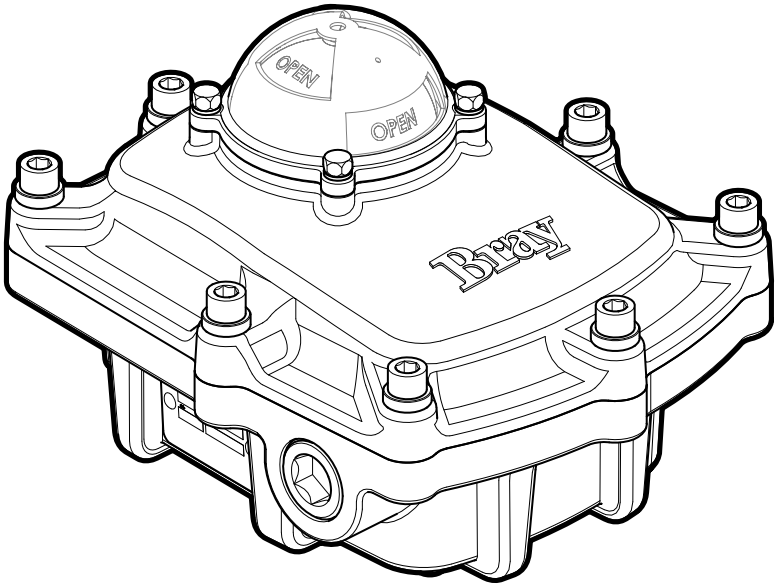
SERIES 5C

VALVE STATUS MONITOR

Installation, Operation and Maintenance Manual



Bray®

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READ AND FOLLOW THESE INSTRUCTIONS CAREFULLY.
SAVE THIS MANUAL FOR FUTURE USE.

1.0 DEFINITION OF TERMS

All information within this manual is relevant to the safe operation and proper care of your Bray valve. Please understand the following examples of information used throughout this manual.

SAFETY STATEMENTS: To prevent unwanted consequences. Standard symbols and classifications are:

DANGER
Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.

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, could 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.

2.0 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.

3.0 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.
- In cases where the device is installed in a potentially explosive (hazardous) location - is trained in the commissioning, operation, and maintenance of equipment in hazardous locations.

WARNING
The VSM must only be installed, commissioned, operated and repaired by qualified personnel.
All installation, commissioning, operation and maintenance must be performed under strict observation of all applicable codes, standards and safety regulations.
Reference is specifically made here to observe all applicable safety regulations for electrical equipment installed in potentially explosive (hazardous) locations.

4.0 PART NUMBERING SYSTEM REFERENCE CHART

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

5X – Designates Housing Size

5C	Type 4, 4x; IP66/67/68 (1 meter for 1 hour); 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
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
M	DeviceNet CommPro
N	AS-i CommPro
P	PROFIBUS-DP CommPro
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)

NOTE: Switch configurations 3, 5, and 6 are not available for CommPro units (M, N, and P)

5.0 INTRODUCTION

The Bray Series 5C Valve Status Monitor (VSM) provides visual and electrical indication of position of any VDI/VDE 3845 compliant quarter-turn device. The S5C VSM is designed to operate in multiple hazardous locations.

6.0 PRINCIPLE OF OPERATION

Bray Series 5C VSMs are comprised of a hazardous location housing with NEMA Type 4, 4x and IP 66/67/68 (1 meter for 1 hour) ratings, external position indicator, three conduit entries, cam shaft with self-locking cams, elevated terminal block(s), internal grounding screw, ATEX/IECEx required external grounding screw, and mounting bracket.

The VSM is coupled to the quarter turn device via the cam shaft. Rotation of the cam shaft, in turn, drives switch activation. 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.

7.0 HAZARDOUS LOCATIONS

The S5C VSM is designed and certified to operate in the following hazardous locations:

<table>
<tr><td rowspan="3">NEC 500</td><td>Class I Division 1
Groups A, B, C & D T6</td><td rowspan="3">E202292</td></tr>
<tr><td>Class I Division 1
Groups B, C & D T6 (cUL only)</td></tr>
<tr><td>Class II Division 1
Groups E, F, G T85°C</td></tr>
<tr><td>ATEX</td><td rowspan="2">II 2 G Ex db IIB + H2 T6 Gb
II 2 D Ex tb IIIC T85°C Db
IP66/67/68</td><td>DEMKO 18ATEX1951X</td></tr>
<tr><td>IECEx</td><td>IECEx UL 18.0075X</td></tr>
</table>

8.0 PRE-INSTALLATION STORAGE

Bray Series 5C VSMs are not weatherproof until the unit is properly installed, or all conduits and applicable port connections are sealed off and prepared for storage. The units may be shipped with temporary covers to prevent foreign matter from entering through the conduit openings; however, the user is responsible for replacing with the proper sealing plugs to support its NEMA/IP ratings.

To prevent condensation from forming inside the unit, maintain a near constant external temperature and store indoors in a well ventilated, clean, dry room. The temperature shall be between 40°F (4°C) and 85°F (29°C), with a relative humidity less than 70%. Store units away from vibration and direct sunlight exposure, and place units on a shelf or wooden pallet in order to protect against dampness. Keep units covered to protect against dust and dirt; if storing for long term, placing the unit inside a plastic sealed bag may be preferred.

Bray cannot accept responsibility for deterioration caused on-site once the cover is removed or due to improper storage.

NOTICE

Units are shipped with three 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

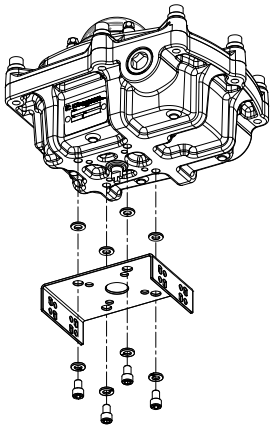
9.0 MOUNTING

All Bray Series 5C 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.

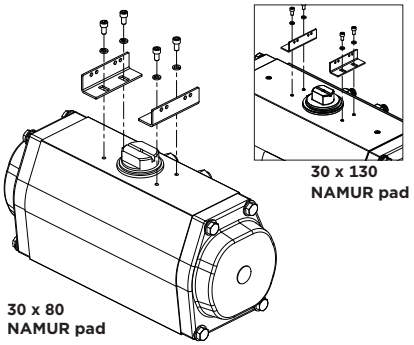
9.1 Adjustable Bracket

Bray's 3 piece adjustable bracket is designed to mount on both NAMUR 30 x 80 and 30 x 130 pads. 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 lb-in [8 N-m]
   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 lb-in [5 N-m]

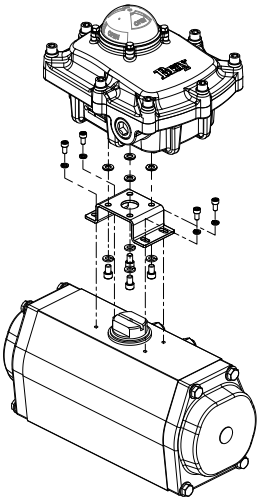


8. Attach coupler or adapter if provided.
9. Adjust the VSM cam shaft to align with the actuator shaft or coupler.
10. Connect the mounting bracket top plate to both bracket feet using bolts.
    a. Adjust height of the bracket by choosing mounting hole.
    b. Tighten bolts to 44.3 lb-in [5 N-m]

9.2 Fixed Bracket

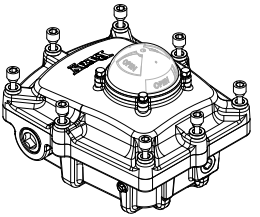
Bray's single piece bracket is used for NAMUR pad 30 x 80. Installation is as follows:

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 lb-in [8 N-m]
   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 lb-in [5 N-m].



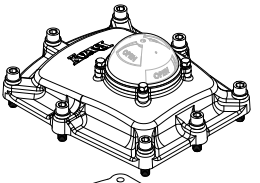
10.0 ACCESSING INTERNAL COMPONENTS

Access to the S5C internals is done by removing the cover from the unit. The steps for removal are as follows.

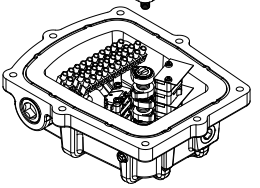


WARNING
To reduce the risk of ignition of hazardous atmospheres, disconnect the equipment from the supply circuit before opening.

10.1 Cover Removal

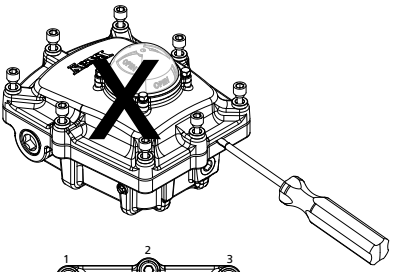


1. Loosen captive cover bolts. The S5C contains 8 bolts located around the perimeter of the unit.
2. Pull the cover up and away from unit. **Do not** use a wedge device to remove cover.
3. Perform internal adjustment. Reference position adjustment section.



WARNING
Rework of flamepaths is not permitted

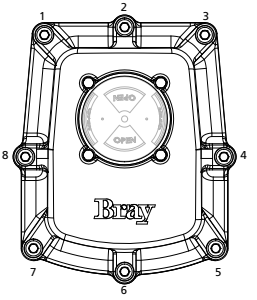
10.2 Cover Installation



WARNING
Cover joints must be cleaned before replacing the cover.

To reduce the risk of ignition, the cover must be kept tightly closed.

Substitution of Bray supplied S5C cover mounting bolts and washers is not permitted.



1. Ensure 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 80 lb-in [9.0 N-m] in a cross pattern.
   a. 1, 5, 7, 3, 2, 6, 4, 8

11.0 FIELD WIRING

Bray Series 5C VSMs may be assembled with either a 12-pole terminal block with numbered terminal strip marker 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.
> Three conduit openings are available.

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

Observe all applicable safety regulations for electrical equipment installed in potentially explosive (hazardous) locations.

NOTICE
> 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 5C VSMs should be wired as follows:

1. Remove the cover of the VSM.
2. Remove the factory installed conduit plugs.

WARNING
When a conduit is not used, replace the factory installed conduit plug with a plug which has appropriate hazardous location certifications.

3. Install appropriate cable or conduit fittings required to meet application needs, weatherproof requirements and hazardous location requirements.

WARNING
For NEC 500 hazardous locations:
To reduce the risk of ignition of hazardous atmospheres, conduit runs must have a sealing fitting connected within 18" of the enclosure.

For IECEx and ATEX hazardous locations:
To reduce the risk of ignition of hazardous atmospheres, conduit runs must have a sealing fitting connected within 20mm of the enclosure

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 N-m].

NOTICE
External ground screw may only be used in ATEX and IECEx hazardous locations.

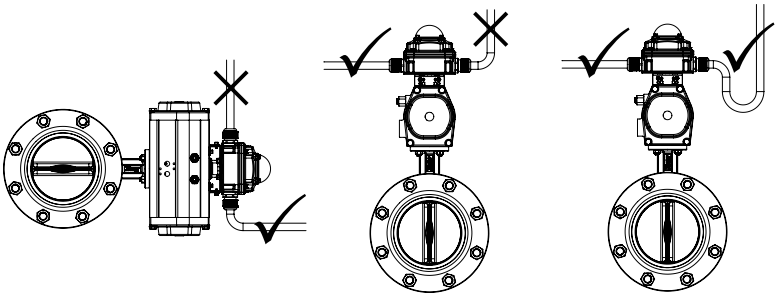
5. Re-attach the VSM cover once position adjustment has been completed.
   a. Tighten cover bolts in a cross pattern to 80 lb-in [9.0 N-m].

NOTICE
Do not use power tools to tighten the cover screws.

See CommPro IOM for details of CommPro field wiring.

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 below.



12.0 REVERSAL OF VISUAL INDICATION

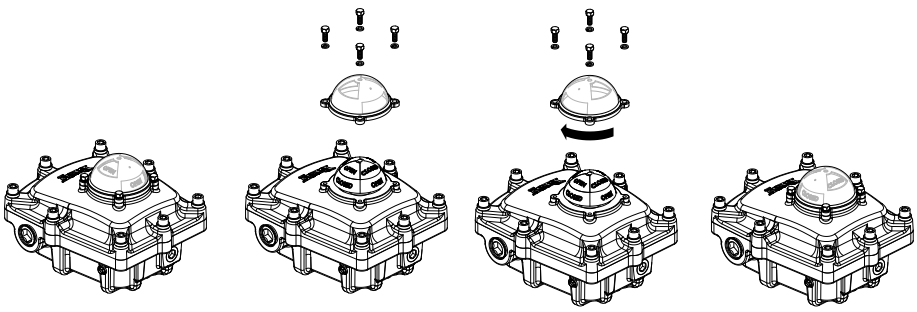
Visual indication can be reversed per application requirements without the need to re-mount the VSM. This may also be appropriate if the standard orientation of the VSM is not convenient for the application such as field wiring entry direction do not align with conduit entries.

WARNING
Observe all applicable safety regulations for electrical equipment installed in potentially explosive (hazardous) locations when making modifications to the assembly.

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

Bray Series 5C 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 N-m].
   b. Ensure that o-ring is secure in indicator dome and is not pinched when dome is re-installed.



13.0 POSITION ADJUSTMENT

A single or doubled lobed cam is provided for every independent/main switch. Double lobed cams are provided 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 for most switches and can be used for mid-travel position indication or to provide an additional auxiliary open and close indication. Mid-travel switches are unlabeled.

13.1 Closed Travel Indication Adjustment

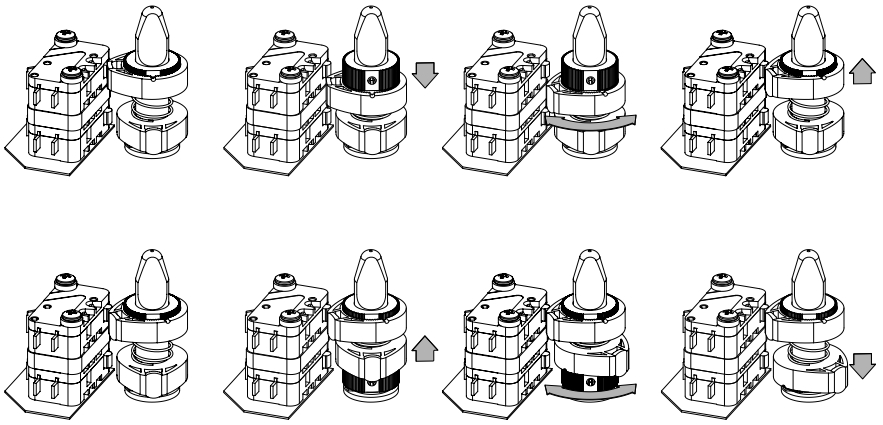
1. Operate the quarter turn device until it reaches the desired closed position.
2. Pull the bottom red close cam upwards towards the yellow cam to disengage the cam from the fixed cam holder.
3. While the cam is disengaged, rotate the cam to the position that will activate the close switch.
    a. NOTE: 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.

13.2 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.

13.3 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.

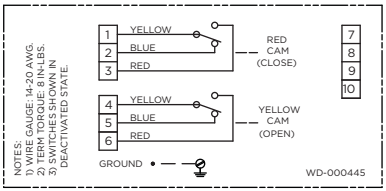


14.0 SWITCH RATINGS

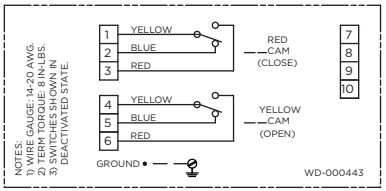
14.1 Mechanical Switches

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	6	6	2

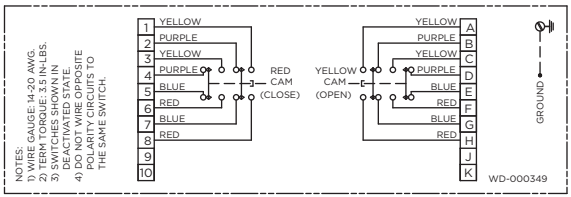
5C - Option A - (2) SPDT Mechanical Switches



5C - Option B - (2) SPDT Low Power Mechanical Switches



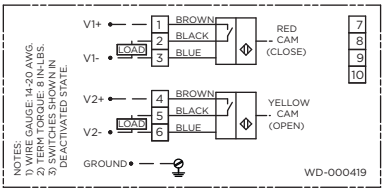
5C - Option S - (2) DPDT Mechanical Switches



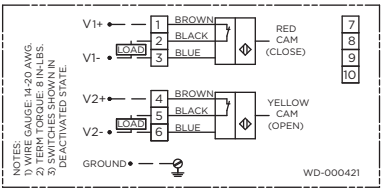
14.2 3-Wire DC Inductive Proximity Switches

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

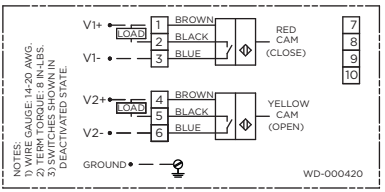
5C - Option C - (2) PNP N.O
3-wire Switches



5C - Option E - (2) PNP N.C
3-wire Switches



5C - Option D - (2) NPN N.O
3-wire Switches



14.3 CommPro

CommPro	DeviceNet	AS-i	PROFIBUS
CommPro Power	DeviceNet BUS: 16W, 24VDC nom. (11-25VDC)	AS-i BUS: 300mA max, 30VDC nom. (29.5-31.6VDC)	CUSTOMER SUPPLIED: 16W, 24V +/- 10%
Aux Power	CUSTOMER SUPPLIED 16W, 24V +/- 10%		
Load	6.9W max/channel, 24V		

15.0 BASIC TOOLS

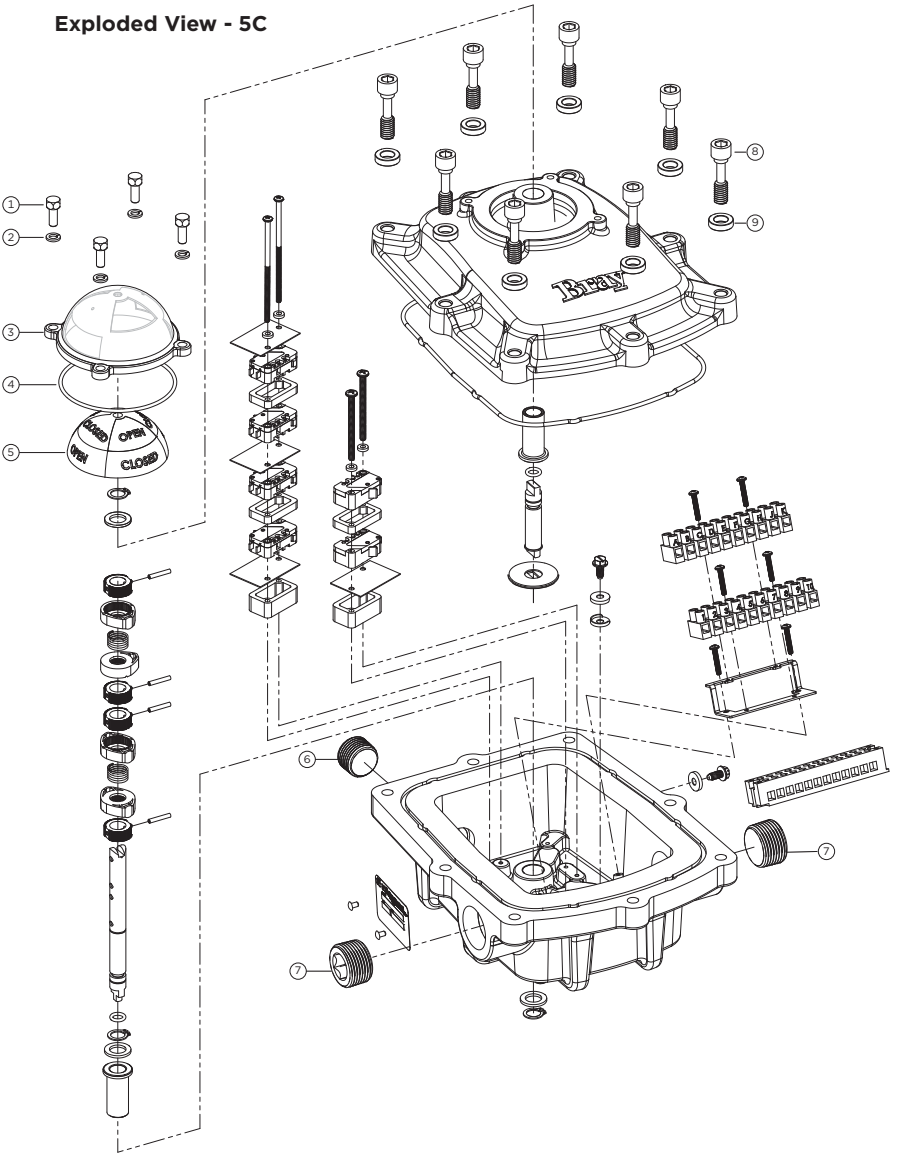
Common To All Units	
Terminal Connections	Screwdriver, ¼" tip flat blade
All switches, terminal strip	Screwdriver, No. 1 Phillips
Indicator Dome	Wrench, 8mm
Cover Bolt	Hex Key, 6mm
Ground screw	Screwdriver, No. 2 Phillips
Imperial Style Housing	
S5C Conduit Entry – ½" NPT	Hex Key, 3/8"
S5C Side Conduit Entries – ¾" NPT	Hex Key, 9/16"
Mounting Bracket Bolts	Wrench, 5/16" & 7/16"
Metric Style Housing	
S5C Rear Conduit Entry – M20	Screwdriver, No. 3 Phillips
S5C Side Conduit Entries – M25	Screwdriver, No. 3 Phillips
Mounting Bracket Bolts	Wrench, 8mm & 10mm

16.0 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 leaking in	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.

17.0 EXPLODED VIEWS

Exploded View - 5C



Replacement Parts		
No.	**Description**	**Part**
1.	Dome Bolts	Indicator Kit, RED/YEL 5A0000-25350536 Indicator Kit, RED/GRN 5A0000-25351536 Indicator Kit, YEL/BLK 5A0000-25352536
2.	Dome Washer	
3.	Dome Assembly	
4.	Dome Gasket	
5.	Indicator Assembly	
6.	1/2″ or M20 Conduit Plug	See below for replacement conduit plugs with certifications
7.	3/4″ or M25 Conduit Plugs	
8.	Cover Bolt	5C0000-22901536
9.	Cover Washer	

Explosion-Proof Conduit Plugs	
Certification	**Part**
II 2 GD Ex db IIC Gb Ex tb IIIC Db Class I, Div. I Groups A, B, C, D Class II, Div. I Groups E, F, G	M20: 09M020-74331525 M25: 09M025-74332525
Class I, Div. I Groups A, B, C, D Class II, Div. I Groups E, F, G	3/4″ NPT: 091200-74305525 1/2″ NPT: 090800-74305533

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