

# Installation and Operation Manual

Switch Package 2 (SP2)



**ITT**



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# 1 Introduction and Safety

## 1.1 Safety message levels

### Definitions

Safety message level	Indication
 <b>DANGER:</b>	A hazardous situation which, if not avoided, will result in death or serious injury
 <b>WARNING:</b>	A hazardous situation which, if not avoided, could result in death or serious injury
 <b>CAUTION:</b>	A hazardous situation which, if not avoided, could result in minor or moderate injury
 <b>ELECTRICAL HAZARD:</b>	The possibility of electrical risks if instructions are not followed in a proper manner
<b>NOTICE:</b>	<ul style="list-style-type: none"> <li>• A potential situation which, if not avoided, could result in an undesirable result or state</li> <li>• A practice not related to personal injury</li> </ul>

## 1.2 User health and safety

### General precautions

This product is designed and manufactured using good workmanship and materials, and meets all applicable industry standards. This product should be used only as recommended by ITT.



### **WARNING:**

- Misapplication of the valve can result in injury or property damage. Select valves and valve components of the proper materials and make sure that they are consistent with your specific performance requirements. Incorrect application of this product includes but is not limited to:
  - Exceeding the pressure or temperature rating
  - Failing to maintain this product according to the recommendations
  - Using this product to contain or control media that is incompatible with the materials of construction
  - Proper containment or protection from hazardous media must be provided by the end user to protect employees and the environment from valve discharge.

### Qualifications and training

The personnel responsible for the assembly, operation, inspection, and maintenance of the valve must be appropriately qualified. The operating company must do the following tasks:

- Define the responsibilities and competency of all personnel handling this equipment.
- Provide instruction and training.
- Ensure that the contents of the operating instructions have been fully understood by the personnel.

Instruction and training can be carried out by either ITT or the reseller of the valve by order of the operating company

### **Non-compliance risks**

Failure to comply with all safety precautions can result in the following conditions:

- Death or serious injury due to electrical, mechanical, and chemical influences
- Environmental damage due to the leakage of dangerous materials
- Product damage
- Property damage
- Loss of all claims for damages

### **Operational safety precautions**

Be aware of these safety precautions when operating this product:

- Do not leave hot or cold components of the product unsecured against contact if they are a source of danger.
- Do not remove the contact guard for moving parts when the product is in operation. Never operate the product without the contact guard installed.
- Do not hang items from the product. Any accessories must be firmly or permanently attached.
- Do not use the product as a step or hand hold.
- Do not paint over the identification tag, warnings, notices, or other identification marks associated with the product.

### **Maintenance safety precautions**

Be aware of these safety precautions when performing maintenance on this product:

- You must decontaminate the product if it has been exposed to harmful substances such as caustic chemicals.

### **Use of unauthorized parts**

Reconstruction or modification of the product is only permissible after consultation with ITT. Genuine spare parts and accessories authorized by ITT serve to maintain safety. Use of non-genuine ITT parts can annul liability of the manufacturer for the consequences. ITT parts are not to be used in conjunction with products not supplied by ITT as this improper use can annul all liability for the consequences.

### **Unacceptable modes of operation**

The operational reliability of this product is only guaranteed when it is used as designated. The operating limits given on the identification tag and in the data sheet may not be exceeded under any circumstances. If the identification tag is missing or worn, contact ITT for specific instructions.

## 2 Transportation and storage

### 2.1 Handling and unpacking guidelines

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**CAUTION:**

Always observe the applicable standards and regulations regarding the prevention of accidents when handling the product.

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#### Handling guidelines

Follow these guidelines when handling the product to prevent damage:

- Use care when handling the product.
- Leave protective caps and covers on the product until installation.

#### Unpacking guidelines

Follow these guidelines when unpacking the product:

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. Do not lift or pull on the electrical conduit lines. Doing so may cause the POC switches to come out of calibration.

### 2.2 Storage, disposal, and return requirements

#### Storage

If you are not immediately installing the product after delivery, store it as follows:

- Store the product in a dry room that maintains a constant temperature.
- Make sure that the products are not stacked on top of one another.

#### Disposal

Dispose of this product and associated components in compliance with federal, state, and local regulations.

#### Return

Ensure these requirements are met before you return a product to ITT:

- Contact ITT for specific instructions on how to return the product.
- Clean the valve of all hazardous material.
- Complete a Material Safety Data Sheet or Process Data Sheet for any process fluid that could remain on the valve.
- Obtain a Return Material Authorization from the factory.

# 3 Product Description

## 3.1 General description

The switch package is offered with a complete range of mechanical switches and proximity sensors to meet your electrical and control system specifications. The switch package can be mounted on the Advantage and Advantage Piston Actuator lines of pneumatic actuation.

## 3.2 Switch identification

### Switch type

Code	Type	Description
SP2S	Mechanical	Silver contacts
SP2G	Mechanical	Gold contacts
SP2P	Proximity	3 wire PNP
SP2NP	Proximity	3 wire NPN
SP2Z	Proximity	2 wire "Z"
SP2N	Proximity	2 wire Namur

### European Switch labels (product made in Obernkirchen, Germany)

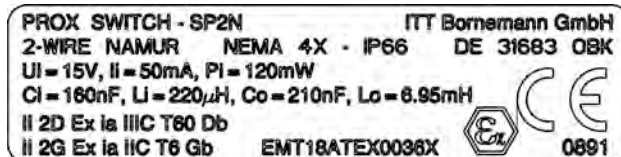


Figure 1: SP2N



Figure 2: SP2P



Figure 3: SP2Z



Figure 4: SP2NP

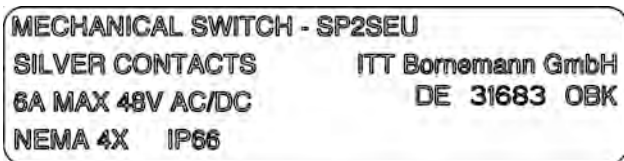


Figure 5: SP2PSEU



Figure 6: SP2GEU

US Switch labels (product made in Lancaster, PA)

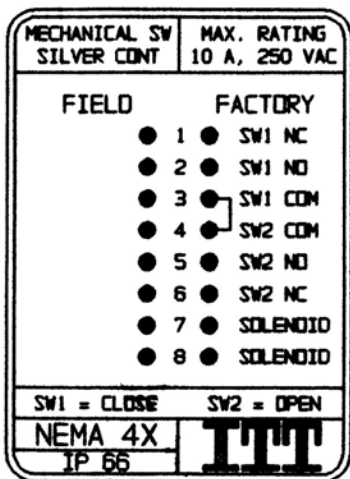


Figure 7: SP2S

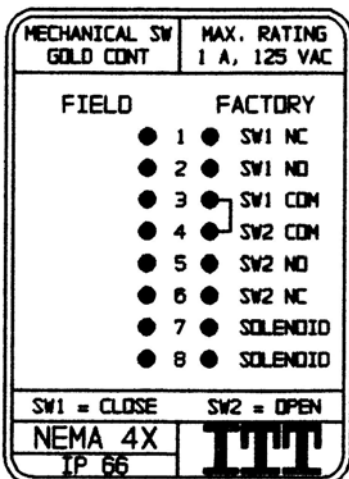


Figure 8: SP2G

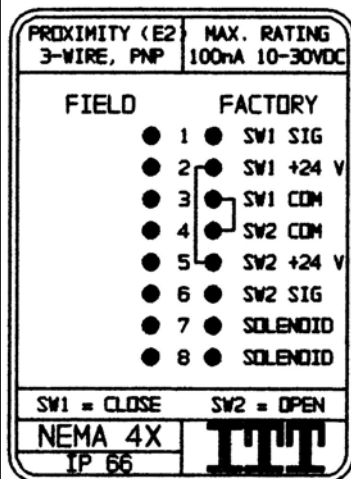


Figure 9: SP2P

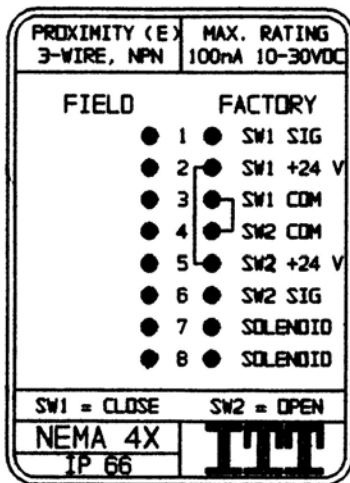


Figure 10: SP2NP

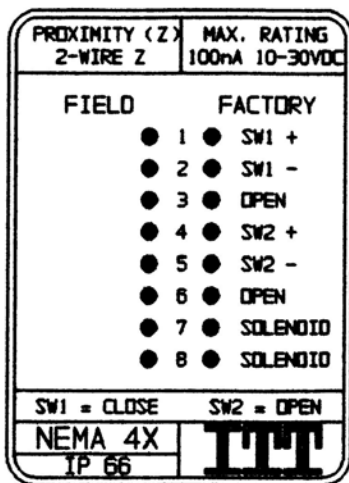


Figure 11: SP2Z

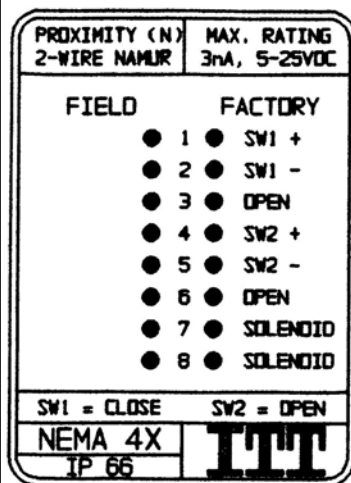


Figure 12: SP2N



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# 4 Installation

## 4.1 Mount the switch package on the actuator

These instructions are for all actuators except the 3" and 4" series 47 Advantage actuator.

1. Prepare the actuator for the switch:
  - a) Remove the four stainless steel screws on the actuator upper cover.
  - b) Place the valve in the open position.
  - c) Remove the plastic plug from the indicating spindle.
2. Slide the switch sub-assembly off the switch adapter.

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**NOTICE:**

Do not damage the switch internals (specifically the mechanical switch levers).

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3. Apply Blue Loctite #242 to the #10-24 UNC threads.  
This is on the switch actuator spindle.
4. Thread the switch actuator spindle into the indicating spindle until it shoulders.
5. Secure the switch adapter to the actuator upper cover by tightening the four hex socket head screws to 0.56 N-m | 5 in-lbs.
6. Slide the switch sub assembly down over the switch adapter and position the conduit entrance in the desired position.

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**NOTICE:**

Do not damage the switch internals (specifically the mechanical switch levers).

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7. Press down on the switch sub assembly and tighten the set screw located on the side of the lower housing to lock the unit in place.  
The set screw torque should not exceed 0.56 N-m | 5 in-lbs.
8. Remove the switch package upper cover.
9. Run field wires and conduit to the switch package.  
For more information, see the Wiring diagrams in this manual.
10. Verify that the switches operate correctly by cycling the valve.  
For more information, see Set the switch in this chapter.
11. Screw on the switch package upper cover.  
Ensure the o-ring remains in the groove.

## 4.2 Mount the switch package on a series 47 Advantage actuator

These instructions are for the 3" and 4" series 47 Advantage actuator.

1. Remove the clear plastic cap from the actuator.
2. Apply Blue Loctite #242 to the #10-24 UNC threads on the switch actuator spindle.
3. Thread the switch actuator spindle into the indicating spindle until it shoulders.
4. Thread the mounting adapter onto the upper actuator cover bushing until it shoulders against the upper actuator cover.  
Ensure that the o-ring is in place at the base of the adapter.
5. Slide the switch sub-assembly down over the mounting adapter and position the conduit entrances in the most desirable location (45° increments).
6. Press down on the switch sub-assembly and tighten the set screw located on the side of the lower housing to lock the unit in place.

#### 4.2 Mount the switch package on a series 47 Advantage actuator

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The set screw torque should not exceed 0.56 N-m | 5 in-lbs.

7. Remove the switch package upper cover.
8. Run field wires and conduit to the terminal strips.  
Reference the factory wiring decal.
9. Verify that the switches operate correctly by cycling the valve.  
For more information, see Set the switch in this manual.
10. Screw on the switch package upper cover.  
Ensure the o-ring remains in the groove.

# 5 Operation

## 5.1 Switch operation guidelines

- The switch package is not autoclavable.
- Maximum switch temperature is 65.5°C | 150°F. (Applies to non-Ex products)
- Switches and positioners cannot be used together.

### SP2N hazardous location classification

⊕ II 2 G

⊕ II 2 D

Ex ia IIC T6 Gb

Ex ia IIIC T60 Db

Tamb -20°C to +40°C

ATEX certificate number: EMT18ATEX0036X (for products made in Axminster, UK)

### SP2N Hazardous area connection parameters

**Table 1: Entity parameters**

Parameter	Power interface
$U_i$	15 V
$I_i$	50 mA
$P_i$	120 mW
$C_i$	160 nF
$L_i$	220 $\mu$ H
$C_o$	210 nF
$L_o$	6.95 mH

1. Cable length used to connect the control unit to the SP2N switch pack must be determined by using the most onerous electrical parameters provided by cable manufacturer, or by considering increasing  $C_c$  (cable capacitance) and  $L_c$  (cable inductance) by 200 pF/m and 1  $\mu$ H/m.
2. Distributed inductance and capacitance (e.g. as in cable) connected to the SP2N switch pack shall not exceed  $L_o$  and  $C_o$  (refer to Table of Entity Parameters).
3. The SP2N switch pack must only be powered via ATEX approved intrinsically safe barrier.
4. In order to avoid electrostatic charge / discharge hazard on non-metallic enclosure, always clean equipment with damp cloth only.

# 6 Maintenance

## 6.1 Assemble the switch package

These instructions are for assembling the switch package after service or repair.

Ensure all o-rings are on the switch adapter and lubricated with Dow 111.

1. Apply Blue Loctite #242 to the #10-24 UNC threads.
2. Thread the switch actuator spindle into the indicating spindle until it shoulders.
3. Secure the switch adapter to the actuator upper cover by tightening the four hex socket head screws to 0.56 N-m | 5 in-lbs.
4. Remove the switch package upper cover.
5. Slide the switch sub-assembly down over the switch adapter and position the conduit entrance in the most desirable location.

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### NOTICE:

Do not damage the switch internals (specifically the mechanical switch levers).

6. Press down on the switch sub assembly and tighten the set screw located on the side of the lower housing to lock the unit in place.  
The set screw torque should not exceed 0.56 N-m | 5 in-lbs.
7. Run field wires and conduit to the switch package.  
For more information, see the Wiring diagrams in this manual.
8. Verify the switches operate correctly by cycling the valve.  
For more information, see Set the switch in this chapter.
9. Screw on the switch package upper cover.  
Ensure the o-ring remains in the groove.

## 6.2 Set the switch




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### CAUTION:

Do not short the inductive proximity switch by directly connecting a power supply. Irreparable and immediate damage can occur to the switch.

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The switch package is pre-set at the factory. Only minimal adjustment is required to adapt to the actuator.

1. Remove the switch package upper cover.
2. Verify that the switch package locking set screw is tight.
3. Place the valve in full open position.
4. Repeat the steps below for the open and closed switch:
  - a) Connect the appropriate test device to the switch terminals.

Switch type	Test device
Mechanical	Traditional volt meter
Proximity	Inductive proximity tester (ex. Pepperl+Fuch's model #1-1305)
Inductive proximity	Energize with correct load and supply voltage

- b) Slightly loosen the two screws on the switch.
- c) Move the switch up or down the bracket to the optimum position with the adjusting screw, which is accessible from the top. ITT recommends two turns past the trigger location.

- d) Tighten the two screws on the switch.
  - e) Place the valve in the full closed position.
5. Replace the switch package upper cover.

# 7 Parts Listing and Cross-Sectional Drawings

## 7.1 Drawings and parts

List of parts

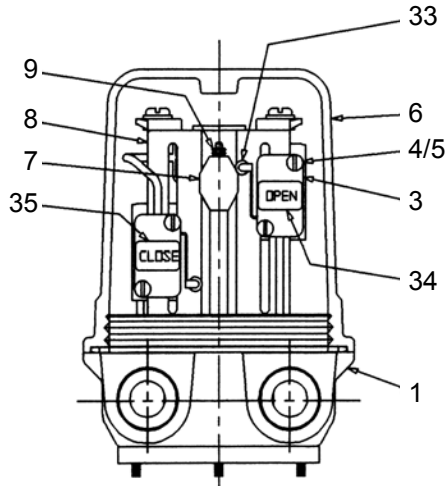


Figure 13: Front view

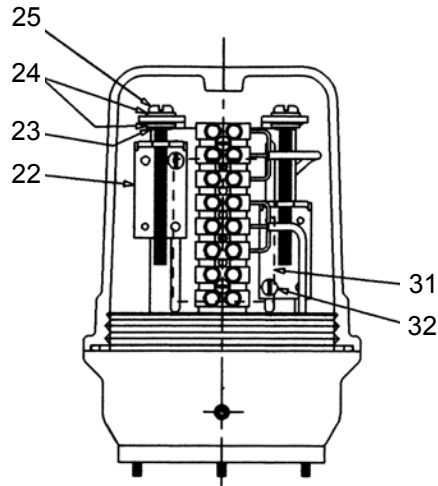


Figure 14: Back view

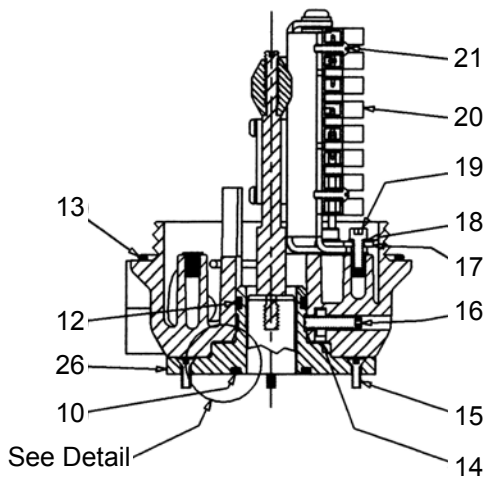


Figure 15: Internal side view

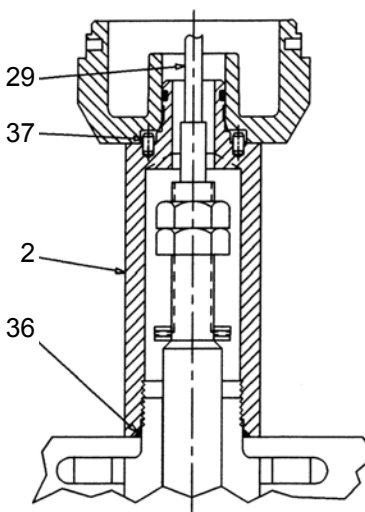


Figure 16: 3 in. and 4 in. series 47 detail

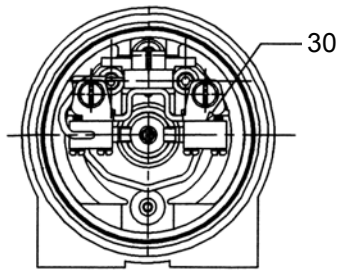


Figure 17: Top view

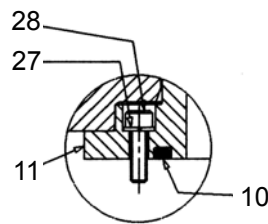


Figure 18: Detail

Item	Description	Material	Quantity
1	Lower housing	Plastic	1
2*1	Switch adapter	Stainless steel	1
3	Switch	-	2
4	Machine screw	Stainless steel	4
5	Spring washer	Stainless steel	4
6	Upper cover	Plastic	1
7	Switch actuator	Aluminum	1
8	Switch mtg bracket	Stainless steel	1
9*2	Switch actuator spindle	Stainless steel	1
10*3	O-ring #117	Buna-N	1
11*4	Switch adapter	Plastic	1
12*3	O-ring #116	Buna-N	1
13*3	O-ring #152	Buna-N	1
14	Nut	Stainless steel	1
15*5	Screw - Fl Hex Soc Ho	Stainless steel	4
16	Set Screw	Stainless steel	1
17	Washer	Stainless steel	3
18	Spring lock washer	Stainless steel	3
19	Cap screw	Stainless steel	3
20	Terminal strip	-	1
21	Machine screw	Stainless steel	2
22	Adjusting bracket	Stainless steel	2
23	Retaining ring	Steel	2
24	Washer	Stainless steel	4
25*5	Modified screw	Stainless steel	2
26	Switch adapter	Plastic	1
27*4	Washer	Stainless steel	4
28*4	Cap screw	Stainless steel	4
29	Switch actuator spindle	Stainless steel	1
30*6	Switch insulator	Nomex aramid	2
31	Switch pack label	Mylar	1
32	Screw	Stainless steel	2
33*7	Actuator switch	Stainless steel	2
34	Switch (open) label	Mylar	1
35	Switch (close) label	Mylar	1

Item	Description	Material	Quantity
36*1*3	O-ring #128	Buna-N	1
37*1	Spirol pin	Stainless steel	2

- \*1 Used on 3 - 4 in.
- \*2 Used on Bio-Tek - 2 in.
- \*3 Recommended spare part
- \*4 Used on Bio-Tek - 1 in.
- \*5 Used on 1.5 - 2 in.
- \*6 Used only with mechanical switches.
- \*7 Used only with proximity switches.

## 7.2 Wiring diagrams

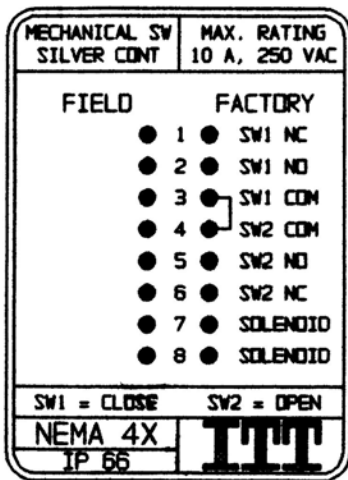


Figure 19: SP2S

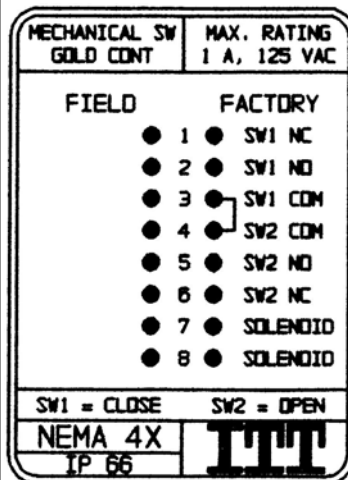


Figure 20: SP2G

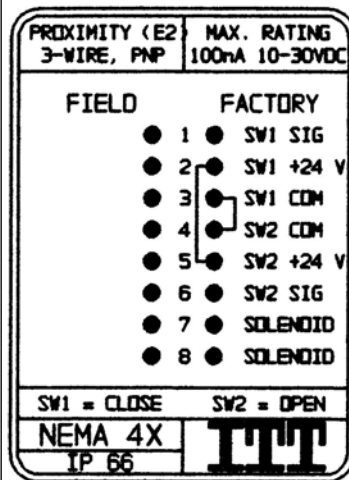


Figure 21: SP2P

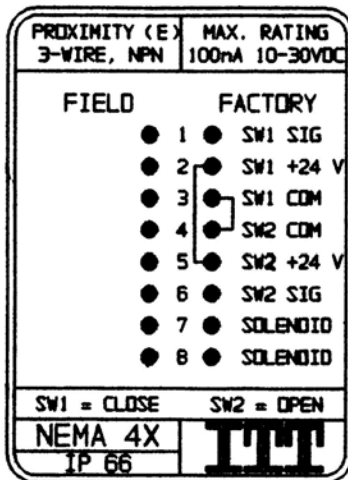


Figure 22: SP2NP

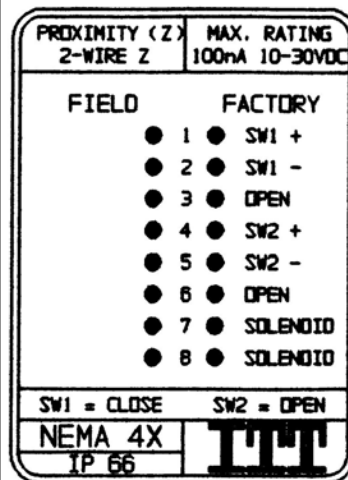


Figure 23: SP2Z

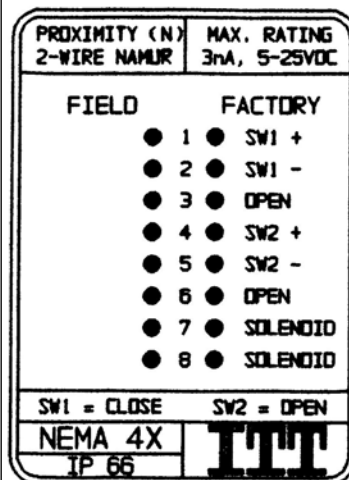


Figure 24: SP2N



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ITT Engineered Valves  
33 Centerville Road  
Lancaster, PA 17603  
USA

ITT Bornemann GmbH  
Industriestrasse 2  
31683 Obernkirchen  
Germany

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