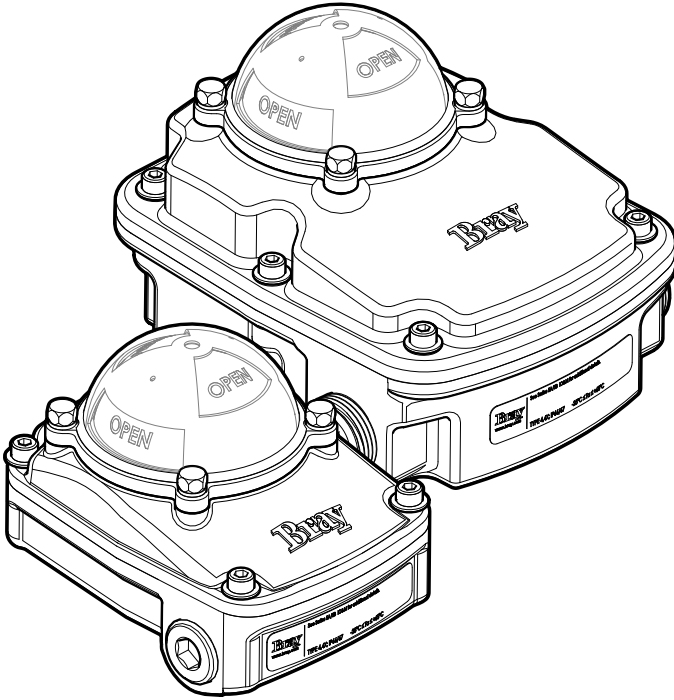


SERIES 5A AND 5B

VALVE STATUS MONITOR

Installation, Operation and Maintenance Manual



 **Bray**[®]

THE HIGH PERFORMANCE COMPANY



Table of Contents

1. Safety Instructions - Definition of Terms	3
2. Hazard-Free Use	3
3. Qualified Personnel	3
4. Part Numbering System Reference Chart	4
5. Introduction	5
6. Principle of Operation	5
7. Pre-Installation Storage	5
8. Mounting	5
8.1 Adjustable Bracket.	5
8.2 Fixed Bracket	6
9. Cover Removal	7
10. Field Wiring	7
11. Reversal of Visual Indication.	8
12. Position Adjustment.	9
13. Switch Ratings and Certifications	10
Mechanical Switches.	10
3-Wire DC Inductive Proximity Switches	10
2-Wire Inductive Proximity Switches	11
Reed Switches	11
14. Mounting Kits.	12
15. Basic Tools	12
16. Troubleshooting Chart	13
17. Exploded Views	14
Exploded View S5A	14
Exploded View - S5B.	15

Read and Follow These Instructions

Save These Instructions

1. Safety Instructions - Definition of Terms

 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state, including property damage.

2. Hazard-Free Use

This device left the factory in proper condition to be safely installed and operated in a hazard-free manner. The notes and warnings in this document must be observed by the user if this safe condition is to be maintained and hazard-free operation of the device assured.

Take all necessary precautions to prevent damage to the device due to rough handling, impact, or improper storage. Do not use abrasive compounds to clean the device, or scrape surfaces with any objects.

Configuration and setup procedures for this device are described in this manual. Proper configuration and setup are required for the safe operation of this device.

The control system in which this device is installed must have proper safeguards to prevent injury to personnel, or damage to equipment, should failure of system components occur.

3. Qualified Personnel

- A qualified person in terms of this document is one who is familiar with the installation, commissioning and operation of the device and who has appropriate qualifications, such as:
 - Is trained in the operation and maintenance of electric equipment and systems in accordance with established safety practices.
 - Is trained or authorized to energize, de-energize, ground, tag and lock electrical circuits and equipment in accordance with established safety practices.
 - Is trained in the proper use and care of personal protective equipment (PPE) in accordance with established safety practices.
 - Is trained in first aid.

 WARNING
<p>The VSM must only be installed, commissioned, operated and repaired by qualified personnel.</p> <p>All installation, commissioning, operation and maintenance must be performed under strict observation of all applicable codes, standards and safety regulations.</p>

4. Part Numbering System Reference Chart

Series		Housing	Product	Switch	Configuration	Trim
5X	000	H	-126	S	C	536

5X – Designates Housing Size

5A	Type 4,4x, IP 66/67, Max 2 switches
5B	Type 4,4x, IP 66/67, Max 6 switches

H – Designates Housing Style

0	Imperial
5	Metric

S – Designates Switch Option

A	SPDT Mechanical Switch
B	SPDT Mechanical Gold Plated Switch (Low Power)
C	PNP N.O., 3-Wire Switch
D	NPN N.O., 3-Wire Switch
E	PNP N.C., 3-Wire Switch
F	140V, 2-Wire Switch
G	250V, 2-Wire Switch
J	SPDT Reed Switch
R	NPN N.C., 3-Wire Switch
S	DPDT-DB Mechanical Switch

C – Designates Switch Configuration

2	2 Switches
3	3 Switches, Independent
4	4 Switches, Independent
5	4 Switches (2 Independent, 2 Auxiliary)
6	6 Switches (4 Independent, 2 Auxiliary)

5. Introduction

The Bray Series 5A and 5B Valve Status Monitors (VSM) provide visual and electrical indication of position of any VDI/VDE 3845 compliant quarter-turn device.

6. Principle of Operation

Bray Series 5A and 5B VSMs are comprised of a NEMA Type 4/4X housing with external position indicator and two conduit entries, cam shaft with self-locking cams, elevated terminal block, internal grounding screw, and mounting bracket.

The VSM is coupled to the quarter turn device via the indicator shaft. Rotation of the indicator shaft, in turn, drives the cams and activates the switch. The angular position in which the switches activate can be adjusted through the self-locking cams. Mechanical or proximity activation of switches provides electrical feedback of achieved position through field wiring to a control network.

7. Pre-Installation Storage

Bray Series 5A and 5B VSMs are not weatherproof until properly installed on the quarter-turn device or prepared for storage. Bray cannot accept responsibility for deterioration caused on-site once the cover is removed.

NOTICE

Units are shipped with two screw-in plugs to prevent foreign matter from entering the unit. To prevent condensation from forming inside these units, maintain a near constant external temperature and store in a well-ventilated, clean, dry room away from vibration.

Store units on a shelf or wooden pallet in order to protect against dampness.

Keep units covered to protect against dust and dirt.

Storage temperature should be maintained between -25°C and 65°C

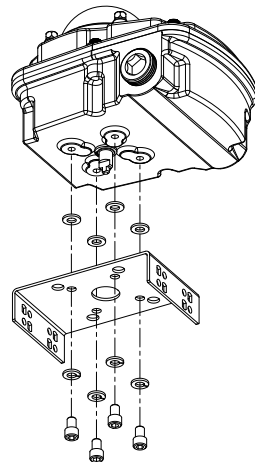
8. Mounting

All Bray Series 5A and 5B VSMs are suitable for mounting to VDI/VDE 3845 compliant quarter-turn devices using standard mounting hardware. With proper mounting hardware, VSMs can be installed onto other quarter-turn devices. Mounting instructions may vary when using alternative mounting hardware.

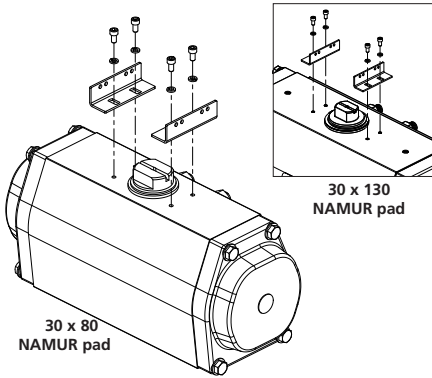
8.1 Adjustable Bracket

Bray's 3 piece adjustable bracket is designed to mount on both NAMUR 30x80 and 30x130 patterns. Installation is as follows:

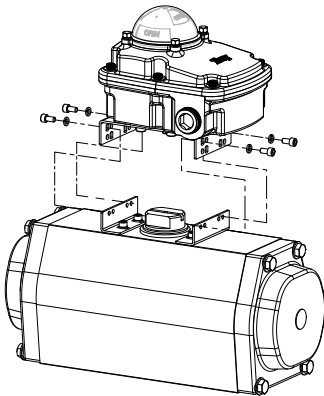
1. Disassemble two mounting bracket foot plates from top plate.
 - a. Continue to Step 6 if the mounting bracket top plate was pre-installed.
2. Lightly coat mounting bracket bolt threads with grease.
3. Place lock washer onto bolts.
4. Place nylon washer in between mounting bracket and bottom of the VSM.
5. Attach mounting bracket and nylon washers to the VSM using mounting bracket bolts.
 - a. Tighten mounting bolts in a cross pattern to 70.8 in-lbs. [8Nm]
 - b. Ensure that the bracket remains aligned with the body of the VSM.



6. Place lock washers on foot plate mounting bolts.
7. Attach two mounting bracket foot plates to the quarter-turn device.
 - a. Tighten mounting bracket foot plates to 44.3 in-lbs. [5Nm]



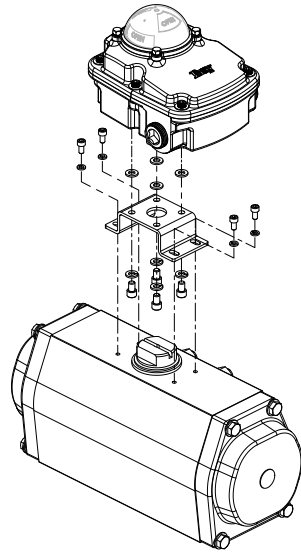
8. Attach coupler or adapter if provided.
9. Adjust the VSM cam shaft to align with the actuator shaft or coupler.
 - a. Adjust bracket plates as needed.
10. Connect the mounting bracket top plate to both bracket feet using bolts.
 - a. Adjust height of the bracket by choosing mounting hole.
 - b. Tighten bolts to 44.3 in-lbs. [5Nm]



8.2 Fixed Bracket

Bray's single piece bracket is used for NAMUR pattern 30 x 80. Installation is as follows:

1. Attach mounting bracket and nylon washers to the VSM using mounting bracket bolts.
 - a. Tighten mounting bolts in a cross pattern to 70.8 in-lbs. [8Nm]
 - b. Ensure that the bracket remains aligned with the body of the VSM.
2. Place VSM and bracket assembly on actuator. Ensure VSM shaft engages with actuator pinion.
3. Install bracket mounting bolts with lock washers as seen below.
 - a. Tighten mounting bracket bolts to 44.3 in-lbs. [5Nm].

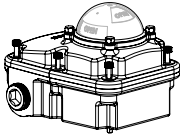


9. Cover Removal

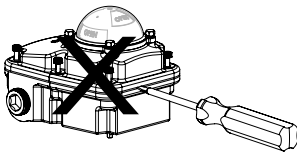
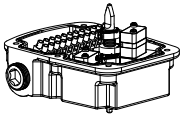
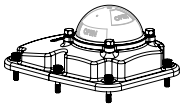
Access to the S5A/S5B internals is done by removing the cover from the unit. The steps for removal are as follows:

Cover removal:

1. Loosen captive cover bolts. The S5A contains 4 bolts and the S5B contain 6 bolts located around the perimeter of the unit.



2. Pull the cover up and away from unit. Do not use a wedge device to remove cover.



3. Perform internal adjustment. Reference position adjustment section.

Cover Installation:

1. Insure o-ring is seated in the o-ring groove.
2. Press on cover insuring captive bolts are aligned with the bolt holes.
3. Tighten cover bolts to 13-18 lb-in.

10. Field Wiring

Bray Series 5A VSMs are assembled with a numbered Euro style 8-pole terminal block. Bray Series 5B VSMs may be assembled with either a numbered Euro style 12-pole terminal block or with two numbered and lettered Euro style 10-pole terminal blocks. Number of terminal blocks are dependent on the switch model and switch configuration. All switches are pre-wired into the terminal block. Several features have been designed to help ease field wiring:

- Terminal blocks are angled towards the cover opening.
- Wiring diagram is attached to the inside of cover.
- Two conduit openings are provided.

WARNING
<p>Turn off all power and lock out service panel before installing or modifying any electrical wiring.</p>

NOTICE
<ul style="list-style-type: none"> • Do not re-machine the conduit entry threads or create any new holes in the enclosure. • Do not remove the screw-in conduit plugs until it is time to wire into the unit's terminal blocks. • Do not tamper with or modify any exposed O-rings or gaskets. • A minimum of 18 AWG wire is recommended for all field wiring. • The terminals inside the VSM accept wire sizes ranging from 14 to 20 AWG. • The conduit connections must be properly sealed to maintain the weatherproof integrity of the VSM enclosure.

Bray Series 5A and 5B VSMs should be wired as follows:

1. Remove the cover of the VSM.
2. Remove the conduit plug(s).
3. Install appropriate cable or conduit fittings required to meet application needs and VSM weatherproof requirements.
4. Terminate the field wiring per the wiring diagram attached to the inside of the cover.
 - a. Tighten wires in terminal block to 3.5 lb-in [0.4 Nm].
5. Re-attach VSM cover once position adjustment has been completed.
 - a. Tighten cover bolts in a cross pattern to 13-18 lb-in [1.5-2.0 Nm].

NOTICE
<p>Do not use power tools to tighten the cover screws.</p>

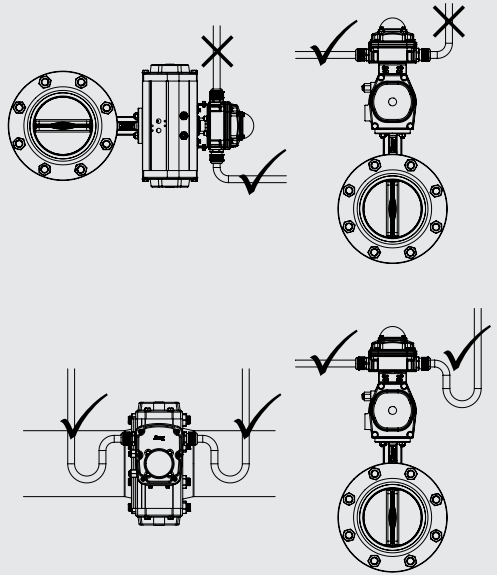
NOTICE

If the valve status monitor is mounted on a vertical pipe, it is recommended that the unit be positioned with the conduit entries on the bottom to prevent condensation from entering through the conduits.

In all cases, the conduit should be positioned to prevent drainage into the valve status monitor. In some cases the use of an "S" pipe can be used to prevent water ingress.

Refer to the figures on the right.

Conduit Entries		
VSM	Imperial	Metric
S5A	2 x 1/2" NPT	2 x M20
S5B	2 x 3/4" NPT	2 x M25



11. Reversal of Visual Indication

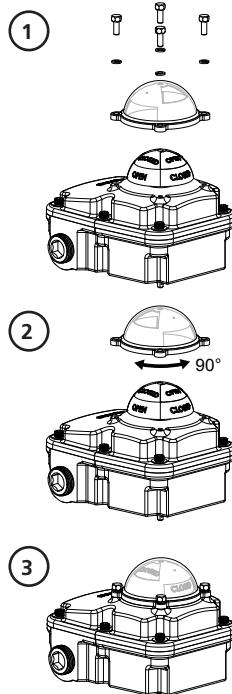
Visual indication can be reversed per application requirements without the need to re-mount the VSM. This may also be appropriate if the standard orientation of the VSM is not convenient for the application such as field wiring entry direction do not align with conduit entries.

NOTICE

Ensure that open and close cams are properly set after any modification to visual indication.

Bray Series 5A and 5B VSM visual indication can be reversed as follows:

1. Remove all four Indicator dome bolts with lock washers.
2. Rotate the indicator dome 90° in either direction.
3. Remount the indicator dome bolts with lock washers.
 - a. Tighten bolts in a cross pattern to 13-18 lb-in [1.5-2 Nm].
 - b. Ensure that o-ring is secure in indicator dome and is not pinched when dome is re-installed.



12. Position Adjustment

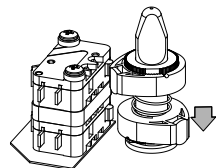
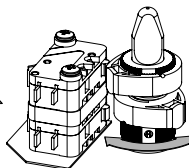
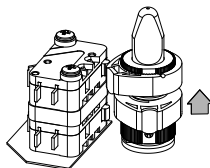
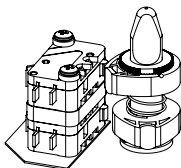
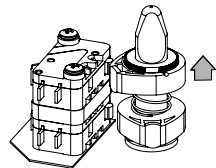
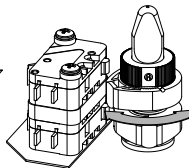
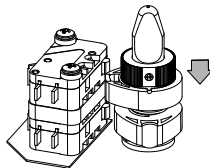
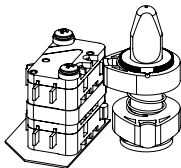
A single lobed or doubled lobed cam is provided for every independent/main switch. Double lobed cams are provided in the S5B when the switch configuration could include an auxiliary switch. Double lobed cams will activate both main and auxiliary switches at the same time.

Cams are mounted to the indicator shaft, alternating between red and yellow and are independently adjustable by hand in 3.6° increments. No special tools are needed for this adjustment. The self-locking design ensures that cams will not slip position.

The bottom red cam is intended to indicate the close position while the bottom yellow cam is intended to indicate the open position. Both of the switches associated with these cams are labeled accordingly. An additional red and yellow cam may be installed in the S5B and can be used for mid-travel position indication or to provide an additional auxiliary open and close indication. Mid-travel switches are unlabeled.

Closed Travel Indication Adjustment

1. Operate the quarter turn device until it reaches the desired closed position.
2. Pull the bottom red close cam upwards towards the yellow cam to disengage the cam from the fixed cam holder.
3. While the cam is disengaged, rotate the cam to the position that will activate the close switch.
 - a. NOTE: Do not attempt to adjust cams prior to disengaging the cam from the fixed cam holder.
4. Release the cam and allow the locking spring to re-engage the cam with the fixed cam holder.



Open Travel Indication Adjustment

1. Operate the quarter turn device until it reaches the desired open position.
2. Push the bottom yellow open cam towards the bottom red cam to disengage the cam from the fixed cam holder.
3. While the cam is disengaged, rotate the cam to the position that will activate the open switch.
 - a. NOTE: Do not attempt to adjust cams prior to disengaging the cam from the fixed cam holder.
4. Release the cam and allow the locking spring to re-engage the cam with the fixed cam holder.

Mid-Travel Indication Adjustment

1. Operate the quarter turn device until it reaches the desired mid-travel position.
2. Disengage the cam from the cam holder.
 - a. NOTE: Mid-travel cams are disengaged similarly to the open and close cams.
3. While the cam is disengaged, rotate the cam to the position that will activate the mid-travel switch.
 - a. NOTE: Do not attempt to adjust cams prior to disengaging the cam from the fixed cam holder.
4. Release the cam and allow the locking spring to re-engage the cam with the fixed cam holder.

NOTICE

Test unit for proper switch activation prior to commissioning VSM into service.

13. Switch Ratings and Certifications

Most Bray Series 5A and 5B VSMs hold cULus certification under UL file E152613. See lists below for switch ratings and approval status.

Mechanical Switches

Mechanical Switches	SPDT	SPDT Low Power	DPDT-DB
Switch Option	A	B	S
Switch Ratings	10A, 250V ac 1/2 HP, 250V ac 0.25A, 250V dc 0.5A, 125V dc	0.1A, 125V ac 0.1A, 30V dc 1mA, 4V ac/dc min	10A, 250V ac 3/4 HP, 250V ac 10A, 28V dc Res. 7A, 28V dc Ind.
Max Number of Switches – 5A	2	2	N/A
Max Number of Switches – 5B	6	6	2
Approvals	cULus	cULus	cULus

3-Wire DC Inductive Proximity Switches

3-Wire DC Proximity Switches	PNP N.O.	PNP N.C.	NPN N.O.	NPN N.C.
Switch Option	C	E	D	R
Power Supply	Class 2	Class 2	Class 2	Class 2
Operating Voltage	10-30V dc	10-30V dc	10-30V dc	10-30V dc
Load Current	≤ 100 mA	≤ 100 mA	≤ 100 mA	≤ 100 mA
Current Consumption	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA
Leakage Current	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA
Voltage Drop	≤ 3V	≤ 3V	≤ 3V	≤ 3V
Max Number of Switches – 5A	2	2	2	2
Max Number of Switches – 5B	6	6	6	6
Approvals	cULus	cULus	cULus	N/A

2-Wire Inductive Proximity Switches

2-Wire Proximity Switches	140V N.O.	250V N.O.
Switch Option	F	G
Operating Voltage	20-140V ac 10-140V dc	20-250V ac 10-300V dc
Load Current	5-200 mA	≤ 100 mA
Leakage Current	≤ 0.8 mA	≤ 1.7 mA
Voltage Drop	≤ 7V	≤ 6V
Max Number of Switches – 5A	2	2
Max Number of Switches – 5B	6	6
Approvals	cULus	N/A

Reed Switches

Reed Switches	SPDT
Switch Option	J
Switch Ratings	0.8A, 120V ac 3A, 28V dc
Max Power	100W
Max Number of Switches – 5A	N/A
Max Number of Switches – 5B	2
Approval	N/A

14. Mounting Kits

Bracket Type	NAMUR Pattern	Actuator Series	Actuator Size	VSM / Actuator	Std. Part No.
Single Piece	30 x 80	92 / 93	063 - 128	Imperial / Imperial	5B0000-22600534
				Metric / Metric	5B0000-22650534
		98	All	Imperial / Metric	5B0000-22630534
				Metric / Metric	5B0000-22650534
Adjustable	30 x 80 or 30 x 130	92 / 93	063 - 210	Imperial / Imperial	5B0000-22601534
			063 - 255	Metric / Metric	5B0000-22651534
			255	Imperial / Metric	5B0000-22631534
		98	All	Imperial / Metric	5B0000-22631534
				Metric / Metric	5B0000-22651534

15. Basic Tools

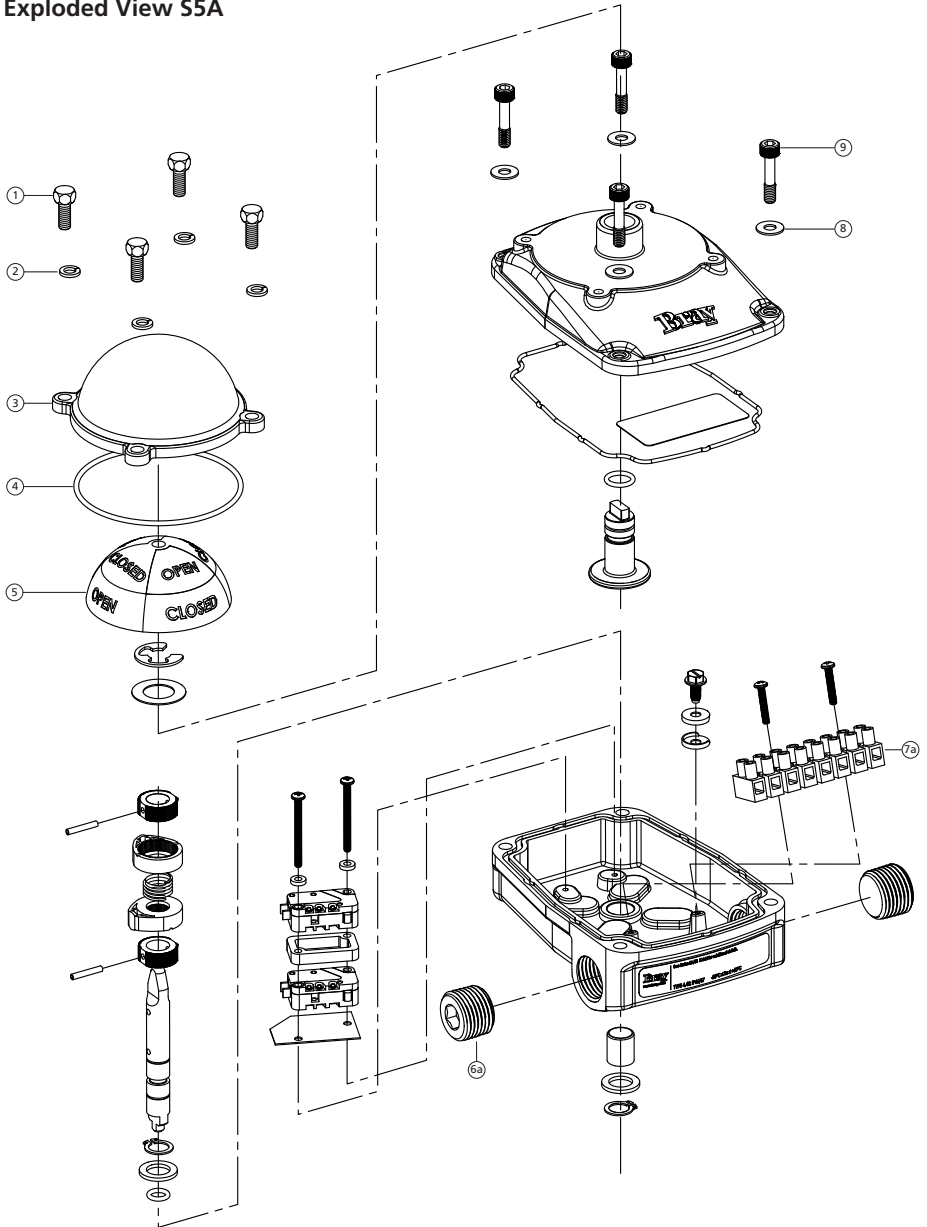
Common To All Units	
Terminal Connections	Screwdriver, ¼" tip flat blade
All switches, terminal strip	Screwdriver, No. 1 Phillips
Ground screw	Screwdriver, No. 2 Phillips
Imperial Style Housing	
Indicator Dome	Wrench, 5/16"
Cover Bolt, Imperial	Hex Key, 5/32"
S5A Conduit Entry – ½" NPT	Hex Key, 3/8"
S5B Conduit Entry – ¾" NPT	Hex Key, 9/16"
Mounting Bracket Bolts	Wrench, 5/16" & 7/16"
Metric Style Housing	
Indicator Dome	Wrench, 8mm
Cover Bolt, Metric	Hex Key, 4mm
S5A Conduit Entry – M20	Screwdriver, No. 3 Phillips
S5B Conduit Entry – M25	Screwdriver, No. 3 Phillips
Mounting Bracket Bolts	Wrench, 8mm & 10mm

16. Troubleshooting Chart

Problem	Possible Cause	Solutions
Signal is not received	Wiring is not connected inside VSM	Rewire field wiring and check applied torque to terminal block
	Cams are set outside of actuator range	Adjust cam position
	Damage to switches	Check power ratings of switches versus application
Open signal is received in close position (or vice versa)	Field wiring is reversed	Rewire field wiring
Corrosion inside unit	Condensation forming	Seal conduit opening
	Water ingress	Check all seals and possible water entry through conduit
Visual indication is opposite of actuator position	Visual indication was reversed or VSM was mounted 90°	Reverse visual indication or remount VSM.
VSM does not rotate	Bracket or adapter does not mate properly with actuator.	Check bracket and adapter for proper fit and adjust as needed.
	Actuator is not moving as commanded	Check troubleshooting chart in actuator IOM. Check field wiring.

17. Exploded Views

Exploded View S5A



Exploded View - S5B

