Engineered Valves

Installation and Operation Manual

Value Switch Package (VSP and VSP+)

ITT

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1 Introduction and Safety

1.1 Safety message levels

Definitions

Safety message level	Indication
 **DANGER:**	A hazardous situation which, if not avoided, will result in death or serious injury
 **WARNING:**	A hazardous situation which, if not avoided, could result in death or serious injury
 **CAUTION:**	A hazardous situation which, if not avoided, could result in minor or moderate injury
 **ELECTRICAL HAZARD:**	The possibility of electrical risks if instructions are not followed in a proper manner
NOTICE:	• A potential situation which, if not avoided, could result in an undesirable result or state • A practice not related to personal injury

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

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 for specific instructions.

2 Transportation and storage

2.1 Handling and unpacking guidelines

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

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

Table 1: Switch type

Code	Type	Description
VSPS48	Mechanical	3 wire, silver contacts 48V
VSPG30	Mechanical	3 wire, gold contacts 30V
VSPN	Proximity	2 wire Namur (NC output)
VSPZ	Proximity	2 wire “Z” (NO/NC programmable)
VSPP	Inductive proximity	3 wire (PNP, NO output)
VSPS240	Mechanical	silver contacts 240V

Table 2: VSP+ Switch type

Order Code	Switch Type	Switch Contact/Output	Amperage	Voltage	Auto Calibration	High Visibility LED
VSP+G	Mechanical	Gold SPDT	100 mA	24VDC	x	x
VSP+S	Mechanical	Silver SPDT	1 A	24VDC	x	x
VSP+N	Proximity	2 Wire Namur	50 mA	24VDC	x	N/A
VSP+P	Proximity	3 Wire PNP	200 mA	24VDC	x	x

European Switch labels (product made in Bornemann, Germany)

Figure 1: VSPS48

Figure 2: VSPG30

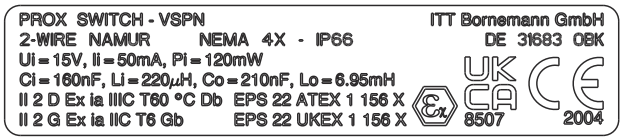

Figure 3: VSPN

Figure 4: VSPZ

Figure 5: VSPP

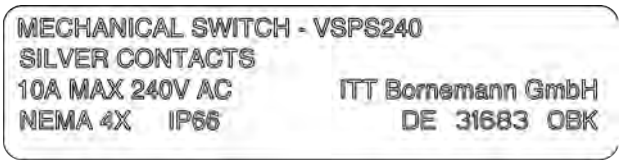

Figure 6: VSPS240

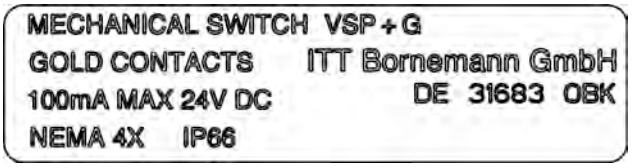

Figure 7: VSP+G

Figure 8: VSP+S

Figure 9: VSP+N

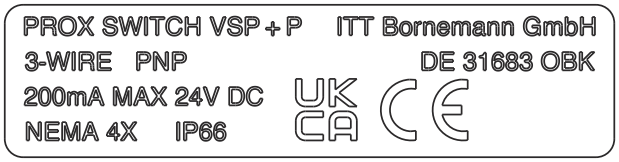

Figure 10: VSP+P

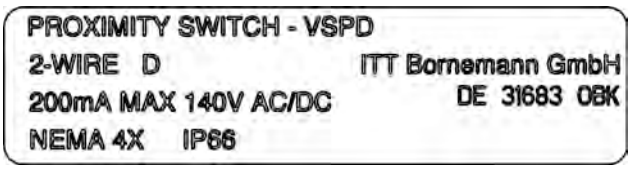

Figure 11: VSPD

US Switch labels (product made in Lancaster, PA)

Figure 12: VSPS48

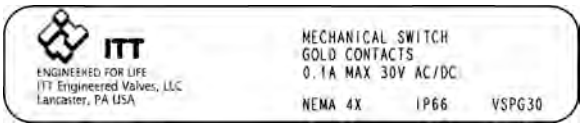

Figure 13: VSPG30

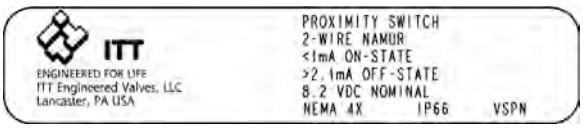

Figure 14: VSPN

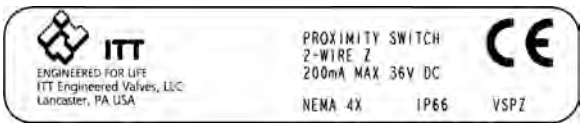

Figure 15: VSPZ

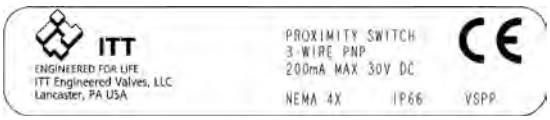

Figure 16: VSPP

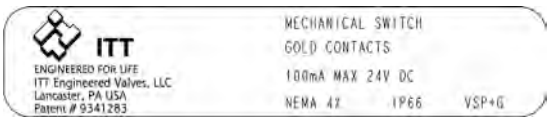

Figure 17: VSP+G

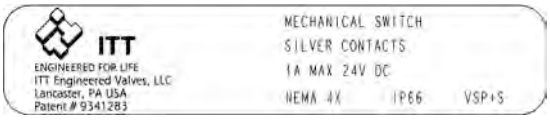

Figure 18: VSP+S

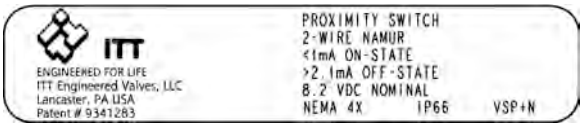

Figure 19: VSP+N

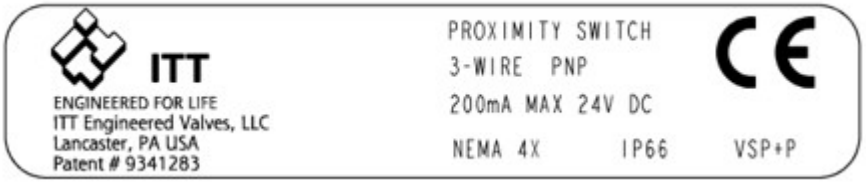

Figure 20: VSP+P

4 Installation

4.1 Mount the switch package on the 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.

   NOTICE:

   Do not damage the switch internals (specifically the mechanical switch levers).
3. Slip the switch actuator spindle through the switch adapter until the #10-24 UNC threads are exposed.
4. Apply Blue Loctite #242 to the #10-24 UNC threads.
5. Thread the switch actuator spindle into the indicating spindle until it shoulders.
6. 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.
7. Slide the switch sub assembly down over the switch adapter and position the conduit entrance in the desired position.

   NOTICE:

   Do not damage the switch internals (specifically the mechanical switch levers).
8. 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 switch adapter has two molded counterbores. Locating the set screw in one of these holes provides maximum resistance to rotation.
   The set screw torque should not exceed 0.56 N-m | 5 in-lbs.
9. Remove the switch package upper cover.
10. Run field wires and conduit to the switch package.
    For more information, see the Wiring diagrams in this manual.
11. Verify that the switches operate correctly by cycling the valve.
    For more information, see Set the switch in this chapter.
12. Push the terminal strip on the bracket assembly down until the top of the terminal strip is approximately flush with the top of the mating bracket.
13. Screw on the switch package upper cover.
    Ensure the o-ring remains in the groove.

4.2 Mount the switch package on the actuator - VSP+ only

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.

NOTICE:

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

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

NOTICE:

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

8. 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 switch adapter has two molded counterbores. Locating the set screw in one of these holes provides maximum resistance to rotation.
   The set screw torque should not exceed 5 in-lbs (0.56 N-m).
9. Remove the switch package upper cover.
10. Run field wires and conduit to the switch package.
    For more information, see the Wiring diagrams in this manual.
11. Install the two switch targets onto switch rod.

NOTICE:

The side with the plastic showing points down for each target.

12. With the valve in the closed position, slide the lower target all the way down until it hits stop on the bracket.
13. Slide the upper target up until it is just below the top bevel of the switch rod or until it hits the upper stop.
14. Cycle the valve open.
15. Verify that the switches operate correctly by cycling the valve.
    For more information, see Set the switch in this chapter.
16. Push the terminal strip on the bracket assembly down until the top of the terminal strip is approximately flush with the top of the mating bracket.
17. 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 60ºC | 140ºF. (Applies to non-Ex products)
- Switches and positioners cannot be used together.
- For switch package models containing mechanical snap switches, contact *bounce* may occur during operation. This characteristic can be eliminated through electrical filters or software. Contact ITT for more information.

VSPN and VSP+N hazardous location classification

Ⓔx II 2 G

Ⓔx 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 Obernkirchen, Germany)

UKEX Certificate number: EPS 22 UKEX 1 156 X

VSPN and VSP+N Hazardous area connection parameters

Table 3: Entity parameters

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

1. Cable length used to connect the control unit to the VSPN switch pack must be determined by using the most onerous electrical parameters provided by cable manufacturer, or by considering increasing Cc (cable capacitance) and Lc (cable inductance) by 200 pF/m and 1 µH/m.
2. Distributed inductance and capacitance (e.g. as in cable) connected to the VSPN switch pack shall not exceed Lo and Co (refer to Table of Entity Parameters).
3. The VSPN 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. Slip the switch actuator spindle through the switch adapter until the #10-24 UNC threads are exposed.
2. Apply Blue Loctite #242 to the #10-24 UNC threads.
3. Thread the switch actuator spindle into the indicating spindle until it shoulders.
4. 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.
5. Thread the appropriate switch actuator(s) on to the switch actuator spindle.
6. Position the closed switch actuator approximately 3.6 mm or 4 turns | 0.14 in. from end of threads and position the open switch actuator approximately 6.4 mm or 7 turns | 0.25 in. below the top of the switch actuator spindle.
   Do not tighten the set screw.
7. Remove the switch package upper cover.
8. Slide the switch sub-assembly down over the switch adapter and position the conduit entrance in the most desirable location.

   NOTICE:

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

9. 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 switch adapter has two molded counterbores. Locating the set screw in one of these holes provides maximum resistance to rotation.
   The set screw torque should not exceed 0.56 N-m | 5 in-lbs.
10. Run field wires and conduit to the switch package.
    For more information, see the Wiring diagrams in this manual.
11. Verify the switches operate correctly by cycling the valve.
    For more information, see Set the switch in this chapter.
12. Push the terminal strip down until the top of the terminal strip is approximately flush with the top of the mating bracket.
13. Screw on the switch package upper cover.
    Ensure the o-ring remains in the groove.

6.2 Assemble the switch package - VSP+ only

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. Slip the switch actuator spindle through the switch adapter until the #10-24 UNC threads are exposed.
2. Apply Blue Loctite #242 to the #10-24 UNC threads.
3. Thread the switch actuator spindle into the indicating spindle until it shoulders.
4. Secure the switch adapter to the actuator upper cover by tightening the four hex socket head screws to 5 in-lbs (0.56 N-m).
5. Thread the appropriate switch actuator(s) on to the switch actuator spindle.

6. Position the closed switch actuator approximately 0.14 in. (3.6 mm or 4 turns) from end of threads and position the open switch actuator approximately 0.25 in. (6.4 mm or 7 turns) below the top of the switch actuator spindle.
   Do not tighten the set screw.
7. Remove the switch package upper cover.
8. Slide the switch sub-assembly down over the switch adapter and position the conduit entrance in the most desirable location.

   NOTICE:

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

9. 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 switch adapter has two molded counterbores. Locating the set screw in one of these holes provides maximum resistance to rotation.
   The set screw torque should not exceed 5 in-lbs. (0.56 N-m).
10. Run field wires and conduit to the switch package.
    For more information, see the Wiring diagrams in this manual.
11. Install the two switch targets onto switch rod.

    NOTICE:
    The side with the plastic showing points down for each target.

12. With the valve in the closed position, slide the lower target all the way down until it hits stop on the bracket.
13. Slide the upper target up until it is just below the top bevel of the switch rod or until it hits the upper stop.
14. Cycle the valve open.
15. Verify the switches operate correctly by cycling the valve.
    For more information, see Set the switch in this chapter.
16. Push the terminal strip down until the top of the terminal strip is approximately flush with the top of the mating bracket.
17. Screw on the switch package upper cover.
    Ensure the o-ring remains in the groove.

6.3 Set the switch - VSP Models

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

NOTICE:
The closed switch actuator must never hit the adapter in the closed position with the body attached.

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. Connect the appropriate test device to the open 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

5. Thread the upper switch actuator two turns past the initial switch indication and lock it in place with the set screw on the switch actuator.
6. Place the valve in the full closed position and connect the appropriate test device to the closed 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

7. Thread the lower switch actuator two turns past the initial switch indication and lock it in place with the set screw on the switch actuator.
8. Replace the switch package upper cover.

6.4 Set the switch - VSP+ Models (with circuit board)

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

NOTICE:
The closed switch actuator must never hit the adapter in the closed position with the body attached.

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

1. Apply 24VDC to Terminal 1 (+) and Terminal 2 (-)
2. Close the valve.
3. When in the closed position, the GREEN or RED LED's (depending on configuration) should be on and with a volt meter should read 24VDC to terminal 4 if GREEN is illuminated or to terminal 3 if RED is illuminated.
4. Apply instrument air to the actuator to open the valve.
5. When in the open position the RED or GREEN LED's (depending on configuration) should be on and with a volt meter should read 24VDC to terminal 3 if RED is illuminated or to terminal 4 if GREEN is illuminated.

7 Parts Listing and Cross-Sectional Drawings

7.1 Drawing and parts

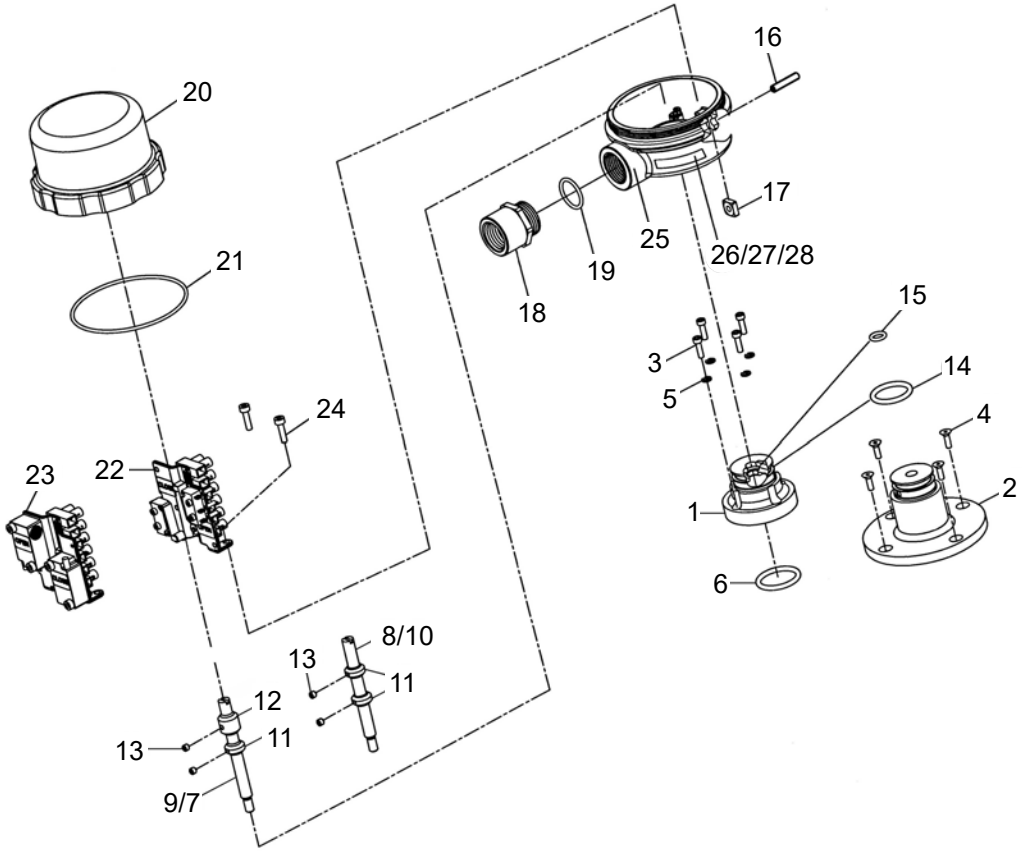

Figure 21: VSP Cross Section

Item	Description	Material	Quantity
1*1	Adapter, Bio-Tek - 1 in. actuator	Plastic	1
2*2	Adapter, 1-½ - 2 in. actuator	Plastic	1
3*1*3	Cap screw, hex socket head	Stainless steel	4
4*2*3	Machine screw, hex socket head	Stainless steel	4
5*1	Washer, Lock	Stainless steel	4
6	O-ring #117	Buna-N	1
7*1*4	Switch actuator spindle	Stainless steel	1
8*2*5	Switch actuator spindle	Stainless steel	1
9*1*6	Switch actuator spindle	Stainless steel	1
10*2*7	Switch actuator spindle	Stainless steel	1
11	Actuator switch T1	Stainless steel	As required
12	Actuator switch T2	Stainless steel	As required
13*8	Set screw	Stainless steel	2

Item	Description	Material	Quantity
14	O-ring #116, external groove	Buna-N	1
15	O-ring #110, internal groove	Buna-N	1
16*9	Set screw	Stainless steel	1
17	Square nut	Stainless steel	1
18	Adapter 1/2" - NPT	Nickel-plated brass	1
19	O-ring #16	Buna-N	1
20	Upper cover	Plastic	1
21	O-ring #037	Buna-N	1
22	Bracket assembly mechanical	Stainless steel	1
23	Bracket assembly proximity	Stainless steel	1
24*3	Cap screw, hex socket head	Stainless steel	2
25	Lower housing	Plastic	1
25A	Cover spacer	Stainless steel	1
26	North American label	Mylar	As required
27	European label	Mylar	As required
28	Far side only label warning	Mylar	As required

*1 Bio-Tek through 1 in. actuators only
*2 1.5 in. and 2 in. actuators only
*3 Torque fasteners to 4-6 in-lb (0.45-0.68 N-m)
*4 Use with Bio-Tek, 0.5 in., 0.75 in. valve
*5 Use with 1.5 in. valve
*6 Use with 1 in. valve
*7 Use with 2 in. valve
*8 Orient toward item 18
*9 Torque should not exceed 5 in-lb (0.56 N-m)

- Stake all fasteners with Loctite Blue #242
- Lubricate all o-rings with Dow #111

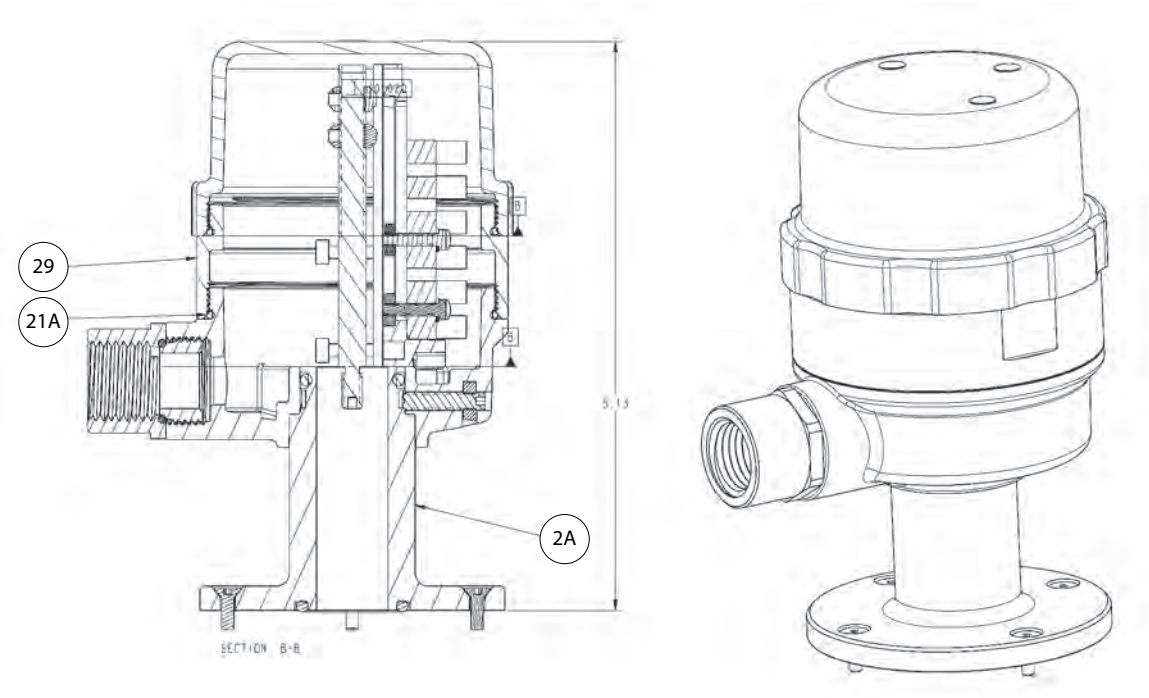

Figure 22: VSP Cross Section for > 2.5" - 4" 33 Series actuators

Item	Description	Material	Quantity
3-28	see Figure 21: VSP Cross Section on page 15		
2A	Adapter 3 and 4 in. Series 33	Stainless steel	1
21A	O-ring #307	Buna-N	1
33	Spacer cover	Stainless steel	1

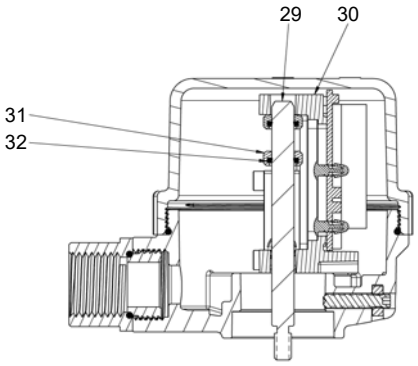

Figure 23: VSP+

Table 4: VSP+

Item	Description	Material	Quantity
29	Switch target rod	Stainless steel	1
30	Switch bracket assembly	Plastic	1
31	Self set switch target	Stainless steel	2
32	Self set switch target ring	Elastomer	2

7.2 Wiring diagrams

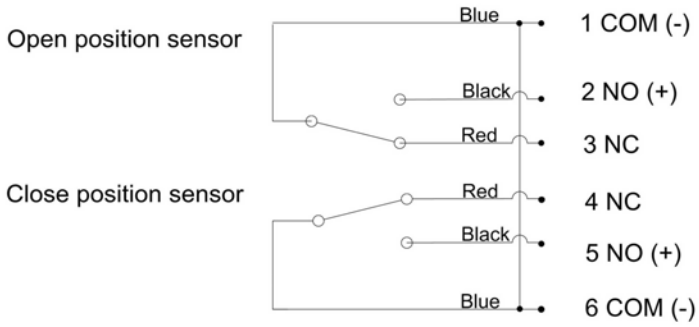

Figure 24: VSPS48 – 3 wire mechanical switch (silver contacts)

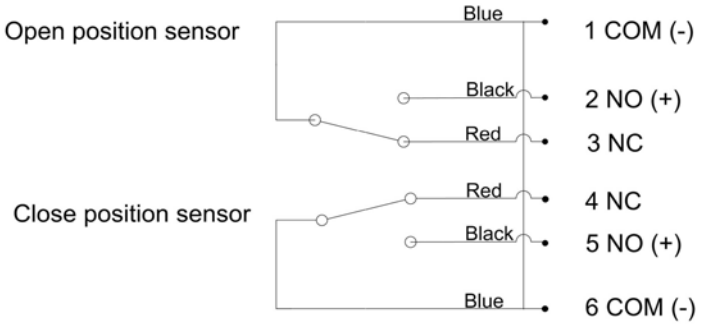

Figure 25: VSPG30 – 3 wire mechanical switch (gold contacts)

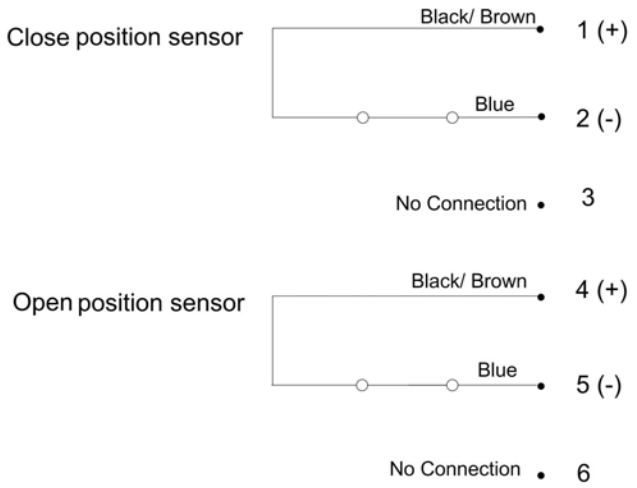

Figure 26: VSPN – 2 wire NAMUR proximity switch (NC output)

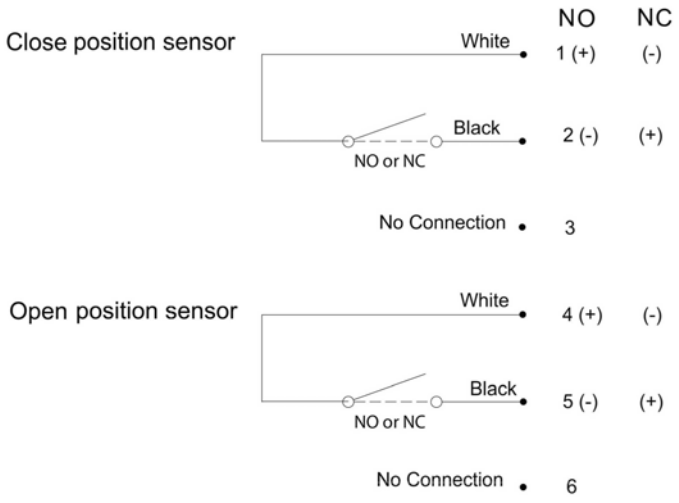

Figure 27: VSPZ – 2 wire "Z" proximity switch (NO/NC programmable)

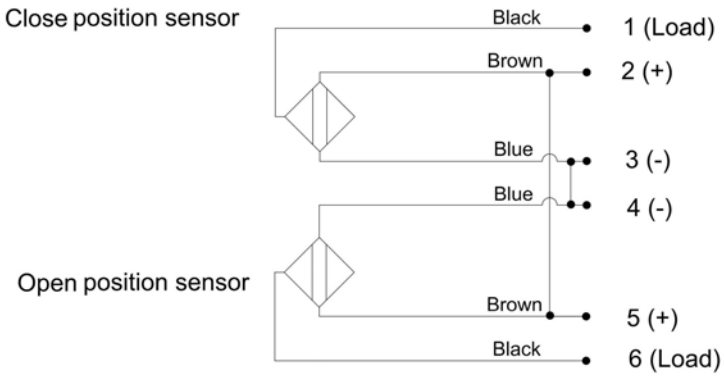

Figure 28: VSPP – 3 wire inductive proximity switch (PNP, NO output)

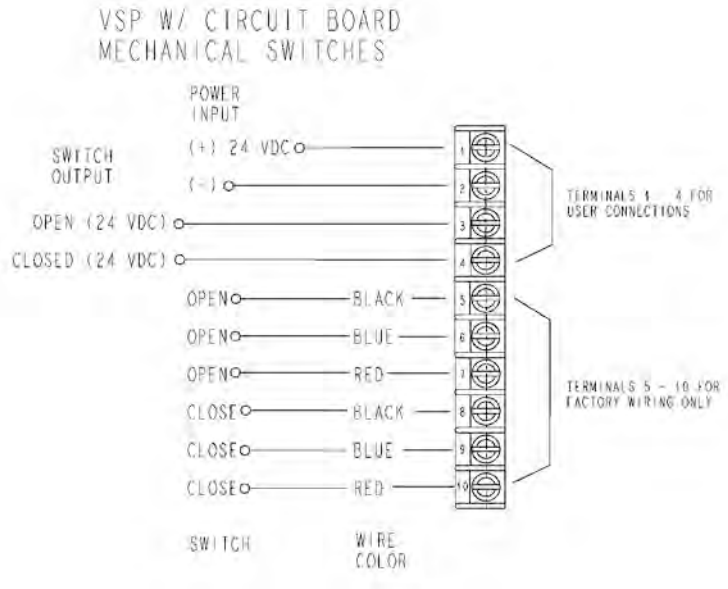

Figure 29: VSP+ Mechanical Switches

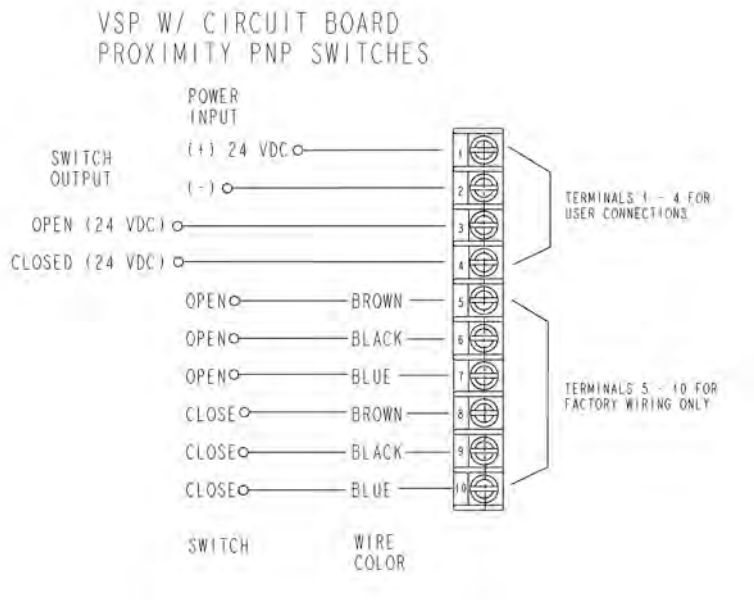

Figure 30: VSP+ 3 Wire proximity PNP switches

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