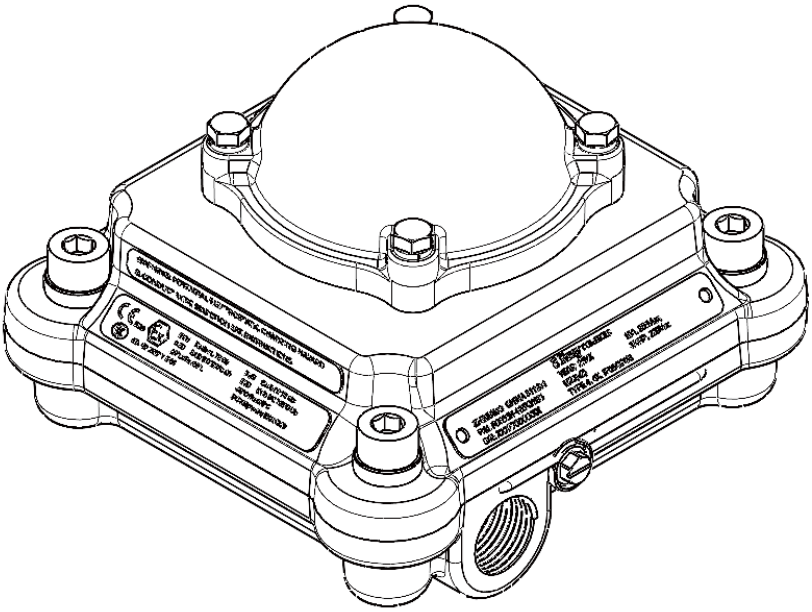
SERIES 5CS

VALVE STATUS MONITOR

Installation, Operation and Maintenance Manual



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

1.0 INTRODUCTION

The Bray Series 5CS Valve Status Monitor (VSM) provides visual and electrical indication of position of any VDI/VDE 3845 compliant quarter-turn device. The S5CS VSM is designed to operate in multiple hazardous locations.

2.0 PRINCIPLE OF OPERATION

Bray Series 5CS VSMs are comprised of a hazardous location housing with NEMA Type 4, 4x and IP 66/67/68 (1 meter for 2 hour) ratings, external position indicator, two 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.

3.0 TECHINICAL DATA

Aluminum Switchbox, Standard			
Enclosure	Die cast aluminum. Coating rated for excellent weatherability.		
Shaft	Standard		NAMUR VDI/VDE 3845 Material: 304 Stainless steels.
Conduit	External accessories	Metal Metric:	(2) M20
		Metal Imperial:	(2) 1/2" NPT
O-ring	Elastomer rated for operating temperature		
Switch Options	2-Switch		2-switch + CPT
	4-Switch		
Certification	Global Certification (ATEX, CCC, IECEX)		
Enclosure Standard	IP67/IP68 [1 meter for 120 mins]		

Visual Indicator	Bray dome indicator: Polycarbonate	Type: Transparent
	Indicator Colors	Standard: Red (closed), Yellow (open),
		Optional: Black (closed), Yellow (open), Black/Yellow (Text) Red (closed), Green(open), Black(text) Yellow (closed), Black (open), Black/Yellow(text) Green(closed), Red(open), Black/Yellow(text)
	Text	Standard: English
Temperature rating	Ambient	-29°C to 58°C -29°C to 65°C
	Optional	-40°C to 65°C
Hardware	Captive socket head 316 series screw	
Mounting Pattern	Pattern 1: ISO 5211 - F05	
Terminal	Standard	8-point terminal

4.0 DETAILS OF CERTIFICATION:

IECEx, ATEX , CCC	
Ex db IIC T6 Gb/ Ex tb IIC T85°C Db	-29°C to 58°C
Ex db IIC T5 Gb/ Ex tb IIC T95°C Db	-29°C to 65°C
IEC	EN60079-0 EN60079-1 EN60079/31
GB	GB/T3836-1 GB/T3836-2

5.0 PART NUMBERING SYSTEM REFERENCE CHART

5CS	0	0	0	0	126	A	2	536	Blank	Blank
I	II	III	IV	V	VI	VII	VIII	IX	X	XI

I - Series
5CS – 5CS Series

II - Pilot Valve
0 – Standard, no pilot valve

III - Solenoid
0 – Standard, no solenoid

IV - Valve/Solenoid Options
0 – Standard, no pilot valve or solenoid

V - Housing

0 – Imperial
5 – Metric

VI - Valve Status Monitor Assembly

126 – Standard

VII - Switch

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 – 140 V 2-wire switch
G – 250 V 2-wire switch
H – NAMUR intrinsically Safe Switches
J – SPDT Reed switch
K – SPDT Reed switch lower power
R – NPN N.C. 3-wire switch

VIII – Switch Configuration

2 – 2 switches
4 – 4 switches (2 independent and 2 auxiliary)

IX – Housing Trim

536 –polyester on aluminum housing
5F5 – Nylon on aluminum housing

X - Language

Blank – Default: English
/E – English
/G – German
/C – Chinese
/F – French
/S – Spanish

XI - Indicator Color

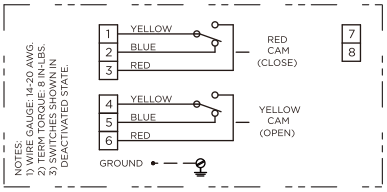
Blank – Default: Red = Close; Yellow = Open
1 – Red = Close; Yellow = Open
2 – Red = Close; Green = Open
3 – Black = Close; Yellow = Open

6.0 SWUTCH RATINGS

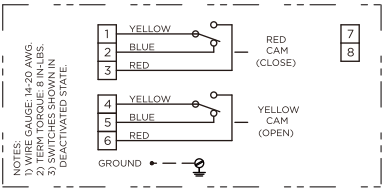
6.1 Mechanical Switches

Mechanical switch	SPDT	SPDT Low Power
Switch Option	A	B
Switch Ratings	10A,250V AC 1/2 HP,250C AC 0.25A,250V DC 0.5A,125V DC	0.1A,125V AC 0.1A,30V DC 1mA,4V AC/DC MIN
Max Number Of Switchs	4	4

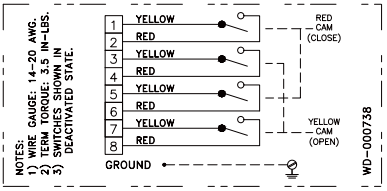
5CS – OPTION A – (2) SPDT Mechanical Switchs



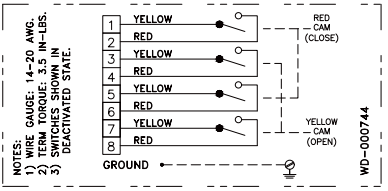
5CS-OPTION B –(2) SPDT Low Power Mechanical Switchs



5CS-OPTION A –(4) SPDT Mechanical Switchs



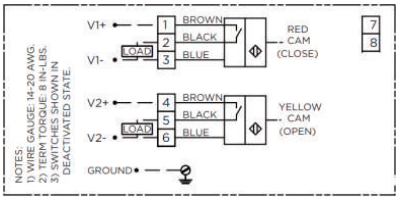
5CS-OPTION B –(4) SPDT Low Power Mechanical Switchs



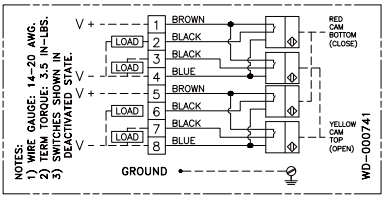
6.2 3-Wire DC Inductive Proximity Switches

3-Wire DC Proximity Switches	PNP NO.	NPN N.O.	PNP N.C.	NPN N.C.
Switch Option	C	D	E	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 Switchs	4	4	4	4

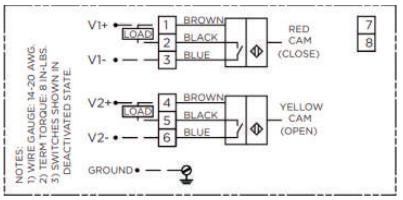
5CS-OPTION C –(2) PNP N.O.
3-wire Switches



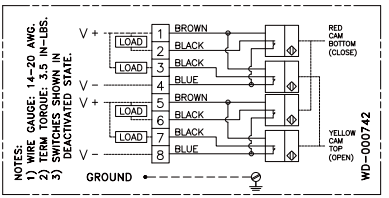
5CS-OPTION C –(4) PNP N.O.
3-wire Switches



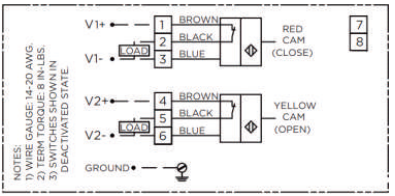
5CS-OPTION D –(2) NPN N.O.
3-wire Switches



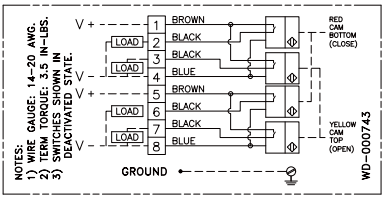
5CS-OPTION D –(4) NPN N.O.
3-wire Switches



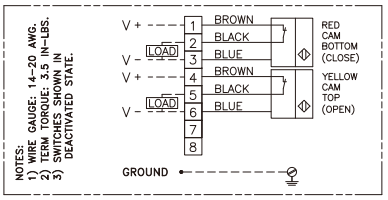
5CS-OPTION E –(2) PNP N.C.
3-wire Switches



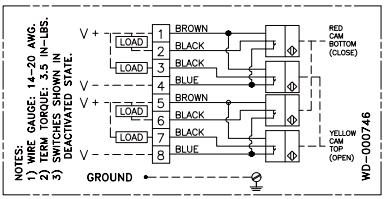
5CS-OPTION E –(4) PNP N.C.
3-wire Switches



5CS-OPTION R –(2) NPN N.C.
3-wire Proximity Switches



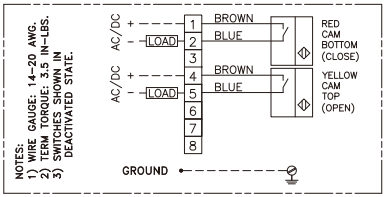
5CS-OPTION R –(4) NPN N.C.
3-wire Proximity Switches



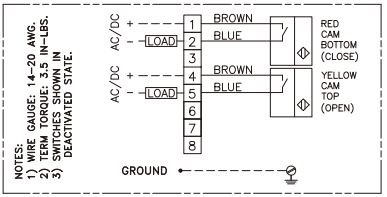
6.3 2-Wire Proximity Switches

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	5-200mA	⩽100mA
Leakage Current	⩽0.8 mA	⩽1.7 mA
Voltage Drop	⩽7V	⩽6V
Max Number Of Switchs	4	4

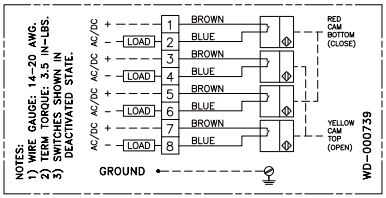
5CS-OPTION F –(2) 140V N.O.
2-wire Proximity Switchs



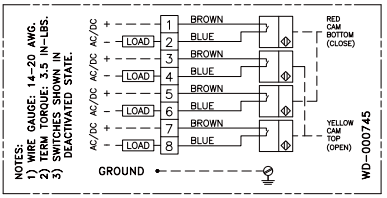
5CS-OPTION G –(2) 250V N.O.
2-wire Proximity Switchs



5CS-OPTION F –(4) 140V N.O.
2-wire Proximity Switchs

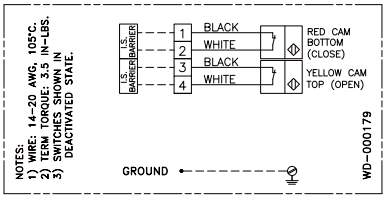


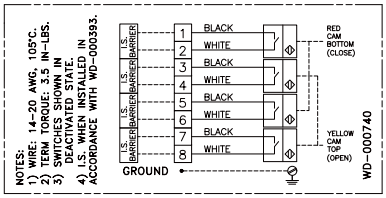
5CS-OPTION G –(4) 250V N.O.
2-wire Proximity Switchs



6.4 NAMUR Intrinsically Safe Switches

I.S. N.C. Proximity Switches	8V N.O.
Switch Option	H
Switch model	NJ2-V3-N
Operating	I.S. BARRIER
Load Current Target Present	5-200mA
Load Current Target Absent	⩽0.8 mA
Max Number Of Switchs	4

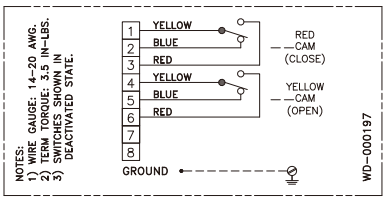




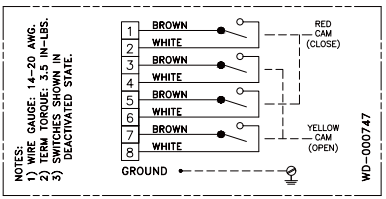
6.5 Reed Switches

Reed Switches	SPDT (lower power)	SPDT
Switch Option	K	J
Switch Ratings	180mA,110V AC 830mA.24V DC	10A,110V AC 10A.250V AC
Max Power	20W	
Max Number of Switches	4	2

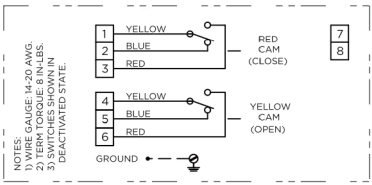
5CS-OPTION K –(2) SPDT
Reed Switchs



5CS-OPTION K –(4) SPDT
Reed Switchs



5CS-OPTION J –(2) SPDT Reed Switchs



7.0 HAZARDOUS LOCATIONS

The construction requirements for Ex db IIC Gb and Ex tb IIIC Db IP66/67 requirements can be found in Clauses 6-23 of IEC/EN 60079-0, Clauses 5-13 of IEC/EN 60079-1, and Clause 5 of IEC/EN 60079-31.

Please note that the temperature portion of IEC/EN 60079-0 is not addressed as a construction clause, however it is addressed as part of the test plan and the marking requirements. The temperature requirements can be found in Clause 5 of IEC/EN 60079-0. Additionally, since the target gas group is IIC, the construction requirements from Group IIC will be used to determine compliance. The performance requirements of Group IIC will be applied.

8.0 SAMPLES PROVIDED

Switch assembly, model 5CS0005-126A4536, shown below:

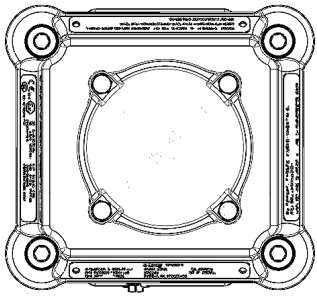
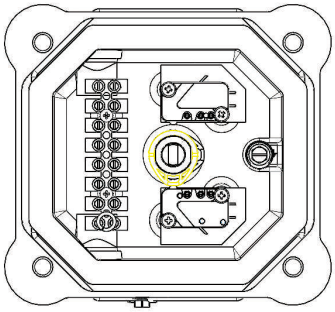
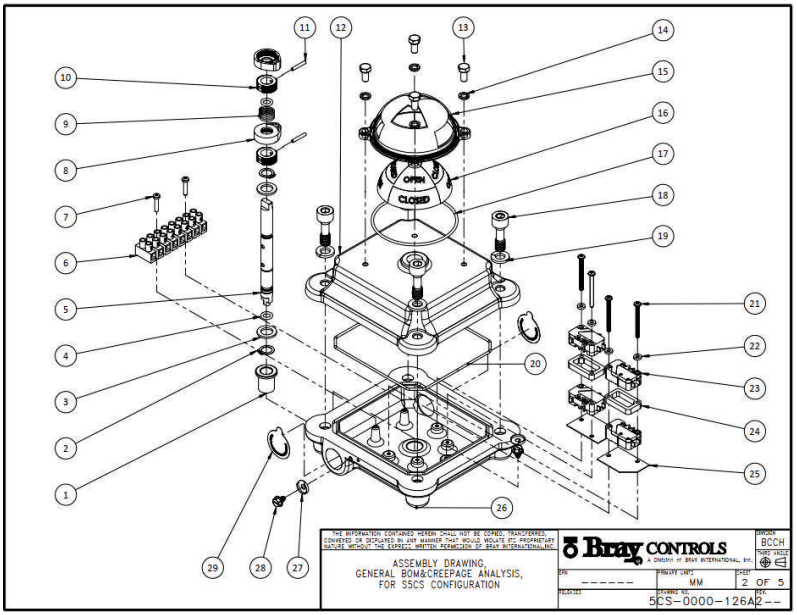


Fig. 1: Switch AssemblyFig.



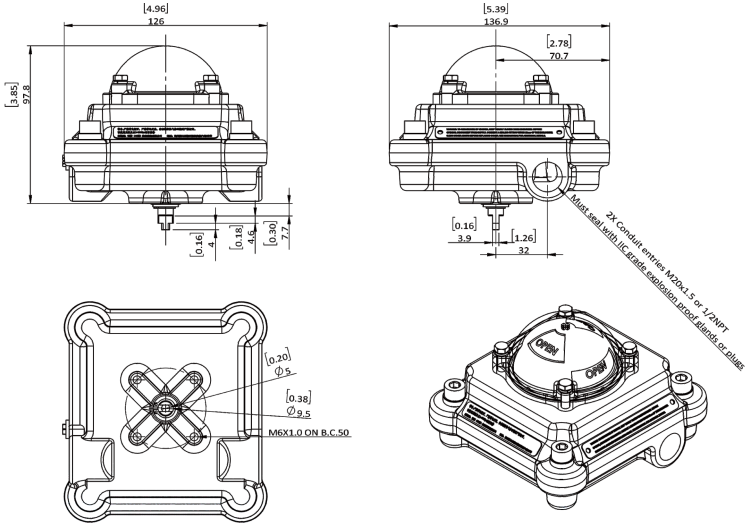
2: Mounted Internal Components

9.0 EXPLODED VIEWS



Item No	Description	Item No	Description
1	SHAFT BUSH	16	INDICATOR ROTOR
2	RETAIN RING	17	O-RING
3	WASHER	18	CAPTIVE BOLT
4	O-RING	19	THICK WASHER
5	INDICATOR SHAFT	20	O-RING
6	TERMINAL	21	PANHEAD SCREW
7	PANHEAD SCREW	22	INSULATION WASHER
8	CAM	23	SWITCH
9	SPRING	24	SPACER
10	CAM POSITIONER	25	INSULATION SHEET
11	PIN	26	BASE
12	COVER	27	GROUND WASHER
13	HEX HEAD BOLT	28	GROUND BOLT
14	LOCK WASHER	29	LABLE
15	INDICATOR DOME		

10.0 DIMENSIONS



11.0 MOUNTING

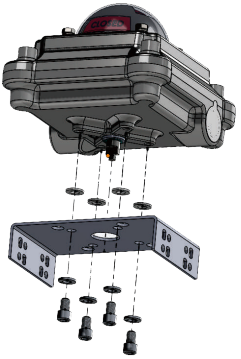
All Bray Series 5CS VSMs are suitable for mounting to VDI/VDE 3845 compliant quarter-turn devices using standard mounting hardware. With proper mounting hardware, VSMs can be installed onto other quarter-turn devices. Mounting instructions may vary when using alternative mounting hardware.

11.1 ADJUSTABLE BRACKET

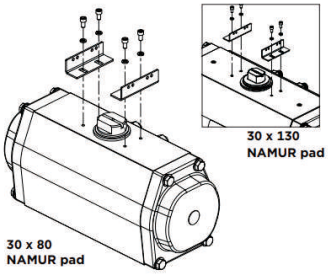
Bray's 3 piece adjustable bracket is designed to mount on both NAMUR 30 x 80 and 30 x 130 pads. Installation is as follows:

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]



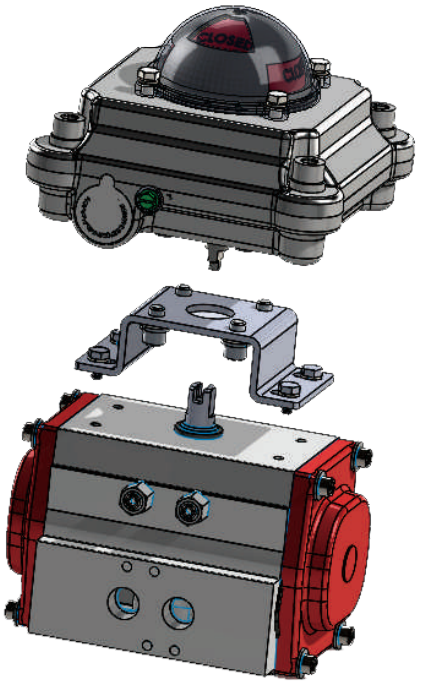
8. Attach coupler or adapter if provided.
9. Adjust the VSM cam shaft to align with the actuator shaft or coupler.
10. Connect the mounting bracket top plate to both bracket feet using bolts.
    a. Adjust height of the bracket by choosing mounting hole.
    b. Tighten bolts to 44.3 lb-in [5 N-m]



11.2 FIXED BRACKET

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

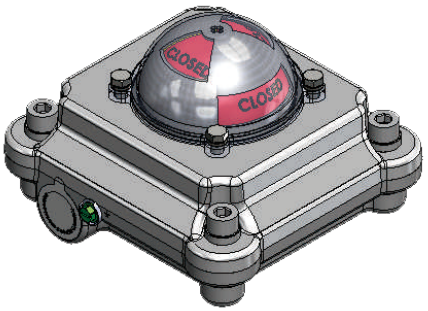
1. Attach mounting bracket and nylon washers to the VSM using mounting bracket bolts.
   a. Tighten mounting bolts in a cross pattern to 70.8 lb-in [8 N-m]
   b. Ensure that the bracket remains aligned with the body of the VSM.
2. Place VSM and bracket assembly on actuator. Ensure VSM shaft engages with 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].



12.0 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.



12.1 Cover Removal

1. Loosen captive cover bolts. The S5C contains 4 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

13.0 POSITION ADJUSTMENT

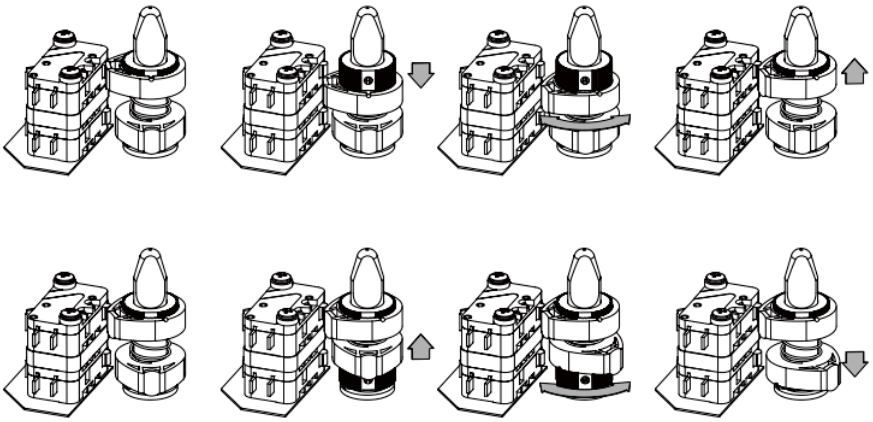
A single or doubled lobed cam is provided for every independent/main switch. Double lobed cams are provided when the switch configuration could include an auxiliary switch. Double lobed cams will activate both main and auxiliary switches at the same time. Cams are mounted to the indicator shaft, alternating 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 yellow cam is intended to indicate the open position. Both of the switches associated with these cams are labeled accordingly.

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 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.s



14.0 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/Ex 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 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

15.0 Field Wiring

Bray Series 5CS VSMs assembled with an 8-pole terminal block with numbered terminal strip marker. All switches are pre-wired into the terminal block.
Several features have been designed to help ease field wiring.
Terminal blocks are rise towards the cover opening.
Wiring diagram is attached to the inside of cover.
Two conduit openings are available.

Use conduct wires with minimum rated temperature of 85°C for T6°C 100°C for T5.

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. electrical equipment installed in potentially explosive (hazardous) locations.

Bray Series 5C VSMs should be wired as follows:

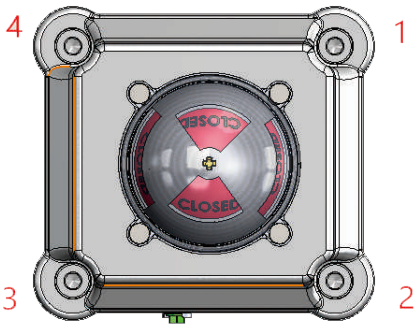
1. Remove the cover of the VSM.
2. Remove the factory installed conduit plugs.
3. Install appropriate cable or conduit fittings required to meet application needs, weatherproof requirements and hazardous location requirements.
4. Terminate the field wiring per the wiring diagram attached to the inside of the cover.
   a. Tighten wires in terminal block to 3.5 lb-in [0.4 N-m].

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

16.0 Cover Installation

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, 3, 2, 4

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 S5CS cover mounting bolts and washers is not permitted.



17.0 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.

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.

WARNING - EXPLOSION HAZARD!
Electrostatic Discharge (ESD) Risk

> This equipment can present an electrostatic ignition risk if not properly installed, operated, and maintained.
> Never clean surfaces with dry or non-conductive cloths or materials, as this can generate significant static charges. Use only approved, conductive cleaning materials and methods.
> Maintain all designated dissipative and conductive surfaces clean and free of non-conductive coatings (e.g., paint, corrosion, contamination) that could isolate them and prevent static charge from draining safely to ground.
> Consult the installation and maintenance manual for specific grounding and bonding requirements before installation or service.

18.0 Specific Conditions of Use

Repair of the flameproof joints may only be made by the manufacturer or on behalf of the manufacturer and on his own responsibility. Contact the manufacturer for the detail dimensions of flameproof joins.
The certified cable gland or blank element, with type of protection Ex db IIC Gb, Ex tb IIC Db, threaded type M20x1.5 or NPT 1/2 and degree of protection IP66. Shall be fitted by the end user. The installation shall conform with EN/IEC 60079-14.

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