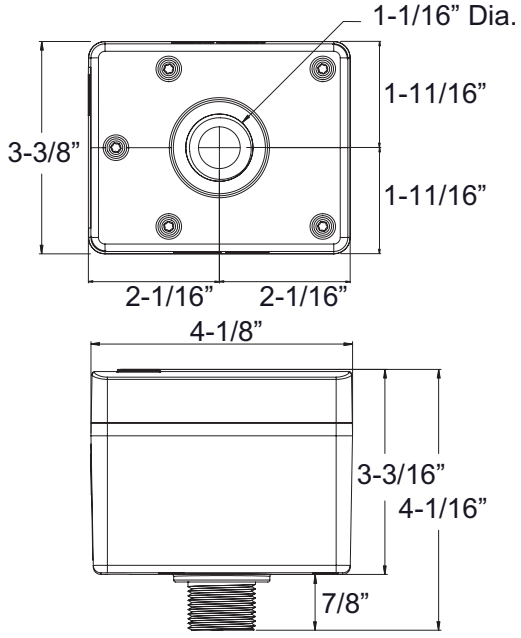
Available in popular voltage and system specific versions to match common residential and light commercial electrical system and equipment requirements, the SurgePOD PRO delivers superior surge protection using MOV thermal disconnect technology.

Parallel connection to the electrical system permits the SurgePOD PRO SPD to be installed on any ampacity panel.

- Type 1 UL Listed 1449 3rd Edition SPDs are easily selected and installed on the lineside or loadside of the service entrance overcurrent protective device
- Voltage specific models precisely match and protect electrical systems and equipment better than "one-size-fits-all" SPDs
- Thermal disconnect technology eliminates the need for additional fusing
- Compact NEMA 4X enclosure for indoor or outdoor applications
- *easy*ID™ LED status indicator provides surge protection status at a glance

*easy*ID™ LED
Status Indicator

Dimensions - in



Available catalog numbers

Below are the available SurgePOD PRO catalog numbers. See catalog number explanation below for details.

SPP40SP1120SN	SPP40SP3240DLG	SPP40SP3208WYG
SPP40SP2240PN	SPP40SP3480DLG	SPP40SP3480WYG

Catalog number explanation

SPP 40S Px xxx xxx

SPP = Product series

Surge rating

40kA surge current capacity

Number of wires

P1 = 1, P2 = 2, P3 = 3

System voltage (Vac)

120, 208, 240, 480

System type/wires and connection points

SN = Single-phase 2 wire, 2 connection points
PN = Split-phase 3 wire , 3 connection points
DLG = Three-phase Delta 3 wire + G, 4 connection points
WYG = Three-phase Wye 3 wire, 4 connection points

*easy*ID™ LED status indicator

The *easy*ID LED status indicator will illuminate when the unit is properly installed and the system or equipment being protected is energized. The following LED color/status indicates:

GREEN LED = Good

The circuit is energized and protected.

RED LED = Replace

The circuit is energized and unprotected.

The unit needs replacing.

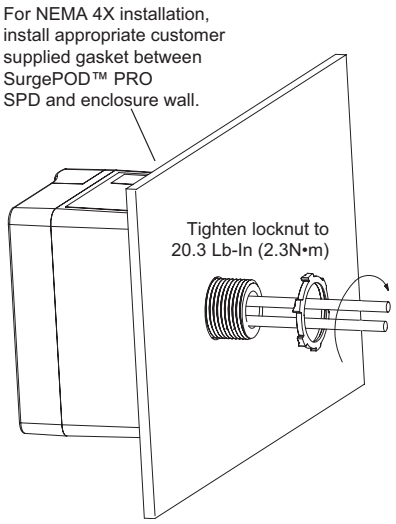
LED is Out / Unlit:

- The circuit is most likely deenergized
- The unit's leads are disconnected
- The unit is damaged

Authorized personnel should follow all prescribed lockout/tagout and safety procedures in troubleshooting the cause for the above conditions. Opening SurgePOD PRO enclosure will void the warranty.

Mounting

SurgePOD HEAVY DUTY is a panel mount device. It may also be mounted using a customer supplied bracket or directly onto a female threaded conduit fitting.



SurgePOD™ PRO technical information

Catalog number	Nominal system voltage	Max. continuous operating AC voltage (MCOV) (V_c)	System type	Connection points
SPP40SP1120SN	120V	150V	Single-phase 2 Wire	2
SPP40SP2240PN	120/240V	150V	Split-phase 3 Wire	3
SPP40SP3240DLG	240V	320V	Three-phase Delta 3 Wire + G	4
SPP40SP3480DLG	480V	550V	Three-phase Delta 3 Wire + G	4
SPP40SP3208WYG	208V	150V	Three-phase Wye 3 Wire + G	4
SPP40SP3480WYG	480V	320V	Three-phase Wye 3 Wire + G	4

Specifications (for all SurgePOD PRO units)	Values
Short-Circuit Current Rating (SCCR)	200kA
Nominal discharge current (8x20µs) (I_n)	10kA
Surge current capacity (8x20µs) (I_{max})	40kA
Response time (ns) (t_A)	<25ns
Frequency	50/60Hz
Operating state/fault indication	Bi-color LED - Green (good) / Red (replace)
Conductor length / gauge	18 inches, 10 AWG stranded tinned copper
Mounting	Chase nipple / bracket*
Enclosure / flammability ratings	NEMA 4X - UL 94-5VA
Degree of protection (installed state)	IP20 (finger-safe)
SPD install location	Indoor/outdoor
Circuit location	Lineside or loadside of service entrance overcurrent protective device
Operating Temperature	-40˚C to +65˚C
Maximum Operating Altitude	12,000FT
Agency information	cULus, RoHS Compliant
Standard	UL 1449 3rd Edition Type 1 Listed SPD
Warranty	Two Years**

* Customer-supplied bracket.

** See Bussmann SPD Limited Warranty Statement (3A1502) for details at www.cooperbussmann.com/Surge.

Voltage Protection Ratings (VPR)

Catalog number	Nominal system voltage	MCOV (V_c)	Voltage Protection Ratings (VPR)		
			L-N	L-L	L-G
SPP40SP1120SN	120V	150V	700	—	—
SPP40SP2240PN	120V/240V	150V	700	1200	—
SPP40SP3240DLG	240V	320V	—	2500	1200
SPP40SP3480DLG	480V	550V	—	3000	1800
SPP40SP3208WYG	208V	150V†	—	1200	700
SPP40SP3480WYG	480V	320V†	—	2500	1200

† SPD voltages are measured from Line-to-Neutral, or Line-to-Ground on systems where there is no Neutral present. These units do not have a Line-to-Neutral, so the Line-to-Ground voltage is 120V for the 208V Wye L-G and 277V for the 480V L-G, making the norman voltage applied to the unit less than the MCOV values listed in the table.

Installing UL Type 1 and Type 2 SPDs

While differences will arise in the installation of different models of SPDs on various electrical systems and locations inside an electrical system, the following are general procedures and considerations to follow.

At the end of this section are diagrams indicating the connection points for the Type 1 and Type 2 SPDs contained in this guide and the electrical system to which they can be connected.

Installation steps

1. Inspect the electrical panelboard to be sure it is properly grounded in accordance with prevailing code requirements.
2. Inspect the SPD unit to determine:

- It has the correct nominal system and MCOV voltage rating and is the correct configuration for the installation.
- It is not damaged; If the unit is damaged or not correct for the system, do not install it. Secure a proper replacement before proceeding with the installation.

3. Deenergize panelboard and follow established lockout / tagout procedures. Remove panelboard cover(s) to gain access to the interior. Check to make sure the entire panelboard is deenergized before proceeding.
4. Select a location on the panelboard that accommodates mounting the SPD and allows the leads to reach their intended connection points. Be sure the SPD unit can be positioned so that the LED status indicator(s) is visible. A location that permits the shortest lead lengths (but not less than six (6) inches) is preferred.
5. Remove a 3⁄4" knockout or make a 1-1⁄16" diameter hole where the SPD is to be mounted.
6. Remove the locknut from the unit and insert leads through the panelboard wall to the interior being careful not to damage the conductor insulation. (For NEMA 4X installations, use appropriate gaskets or sealing means to retain the NEMA 4X rating on the installation - see Figure 1.) Reinstall locknut and tighten to specified torque.

If using conduit, keep the run as straight and short as possible, and avoid using 90 elbows.

NOTE: For optimum performance, trim the leads to the shortest length possible, but not less than six (6) inches and avoid sharp bends. Lead lengths shorter than six (6) inches will void the warranty. Make electrical connections appropriate for the application.

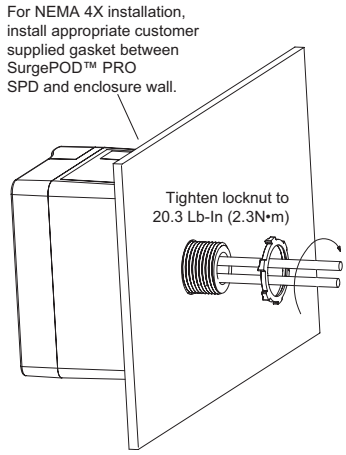


Figure 1.

Installation option A: using feed through lugs

7. Determine if the lugs are rated for stranded 10AWG conductors. If lugs are not rated for this size conductor, DO NOT install the SPD unit, or replace lugs with appropriately rated lugs before proceeding, or install the unit using installation option A.
8. Route and trim the leads so they reach their connection points with the least amount of length, but not less than six (6) inches.
9. Strip the lead ends to lug manufacturer's specifications, insert them into the appropriate lugs and torque to the specified value NOTE: DO NOT install more than one lead into the same lug.

Go to step 13.

Installation option B: circuit breaker or fused switch

When using a circuit breaker or fused switch, see suggested ampacities in Table A for the SPD family product being installed.

10. Place in the OFF position and install a new, dedicated common trip circuit breaker or fusible switch with fuses sized by SPD family and located as close as possible to where the SPD unit is mounted.
11. Route and trim the leads so they reach their intended connection points with the least amount of length, but not less than six (6) inches.
12. Strip the lead end to fit the connection points, insert into the terminals and torque to the specified value.

Go to step 13.

Finishing the installation

13. Reinstall the panelboard cover(s).
14. Test the SPD installation by energizing the panelboard and placing the circuit breaker or fusible switch (requires fuses to be installed) in the ON position. Verify the LED status indicators are functioning according to the SPD model that was installed. If LEDs are not properly displaying for a correctly installed and functioning SPD (per model), see the respective troubleshooting procedures for specific SPD model for possible causes and remedy.

Table A - Circuit breaker and fused switch sizing guide

	Suggested minimum ampacity	
SPD family	**Fused switch**	**Circuit breaker**
SurgePOD PRO (SPP)	30A	20A
SurgePOD HEAVY DUTY (SPH)	60A	30A
BSPD	100A	30A

Electrical system connections

The following diagrams show the SPD connection points for the various electrical systems likely to be encountered, along with the Bussmann SPD models that may be applied.

Understanding the following points will help assure that the correct surge protective device is specified for the electrical system or equipment.

- Typical North American electrical systems include single-phase, split-phase, Delta and Wye.
- Selecting the wrong SPD generally arises from misunderstanding the nominal system voltage, ground and neutral connections.
- General convention has it that a "ground" wire is not counted as a wire in the system description (e.g., 3 wire, 4 wire, etc.), but it is counted as a connection point if the selected SPD has a ground wire.
- Selection of a device voltage rating for Wye systems must be based upon its nominal system voltage rating and not on the leg-to-leg voltages in the Wye.
- Bonded N-G configurations do not require protection at the service entrance transformer, but protection is suggested in downstream bonded N-G systems if the length of conductor making the bond is greater than 10 feet (3m)*.

* See FAQ #24 for more information.

The following are the BSPD, SurgePOD HEAVY DUTY and SurgePOD PRO catalog numbers, and the electrical systems and voltages to which they can be applied along with any notes that help in understanding the context of the application.

The examples show circuit breakers as the most typical means of making connections to the panel phases, although connection with fusible switches and lug connections are permitted, provided the terminals are rated for the 10AWG conductors used by the SurgePOD HEAVY DUTY and PRO, and BSPD of SPDs.

Note: UL does not require the using overcurrent protective devices such as circuit breakers or fused switches as the SPD's thermal disconnect technology will safely take the SPD offline in the event of a failure. Use of these devices is for facilitating connection to the panel buses and installation convenience.

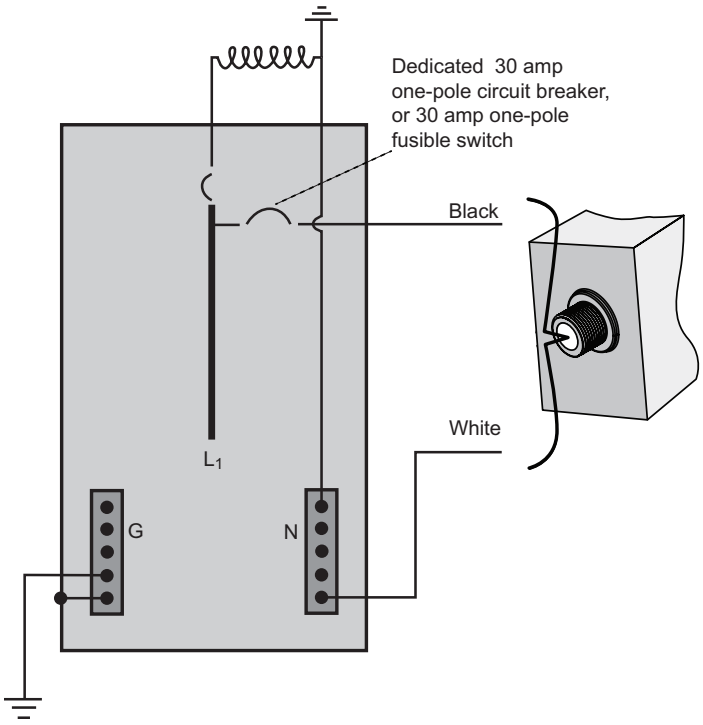
Contact Bussmann Application Engineering for electrical systems not covered in this section.

Two wire single-phase - 2 connection points

Application: Sub-panel or feeder panel

Volts: 120, 240, 347 (L-N)

Note: Less common than believed and often for one leg or piece of equipment. Must be installed within 10 feet (3m) of a bonded neutral ground connection per IEEE C62.41-1991.



Applicable SPD models and part numbers:

SurgePOD HEAVY DUTY

- SPH50SP1120SN
- SPH50SP1240SN
- SPH50SP1347SN

SurgePOD PRO:

- SPP40SP1120SN

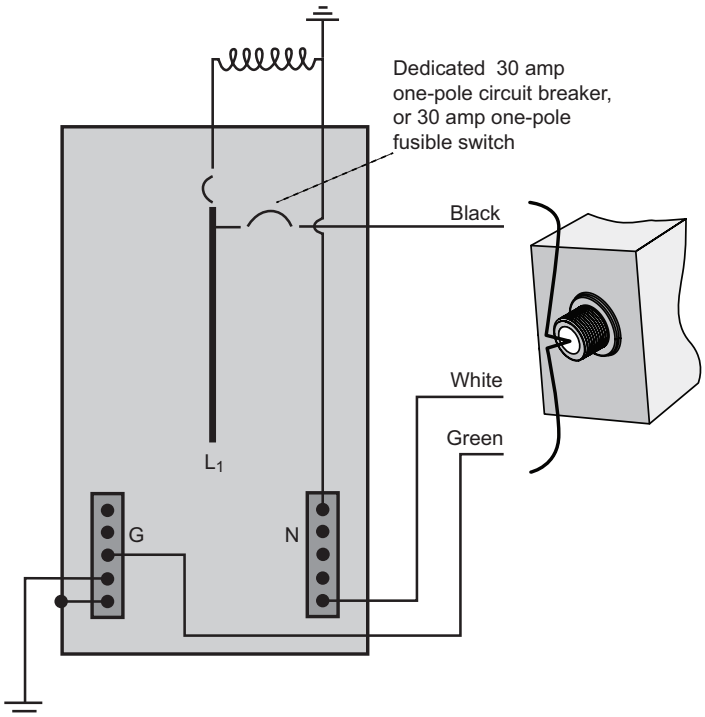
Installation instructions 10207 (BSPD), 3A1984 (SurgePOD HEAVY DUTY) and 3A2204 (SurgePOD PRO)

Three wire split-phase/two-pole - 3 connection points

Application: Service entrance panel

Volts: 120, 240, 347 (L-N)

Note: A very common system. Installation is for where the SPD is located greater than 10 feet (3m) of a bonded neutral-ground connection. The Neutral is usually pulled into facility and is bonded to ground.



Applicable SPD models and part numbers:

SurgePOD HEAVY DUTY:

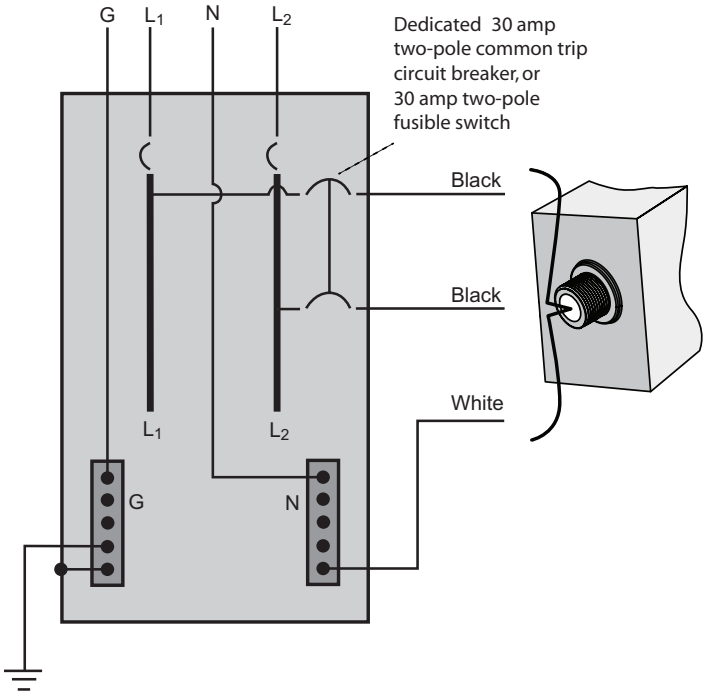
- SPH50SP2120SNG
- SPH50SP2240SNG
- SPH50SP2347S

Three wire split-phase/two-pole - 3 connection points

Application: Sub-panel or feeder panel

Volts: 120, 240 (L-N), 240, 480 (L1-L2)

Note: For installations at or less than 10 feet (3m) from the transformer. A very common system. The Neutral is usually pulled into facility and is bonded to ground. The SPD should be installed within 10 feet (3m) of a bonded-neutral ground connection.



Applicable SPD models and part numbers:

SurgePOD HEAVY DUTY:

- SPH50SP2240PN
- SPH50SP2480PN

SurgePOD PRO:

- SPP40SP2240PN

Contact Bussmann Application Engineering for electrical systems not covered in this section.

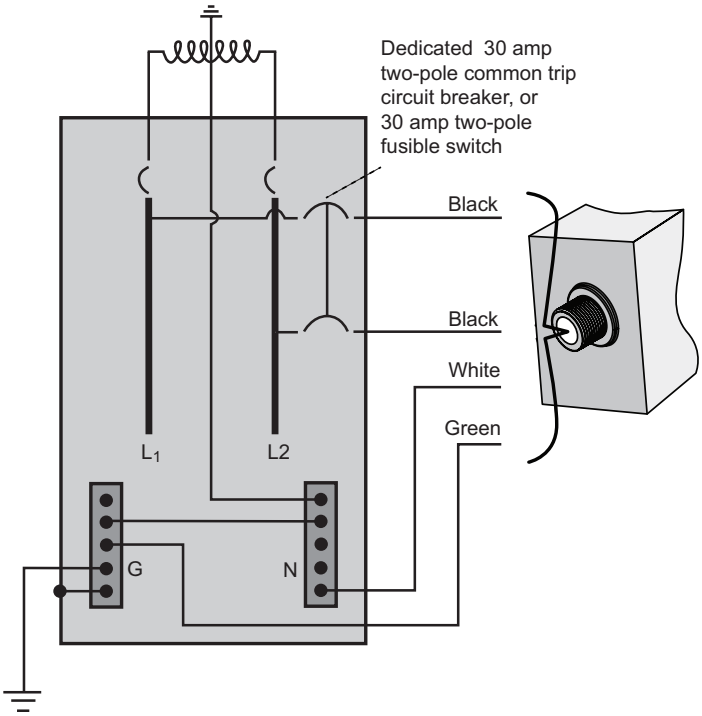
Installation instructions 10207 (BSPD), 3A1984 (SurgePOD HEAVY DUTY) and 3A2204 (SurgePOD PRO)

Three wire split-phase/two-pole plus ground - 4 connection points

Application: Service entrance equipment

Volts: 120, 240 (L-N), 240, 480 (L1-L2)

Note: For installation when located greater than 10 feet (3m) of a bonded-neutral ground connection. A very common system. The Neutral is usually pulled into facility and is bonded to ground.



Applicable SPD models and part numbers:

SurgePOD HEAVY DUTY:

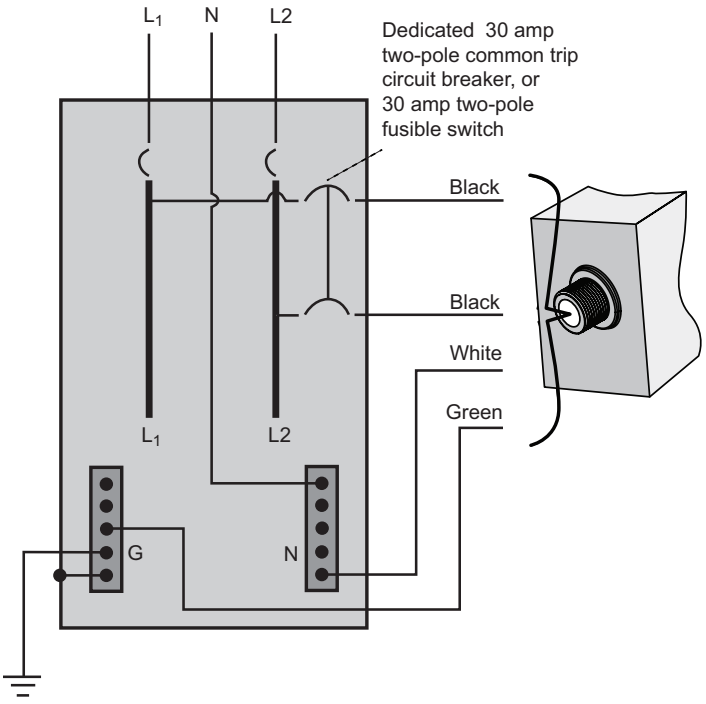
- SPH50SP3240PNG
- SPH50SP3480PNG

Three wire split-phase/two-pole plus ground - 4 connection points

Application: Sub-panel or feeder panel

Volts: 120, 240 (L-N), 240, 480 (L1-L2)

Note: For installation when located greater than 10 feet (3m) of a bonded-neutral ground connection. A very common system. The Neutral is usually pulled into facility and is bonded to ground.



Applicable SPD models and part numbers:

SurgePOD HEAVY DUTY:

- SPH50SP3240PNG
- SPH50SP3480PNG

Contact Bussmann Application Engineering for electrical systems not covered in this section.

Installation instructions 10207 (BSPD), 3A1984 (SurgePOD HEAVY DUTY) and 3A2204 (SurgePOD PRO)