

SYSTEMTRAB (SYS N4...)

Surge protective device combining spark gap type 1 lightning protection and pluggable MOV type 2 transient protection in NEMA 4/4X enclosures



Data sheet
2914_en_D

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1 Description

SYS N4... surge protective devices (SPD) are self-contained products for protecting main power service entrance from the damaging effects of a lightning strike.

The SYS N4... is installed on the secondary side (low voltage side) of the distribution transformer supplying the service entrance of a facility. The device must be connected to the load side of the main service disconnect or to the load side of a protected circuit's disconnection device. Because the unit's primary function is as a lightning arrester, it is recommended that it always be installed at the main service entrance to a facility or electrical installation. For proper operation it is important that the installation point is where a neutral to ground bond exists, as required by NEC for service entrance power.

1.1 Features

- Protects AC power mains from direct lightning strike energy.
- Combination lightning arrester and TVSS. Complete coordinated hybrid over voltage protection system.
- Discharges 50 kA of surge current as tested by the only lightning protection test standard - IEC 61024 (10/350 μ s) waveform. Comparable to the energy of 500 kA (8/20 μ s) waveform.
- Utilizes the revolutionary Arc Chopping Spark Gap technology. Discharges complete lightning surge currents while extinguishing up to 50 kA of follow current.
- Systems are flexible to meet any user requirement.
- Systems include 200 kA IC surge rated fusing with disconnect.
- ETL listed to UL 1449, 3rd edition.



Make sure you always use the latest documentation. It can be downloaded at phoenixcontact.net/products.



This document is valid for all products listed in the "Ordering data" on page 3

MNR: 0127623-02
DNR: 00604261-02

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2 Ordering data

Products

Description	Type	Order No.	Pcs./Pkt.
Surge protective device, for 277/480 V Wye systems, painted enclosure	SYS N4 277/480Y	2800703	1
Surge protective device, for 120/208 V Wye systems, painted enclosure	SYS N4 120/208Y	2800704	1
Surge protective device, for 120/240 V split-phase systems, painted enclosure	SYS N4 120/208S	2800705	1
Surge protective device, for 120/240 V High-leg Delta systems, painted enclosure	SYS N4 120/240HLD	2800706	1
Surge protective device, for 480 V Delta systems, painted enclosure	SYS N4 480D	2800707	1
Surge protective device, for 277/480 V Wye systems, painted enclosure with indicators	SYS N4/I 277/480Y	2800708	1
Surge protective device, for 120/208 V Wye systems, painted enclosure with indicators	SYS N4/I 120/208Y	2800709	1
Surge protective device, for 120/240 V split-phase systems, painted enclosure with indicators	SYS N4/I 120/208S	2800710	1
Surge protective device, for 120/240 V High-leg Delta systems, painted enclosure with indicators	SYS N4/I 120/240HLD	2800711	1
Surge protective device, for 480 V Delta systems, painted enclosure with indicators	SYS N4/I 480D	2800712	1
Surge protective device, for 277/480 V Wye systems, stainless steel enclosure	SYS N4X 277/480Y	2800713	1
Surge protective device, for 120/208 V Wye systems, stainless steel enclosure	SYS N4X 120/208Y	2800714	1
Surge protective device, for 120/240 V split-phase systems, stainless steel enclosure	SYS N4X 120/208S	2800715	1
Surge protective device, for 120/240 V High-leg Delta systems, stainless steel enclosure	SYS N4X 120/240HLD	2800716	1
Surge protective device, for 480 V Delta systems, stainless steel enclosure	SYS N4X 480D	2800717	1
Surge protective device, for 277/480 V Wye systems, stainless steel enclosure with indicators	SYS N4X/I 277/480Y	2800718	1
Surge protective device, for 120/208 V Wye systems, stainless steel enclosure with indicators	SYS N4X/I 120/208Y	2800719	1
Surge protective device, for 120/240 V split-phase systems, stainless steel enclosure with indicators	SYS N4X/I 120/208S	2800720	1
Surge protective device, for 120/240 V High-leg Delta systems, stainless steel enclosure with indicators	SYS N4X/I 120/240HLD	2800721	1
Surge protective device, for 480 V Delta systems, stainless steel enclosure with indicators	SYS N4X/I 480D	2800722	1

Accessories

Description	Type	Order No.	Pcs./Pkt.
Fuse, VSP-100-2	VSP-100-2	5603438	1

3 Technical data

General data

Dimensions (H x W x D)	500 x 400 x 210 mm (19.7 x 15.8 x 8.3 in.)
Weight	18.2 ... 21.6 kg (40.1 ... 47.6 lb.)
Phase connection	Screw terminal
Dry contact connection	Screw terminal
Operating frequency	50/60 Hz
Operating temperature	-40 ... 80°C (-40 ... 176°F)

Surge protection data

IEC nominal discharge surge current (8/20 μ s), I_n	150 kA
UL nominal discharge surge current, I_n	20 kA
Lightning test current (10/350 μ s) I_{IMP}	50 kA
Short circuit current rating SCCR	50 kA

VPR

120/208	L-G	1500 V
	L-L	2500 V
120/240 High-leg	L-G	900 V
	L-G HL	1500 V
	L-L	1500 V
	L-L HL	2500 V
277/480	L-G	1500 V
	L-L	2500 V
480 Delta	L-G	1500 V
	L-L	2500 V

UL type	Type 2
IEC type	I + II
VDE requirement class	B
EN type	T1
Response time	≤ 25 ns
Internal coordinated fusing	VSP-100

Connection data

Required conductor material	Copper (Cu)
Conductor size	
Power	8 ... 35 mm ² (8 ... 2 AWG)
Ground	16 ... 40 mm ² (6 ... 1 AWG)
Alarm	0.14 ... 1.5 mm ² (28 ... 16 AWG)
Stripping length	
Power	14 mm (0.5 in.)
Ground	19 mm (0.75 in.)
Alarm	7 mm (0.3 in.)
Screw-clamp torque	
Power	3.5 Nm (30 lb _f -in.)
Ground	4 Nm (35 lb _f -in.)
Alarm	0.45 Nm (4 lb _f -in.)

Approvals

ETL Intertek listed	ANSI/UL 1449 3rd Edition (2010) CSA C22.2-8 (2004)
CE	2006/95/EC

4 Dimensions

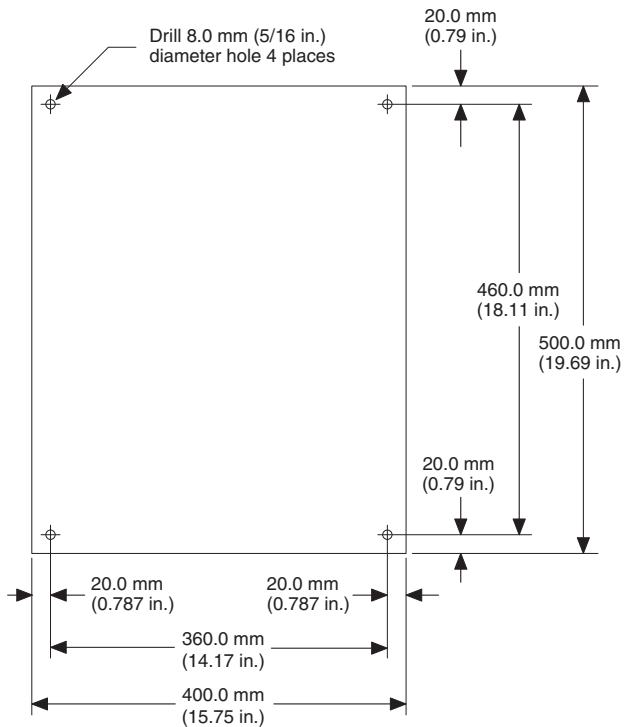


Figure 1 Dimensions SYS N4... enclosures

5 General installation guidelines

Surge protective devices rely on providing an alternate path for short-lived overvoltages. The conductors used to redirect these overvoltages are significant to the system performance and should be kept as short and straight as possible. To further increase performance, choose conductors with as large a cross section as practical, and keep the conductors tightly together as long as practical. Cut off and remove excess wire, as bends, loops, and additional lengths of wire will reduce the effectiveness of the surge protection.

Read and follow all guidelines in these procedures before installing the SYS N4... SPD. The SYS N4... should be

installed by an authorized electrician. Local electrical codes, regulations and guidelines must be observed.



DANGER:

To prevent personal injury due to electrical shock, always disconnect service power to the SYS N4... SPD prior to installing or repairing the panel. Mount the device as close to the main service switchboard as possible to minimize wiring distance.

Only trained electrical technicians should open the enclosure.

Due to high-voltage arcing that may occur in this device, DO NOT install the device in locations where combustible materials are present in the atmosphere.

When wiring the device, always verify the neutral-to-ground bond.



NOTE:

Do NOT exceed the maximum "Line-to-Ground" voltage listed on the label inside the enclosure door or the label supplied with the kit package.

The SYS N4... SPD should be installed after the main service disconnect. This is a parallel installation between each phase and earth ground. The fusing in series with each FLASHTRAB surge arrester is intended to disconnect only in the unlikely event of a short circuit in the FLASHTRAB or VAL-MS... modules.

The appropriate cable entry should be determined and cut before mounting the SYS N4... to the wall or mounting strut. Wiring must always be as straight as possible and avoid sharp bends.

6 System wiring

The SYS N4... can be installed directly to the main power bus or to an available circuit breaker. Many customers choose to install the device to a circuit breaker for both convenience and to function as a disconnect. Care must be taken to coordinate the main and supplementary breakers with the size of the wires.

Follow NEC and applicable local codes when connecting the SYS N4... directly to the bus bar. If connecting to a circuit breaker, see Table 1 for the size of wire applicable to the breaker being used.

Table 1 Circuit breaker sizing

Connecting wire size (AWG)	Circuit breaker rating (A)
8	≤60
6	≤100 - 150
4	≤160
2	≤200

i Refer to "Connection data" on page 4 for stripping length of the conductors.

If applicable, the neutral and ground must be bonded.

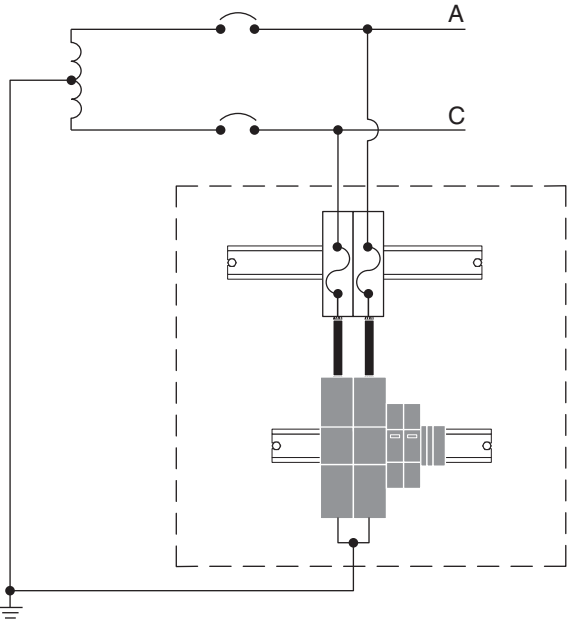


Figure 2 Single-phase connection diagram

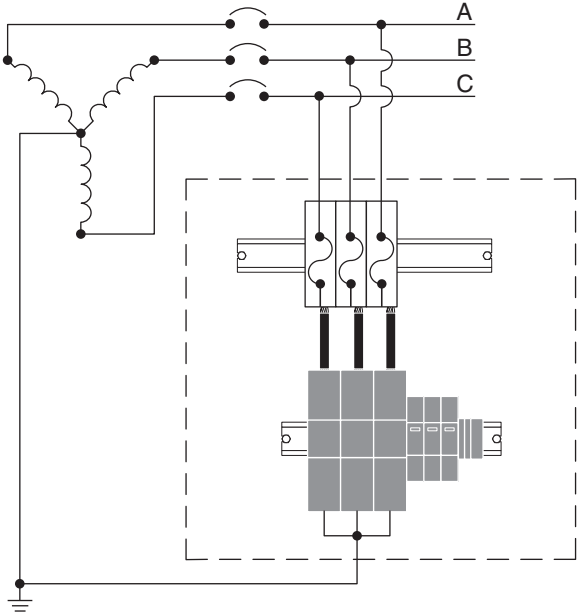


Figure 3 Wye connection diagram

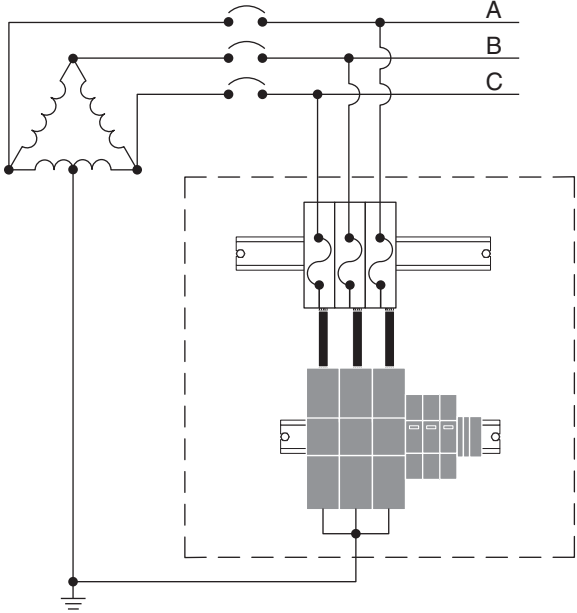


Figure 4 High-leg Delta connection diagram

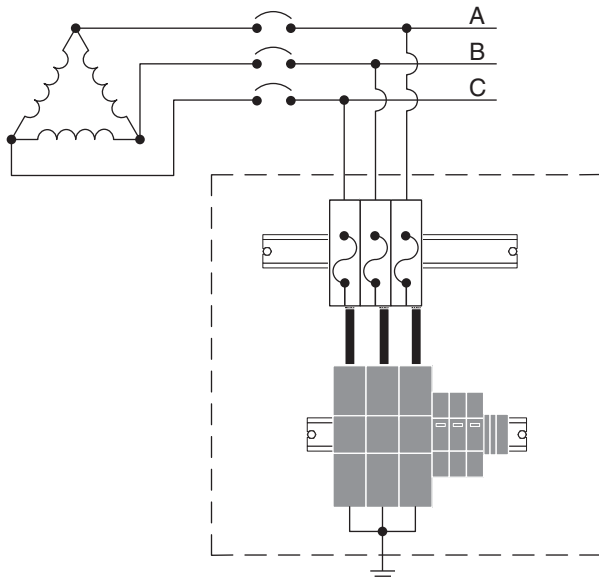


Figure 5 Delta connection diagram

depending on the material the enclosure is mounted on, an M8 x 20 mm bolt is typical of most mounting surfaces.

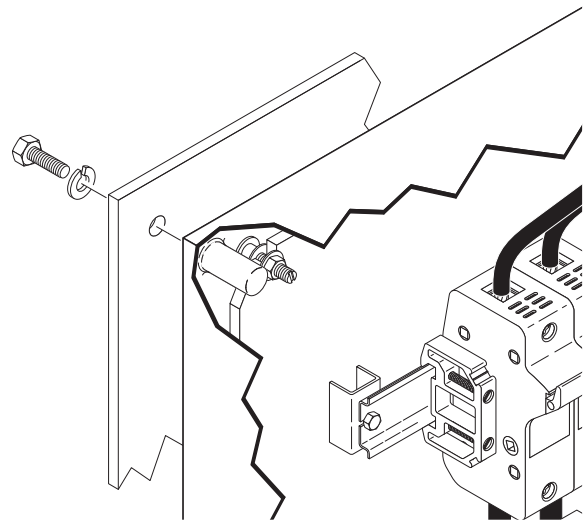


Figure 6 Stainless steel enclosure mounting (SYS N4X ...)

7 Fusing

The SYS N4... is protected by a 200 kA (8/20 μ s) fuse(s) designed for surges. This fuse protects the surge protection components from a steady-state overvoltage that might damage the equipment, but not have the current to open the circuit breakers. This fuse makes the panel suitable for use on circuits capable of delivering not more than 50,000 A_{rms} symmetrical, 385 V maximum.

8 Enclosure installation



Mounting hardware is not included.

There are two different enclosure materials, which differ slightly in mounting methods. The painted enclosure (NEMA 4) uses a through-bolt that can be either metric (M8 x 20 mm) or SAE (5/16 x 3/4 in.). The stainless steel enclosure (NEMA 4X) uses a threaded insert that requires M8 mounting hardware. While bolt length will vary

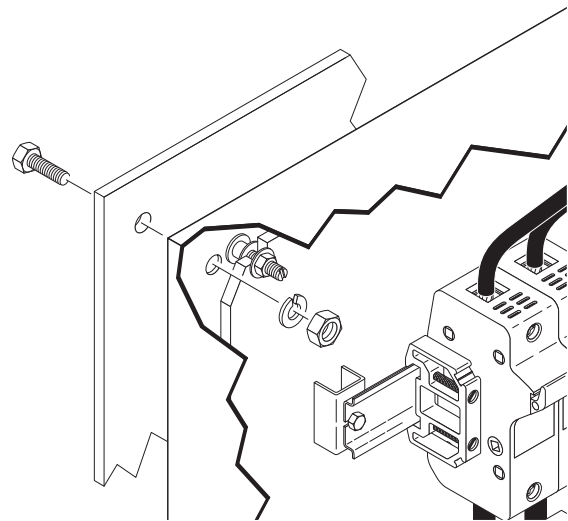


Figure 7 Painted steel enclosure mounting (SYS N4 ...)

To install the enclosure:

1. Drill 5/16-in. or 8-mm holes in the mounting surface. Refer to Figure 1 for dimensions.
2. Remove the plastic hole plugs in the four mounting holes of the painted enclosure (not necessary for the stainless steel enclosure).

3. Align the enclosure to the drilled holes and secure with appropriate hardware for the enclosure (always use lock washers).
4. Torque the mounting bolts to 101 Nm (75 lb_f-ft.).

9 Electrical connections



NOTE:

To ensure that the SYS N4... performs properly and maintains the NEMA 4/4X rating of the system, always use weatherproof connectors and conduit.
Use rigid conduit for wire run between the service entrance unit and the SYS N4... enclosure.

1. Determine the location of conduit entry into the enclosure. Cut a hole suitable to local codes and desired specifications.



For best performance, wires must be as short and straight as possible. The best entry point for the phase conductors is from the top, and the ground connections should be through the bottom.
When longer conductor runs cannot be avoided, the conductors should be twisted together. This will increase performance by lowering connection impedance.

2. Run the conductors through the conduit between the service entrance and the SYS N4... enclosure. The SYS N4... is NOT phase dependent.



NOTE:

For high-leg Delta systems with light indicators, be sure that the high-leg is connected to the center fuse holder of the SYS N4... as shown in Figure 4.

3. Insert phase conductors into the upper terminals of the fuse holders. Tighten the fuse holder terminals to approximately 47 Nm (35 lb_f-ft.).

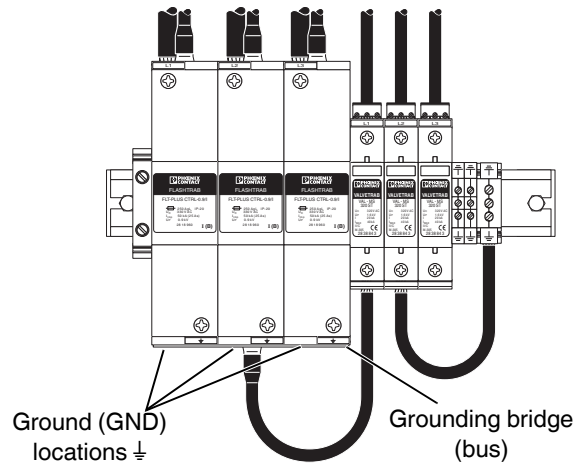


Figure 8 FLASHTRAB ground termination positions

4. Connect one end of the ground wire to one of the available ground terminals at the bottom of the FLASHTRAB module. Ground termination positions are indicated on the FLASHTRAB module by a ground symbol.



NOTE:

Multiple-phase units have the ground connections bussed together; therefore, only one ground connection is necessary.
The wire size of the ground conductor must be the same size or larger than that used for the phase conductors.

5. Connect the other end of the ground wire to the equipment safety ground or a good earth ground connection per NEC specifications and guidelines. The targeted ground resistance is 5 Ω or less.



NOTE:

The SYS N4... SPD must be properly grounded to operate effectively and safely.



The SYS N4... SPD is electrically connected to the ground terminals of the FLASHTRAB lightning arresters and VAL-MS... arresters by means of jumpers and ground terminal blocks. This ensures compliance with NEC requirements for grounding of electrical enclosures.

10 Diagnostic indicators

10.1 General

SYS N4... systems are available with diagnostic light indicators that identify component failures.

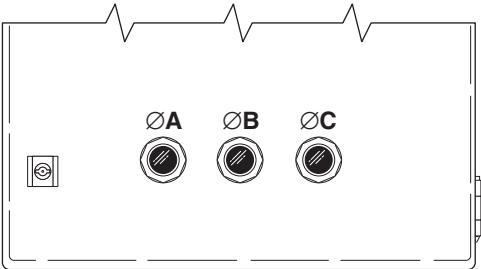


Figure 9 Indicator lights

10.2 Remote indicator connections

Each VALVETRAB plug module is equipped with a push-button switch. The switch is internally wired through the base unit to a screw-clamp connector located on top of the module. The switch can be used to operate the diagnostic indicator lamps on the door of the SYS N4... enclosure, or it can be used to operate remote indicators or devices such as user-supplied lamps (requires power), audio alarm (requires power), autodialer modem, or dry-contact input to a control device or system.

Connectors can be wired so that switches are in either a normally opened or normally closed state. Figure 10 shows typical wiring for a gang of three VALVETRAB modules.

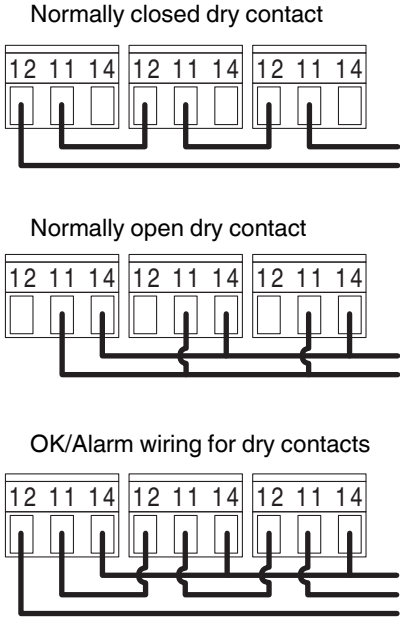


Figure 10 Connections for dry-contact indicator

11 Maintenance

The SYS N4... is designed to repeatedly protect your facility from the full energy of a direct or close-by lightning event and survive. However, in the unlikely event that a component failure occurs, the unit is very serviceable. Fuses and VAL-MS... components can be quickly replaced with minimal downtime.

The VAL-MS... uses a replaceable plug with a “DEFECT” indicator that appears when an MOV failure occurs. The DEFECT indicator identifies failures that have occurred to the MOV due to excessive surge current dissipation.

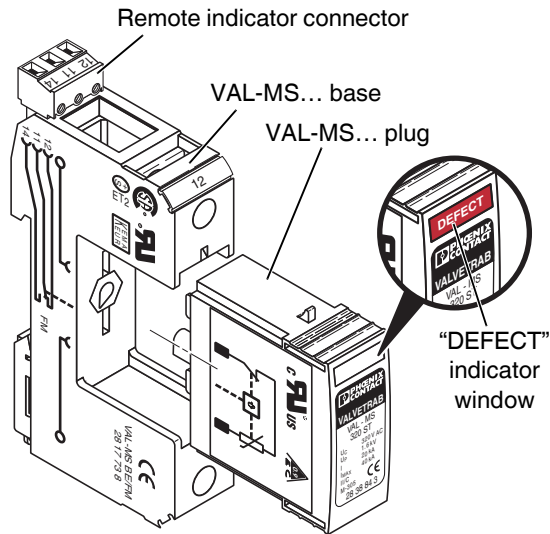


Figure 11 VAL-MS... defect indicator

11.1 VAL-MS... plug

Replacement

Replace the VAL-MS... plug as described in the following procedure.



WARNING:

To prevent personal injury due to electrical shock, always disconnect service power to the SYS N4... SPD prior to installing or repairing the panel.

Removal

1. Remove power to the SYS N4... SPD.
2. Locate the defective plug. Then, while firmly grasping the defective plug, pull it straight back to remove it from its base unit.
3. Note the position of the polarization key on the back of the plug.

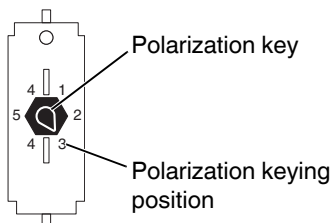


Figure 12 Plug positions

Installation

1. Obtain a replacement VAL-MS... plug with one of the same voltage. Part number and voltage appear on the plug's front label.



VAL-MS... plugs are available in a variety of voltage ratings and are keyed according to each specific rating.

2. Locate the polarization key on the back of the new plug (see Figure 12). Check that the keying position on the new plug is the same as that of the old plug. If the keying position is different, the voltage rating of the new plug is incorrect. Double check the voltage rating and, if necessary, obtain the correct VAL-MS... plug.



VAL-MS... plugs are shipped from the factory with the polarization key installed in the plug and with the polarization keyway placed over the key. The polarization keyway must be removed prior to inserting the new VAL-MS... plug into the VAL-MS... base.

3. Locate the polarization keyway located on the key of the new plug. Remove and discard the keyway.
4. Carefully align the plug with the VAL-MS... base and push straight in.
5. Check remote indication connectors (Figure 11) and remote indicator wiring, if present (Figure 10).
6. Apply power to the SYS N4... SPD.

11.2 Light assembly bulb replacement



WARNING:

To prevent personal injury due to electrical shock, always disconnect service power to the SYS N4... SPD prior to installing or repairing the panel.

1. Remove power to the SYS N4...SPD. Then, open the enclosure door and locate the indicator light that contains the defective light bulb.
2. Locate the latch. Then, press the latch to unlock the light bulb base assembly from the lens assembly. Pull the light bulb base assembly back.

3.

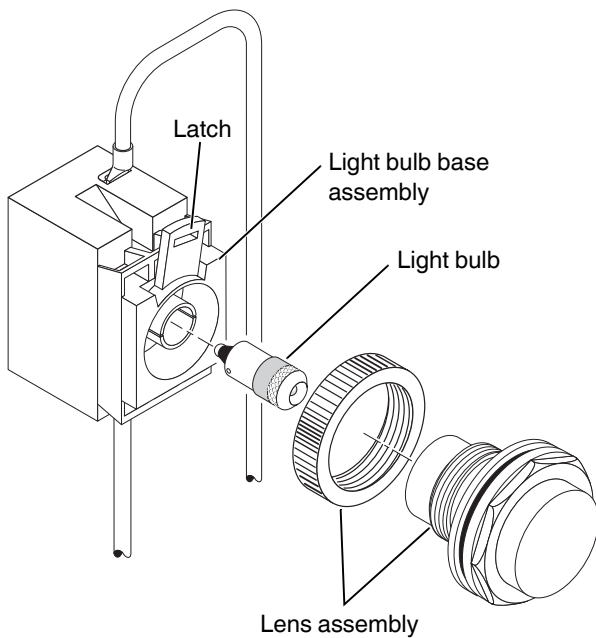


Figure 13 Indicator light assembly

4. Remove the defective bulb and discard.
5. Obtain and install a new bulb (it must have the correct voltage) into the light bulb base assembly.
6. Insert the light bulb base assembly into the lens assembly. Make sure the latch engages the lens assembly.
7. Check all wiring for loose or frayed ends, cracks, etc. Repair or replace any defective wires.
8. Check that terminals are secure. Tighten, if necessary.
9. Close and secure enclosure door before applying power to the SYS N4... SPD.

11.3 Fuse replacement



WARNING:

To prevent personal injury due to electrical shock, always disconnect service power to the SYS N4... SPD prior to installing or repairing the panel.

Removal

1. Remove power to the SYS N4... SPD.
2. Open the enclosure door and locate the fuse holder containing the fuse suspected of being defective. Place your thumb on top of the fuse holder access door and pull down to gain access to the fuse.

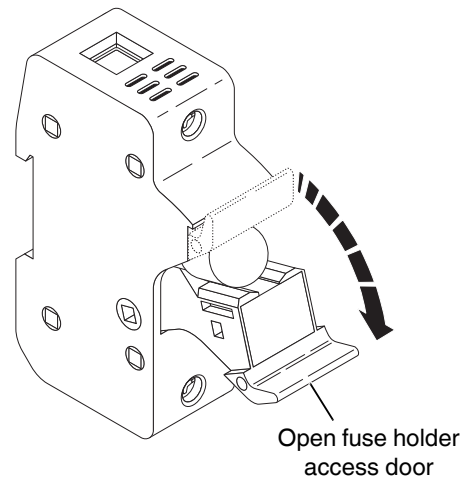


Figure 14 Fuse holder

3. Grasp the end of the fuse and pull it straight out of the fuse holder.
4. Verify that fuse is defective by performing a continuity check.

Installation

1. Obtain new Ferraz Shawmut VSP100-2 fuse (Order No. 5603438).
2. Insert the new fuse into the fuse holder and close the fuse holder access door.
3. Close and secure enclosure door before applying power to the SYS N4... SPD.

12 Troubleshooting



WARNING:

To prevent personal injury due to electrical shock, always disconnect service power to the SYS N4... SPD prior to installing or repairing the SPD.

12.1 SYS N4... units with light indicators

If any indicator light on the SYS N4... front panel is not ON, follow the procedure described in the following paragraphs.

1. Verify that power to the SYS N4... SPD is ON. If not ON, apply power and check lights.
2. Remove power to the SYS N4... unit.

Condition 1 - Defective MOV plug

3. Open the enclosure door of the SYS N4... and check for defective VAL-MS... plug(s). A red indicator with the word "DEFECT" will appear in the window at the top of the plug.

If the word "DEFECT" appears in the window, proceed to Step 4. If the word "DEFECT" does not appear in the window, proceed to "Condition 2 - Defective fuse".

4. Replace defective VAL-MS... plug(s) as described in "VAL-MS... plug" on page 10.
5. Close the SYS N4... enclosure door. Then, apply power to the SYS N4... SPD. The indicator lamp should now be lit.

Condition 2 - Defective fuse

6. If no VAL-MS... plugs are defective, open each fuse holder in the SYS N4... enclosure and verify fuse operation by performing a continuity check.
7. If fuse(s) is found to be defective, proceed to Step 8. If fuse(s) is OK, proceed to step 9.
8. Replace fuse(s) as described in "Fuse replacement" on page 11. Then, apply power to the SYS N4... SPD. The indicator lamp should now be lit.
9. If both fuses and VAL-MS... plugs are OK, replace the light bulb(s) in any lamp assembly where the bulb is not lit. Refer to "Light assembly bulb replacement" on page 10 for bulb replacement.
10. Apply power to the SYS N4... unit. Indicator lamp(s) should now be lit.