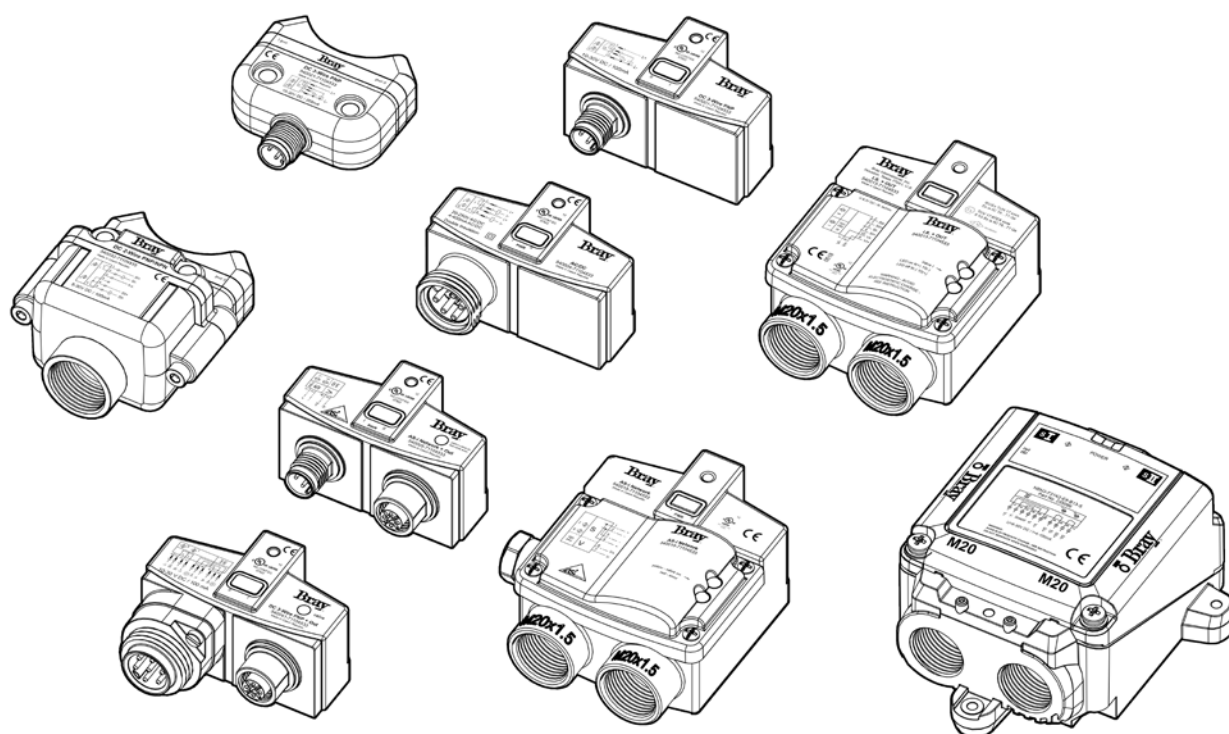


SERIES 54

PROXIMITY SENSORS

Installation, Operation and Maintenance Manual



 **Bray**[®]

BRAY.COM

THE HIGH PERFORMANCE COMPANY

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READ AND FOLLOW THESE INSTRUCTIONS
SAVE THESE INSTRUCTIONS

1.0 · 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.

1.1 · 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 due to rough handling, impact, or improper storage. Do not use abrasive compounds to clean, or scrape its surfaces with any objects.
- Configuration and calibration procedures are described in this document. Proper configuration and calibration is required for the safe operation of this product.
- The control system in which the unit is installed must have proper safeguards to prevent injury to personnel, or damage to equipment, should failure of system components occur.
- This document does not cover every detail about every version of the product described. It cannot take into account every potential occurrence in installation, operation, maintenance and use.
- If situations transpire that are not documented in sufficient detail, please request the required information from the Bray Distributor or Representative responsible for your area.

1.2 · QUALIFIED PERSONNEL

A qualified person in terms of this document is one who is familiar with the installation, commissioning and operation of the product and who has appropriate qualifications, such as:

- Is trained in the operation and maintenance of pneumatic pressure 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 operation, commissioning, and maintenance of equipment in hazardous locations.

2.0 · INTRODUCTION

Note: The following information is intended to assist individuals with the use and support of the Bray Series 54 Proximity Sensors.

The Series 54 Proximity Sensor has been designed to provide valve position indication utilizing various signal types. Each of these configurations will be covered in more detail on the pages that follow.

All Bray Series 54 Proximity Sensors utilize solid state switches. Although the solid state switch performs the same function as a conventional mechanical switch, there are differences in the way solid state switches operate.

NOTICE

It is very important for the user to pay close attention to the exact specifications of their sensor in order to avoid damaging the unit.

Solid state switches have current restrictions imposed by the semi conducting materials used to form the sensor. These current limitations have to be accounted for during setup. Unlike mechanical switches, which can normally handle several amperes of current flowing through them, solid state switches are generally rated for half an ampere or less.

NOTICE

The electrical characteristics of the Series 54 must be compatible with the application

When working with the Series 54, several parameters must be considered. A few of which (with significant importance) are listed here:

- Operating voltage
- Maximum switching current
- Output voltage drop
- Residual current

Using a Series 54 outside of these parameter limits can cause damage to the unit and void factory warranty.

Operating voltage is the amount of voltage necessary for the sensor to operate. The maximum switching current is the largest amount of current that the sensor's solid state electronics can have flowing through them in the on-state (when the target is in proximity of the sensor). During commissioning, it is up to the user to correctly apply the sensor to their control system in order to limit the current flowing through the device. All the necessary information can be found in the technical manual.

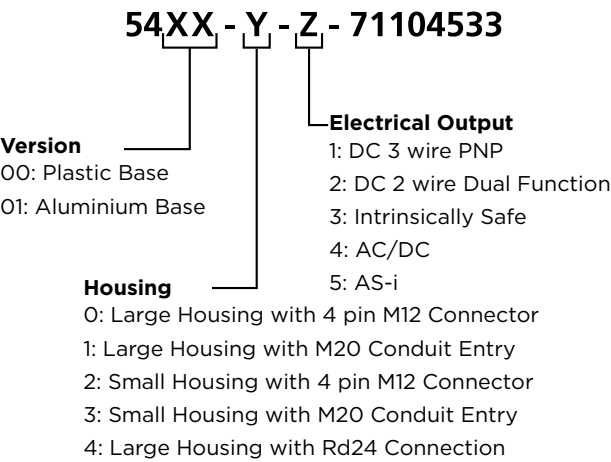
Output voltage drop is defined as the amount of voltage that will drop across the solid state switch. This voltage drop will often vary with the amount of current flowing through the sensor and the load. This drop in voltage becomes paramount when connecting several proximity sensors in series, each unit will have a voltage drop across it – adding each subsequent drop and subtracting from the supply voltage yields the resulting voltage at the end of the series connection. The user needs to ensure that the supply voltage is large enough so that the resulting voltage after all the drops is above the minimum operating voltage of the last Series 54 in the series connection. Sensors located a great distance from the load require consideration as well, as a general rule, every 300 meter (1000 ft.) of wire will have a resistance of 10Ω (see electrical code references for the resistance value of specific wire sizes). It is important for the customer to ensure that the distance between the Series 54 and the control panel is not long enough to cause the voltage drop to fall below the minimum operating voltage of the sensor. Residual current is often referred to as leakage current. In the “off” state (target is NOT in proximity of the sensor) the sensor draws a small amount of current in order to power the device's electronics. This is necessary for the device to sense the target at any point in time when the supply voltage is applied. It is important that this residual current is below the maximum off-state current rating of the control system.

2.1 · PRE-INSTALLED STORAGE

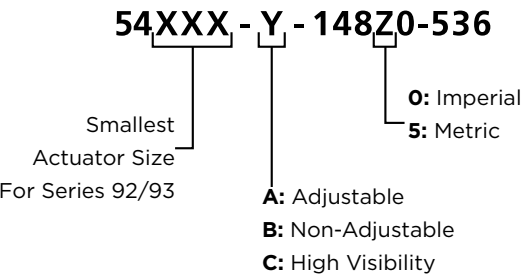
Sensors are not weatherproof unless they are properly installed on the actuator or prepared for storage. Bray cannot accept responsibility for deterioration caused on-site and improper storage.

- Store units on a shelf or wooden pallet in order to protect against floor dampness.
- Cover the unites to protect against dust and dirt.
- To prevent condensation from forming inside the units or the pin connectors, maintain a near constant external temperature and store in a well-ventilated, clean, dry room.

2.2 · SERIES 54 SENSOR PART NUMBERING

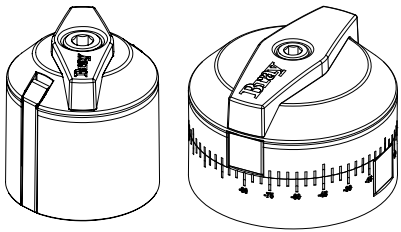


2.3 · ACTIVATOR KIT



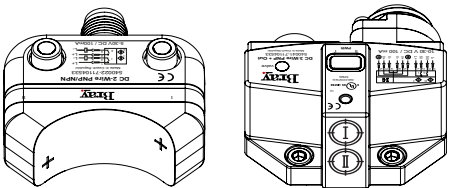
2.4 · SERIES 54 OPERATION OVERVIEW

Bray's inductive sensors use a contactless indication system designed to monitor the position of rotary devices. An activator is mounted on to the actuator center pinion. As the valve is actuated the open and close positions are measured by the rotation of the activator. The activator contains a metal insert that activates the corresponding inductive switch in the sensor. This activation is relayed to the end user to validate valve position.

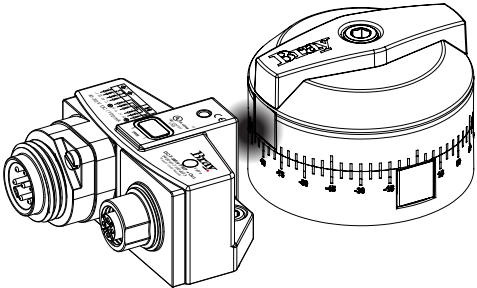
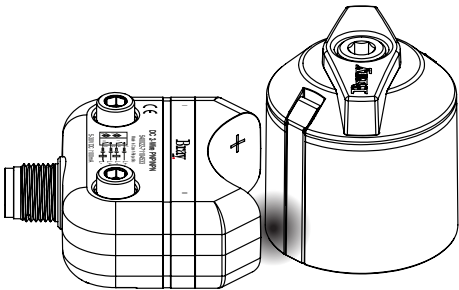


Operations

Bray's Series 54 Sensors contain two proximity switches in a hermetically sealed housing. Location of switches are designated by a "+" or Roman numerals I and II.



Based on the position of the pinion/activator one of the metal inserts on the activator will be directly in front of the switch. When the valve is open, one of the metal inserts is directly in front of the sensor. This signals the end user of an open signal and illuminates the corresponding LED. When the valve is closed the other metal insert activates the second switch. This signals the end user a closed signal and illuminates the second LED. The function of each switch can be selected by the end user. This can be done by adjusting the activator to match the actuator position (see Section 3.2.4) or by configuring the PLC. All activators can be configured to be used for clockwise or counter-clockwise valve operation.



3.0 · ACTIVATOR

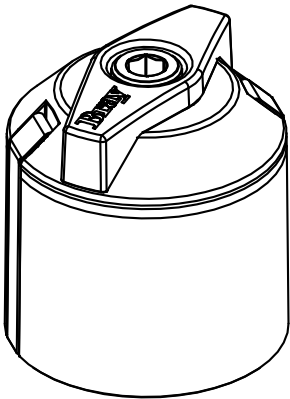
All Series 54 sensors are offered with a dedicated activator. Configurations for installation vary based on the application of the sensor and its mating components.

Fixed Activator

For Sensors PN:	540021-71104533
	540022-71104533
	540032-71104533

Thread Type	Series 92/93 Size	Activator Kit PN
Metric	63 - 93	54063B-14850536
	119 - 255	54119B-14850536
Imperial	63 - 93	54063B-14800536
	119 - 210	54119B-14800536

Note: The Series 98 Scotch Yoke actuator will utilize activator PN 54063B-14850536.

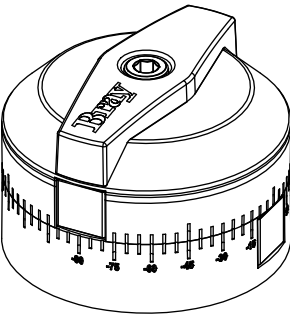


Adjustable Activator

For Sensors PN:	540001-71104533	540013-71104533
	540003-71104533	540015-71104533
	540004-71104533	540041-71104533
	540005-71104533	540043-71104533

Thread Type	Series 92/93 Size	Activator Kit PN
Metric	63 - 128	54063A-14850536
	160 - 255	54160A-14850536
Imperial	63 - 128	54063A-14800536
	119 - 210	54160A-14800536

Note: The Series 98 Scotch Yoke actuator will utilize activator PN 54063A-14850536.

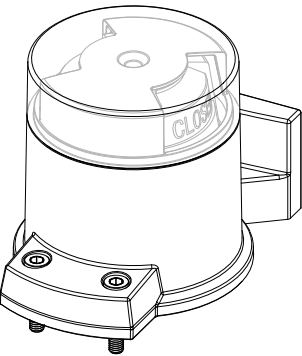


High Visibility Activator

For Sensor PN:	540001-71104533	540013-71104533
	540003-71104533	540015-71104533
	540004-71104533	540041-71104533
	540005-71104533	540043-71104533

Thread Type	Series 92/93 Size	Activator Kit PN
Metric	63 - 128	54063C-14850536
	160 - 255	54160C-14850536
Imperial	63 - 128	54063C-14800536
	160 - 210	54160C-14800536

Note: The Series 98 Scotch Yoke actuator will utilize activator PN 54063C-14850536.



3.1 · SELECTION

Activator and sensor combinations reference the following charts:

3.2 · MOUNTING

Mounting will vary based on the application in which it is used. All activators come with the necessary hardware for sensor and activator mounting. Hardware kits fit multiple actuator sizes, therefore some hardware may be left over after installation.

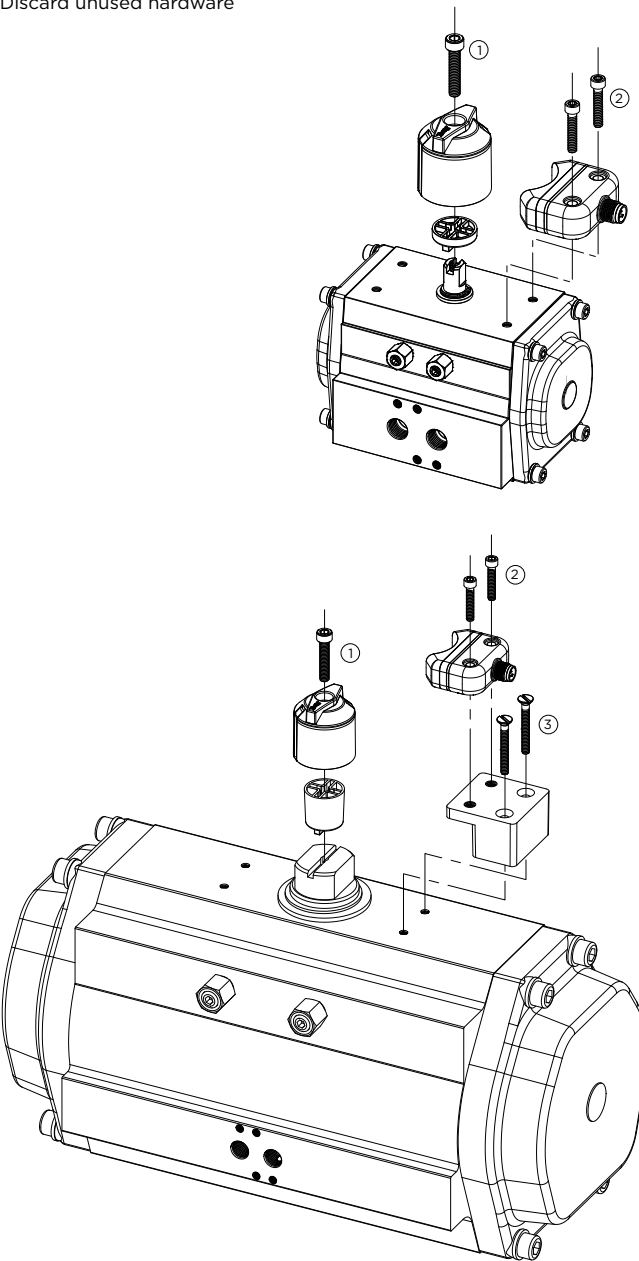
3.2.1 · Fixed Activator - Rack and Pinion Actuator

Size 63 to 93
NAMUR 30x80mm

Kit No. 54063B-14800536			
①	Capscrew	M6	30mm Long
②	Capscrew	#10-32	1" Long

Kit No. 54063B-14850536			
①	Capscrew	M6	30mm Long
②	Capscrew	M5	25mm Long

Discard unused hardware

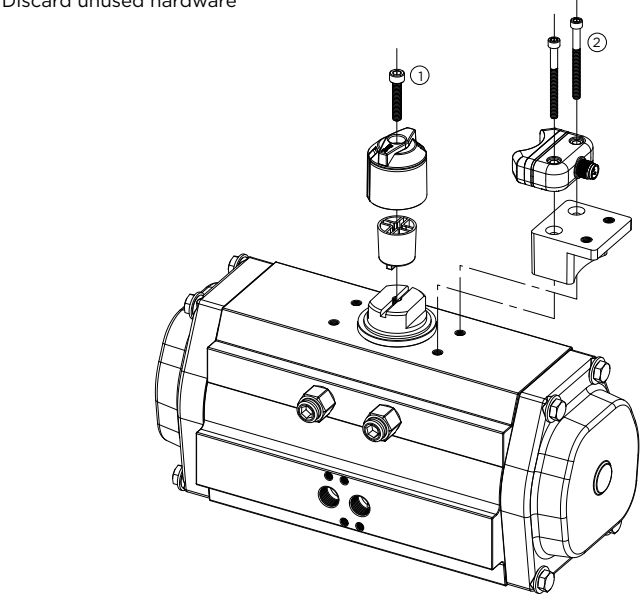


Size 119 to 128
NAMUR 30x80mm

Kit No. 54119B-14800536			
①	Capscrew	M6	45mm Long
②	Capscrew	#10-32	2.25" Long

Kit No. 54119B-14850536			
①	Capscrew	M6	45mm Long
②	Capscrew	M5	55mm Long

Discard unused hardware



Size 160 to 255
NAMUR 30x130mm

Kit No. 54119B-14800536				
①	Capscrew	M6	45mm Long	Not applicable for size 255
②	Capscrew	#10-32	1" Long	
③	Countersunk screw	#10-32	1.5" Long	

Kit No. 54119B-14850536			
①	Capscrew	M6	45mm Long
②	Capscrew	M5	25mm Long
③	Countersunk screw	M5	35mm Long

Discard unused hardware

3.2.1 · Fixed Activator - Rack and Pinion Actuator (continued)

Size 63 to 93
NAMUR 30x80mm

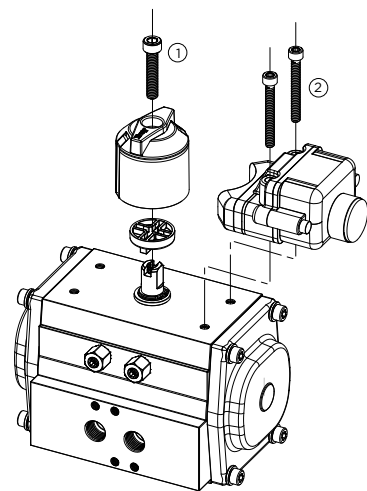
Kit No. 54063B-14800536

①	Capscrew	M6	30mm Long
②	Capscrew	#10-32	1.5" Long

Kit No. 54063B-14850536

①	Capscrew	M6	30mm Long
②	Capscrew	M5	40mm Long

Discard unused hardware



Size 119 to 128
NAMUR 30x80mm

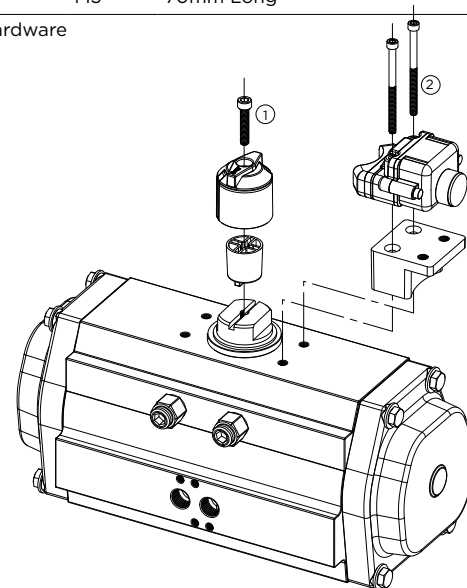
Kit No. 54119B-14800536

①	Capscrew	M6	45mm Long
②	Capscrew	#10-32	2.75" Long

Kit No. 54119B-14850536

①	Capscrew	M6	45mm Long
②	Capscrew	M5	70mm Long

Discard unused hardware



Size 160 to 255
NAMUR 30x130mm

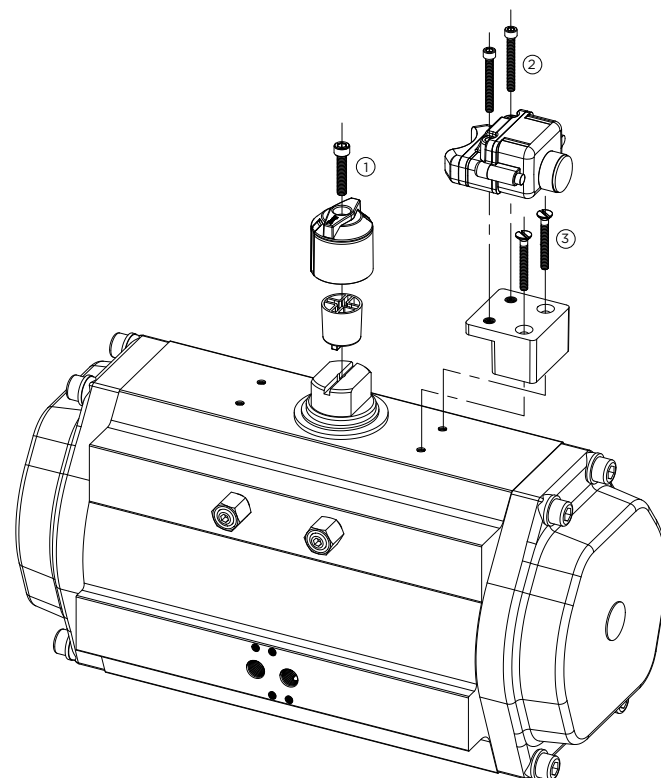
Kit No. 54119B-14800536

①	Capscrew	M6	45mm Long	Not applicable for size 255
②	Capscrew	#10-32	1.5" Long	
③	Countersunk screw	#10-32	1.5" Long	

Kit No. 54119B-14850536

①	Capscrew	M6	45mm Long
②	Capscrew	M5	40mm Long
③	Countersunk screw	M5	35mm Long

Discard unused hardware



3.2.2 · Adjustable Activator - Rack and Pinion Actuator

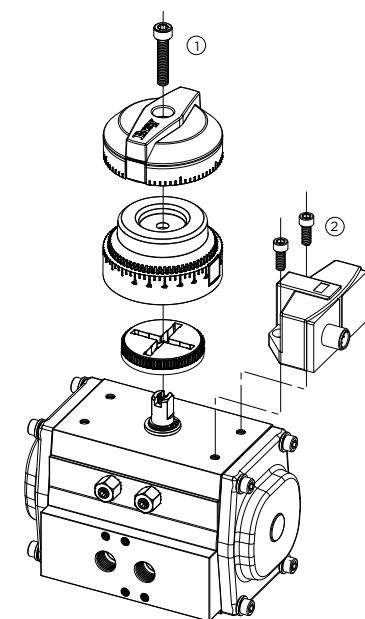
Size 63 to 128
NAMUR 30x80mm

Kit No. 54063A-14800536

①	Capscrew	M6	30mm Long
②	Capscrew	#10-32	7/16" Long

Kit No. 54063A-14850536

①	Capscrew	M6	30mm Long
②	Capscrew	M5	12mm Long



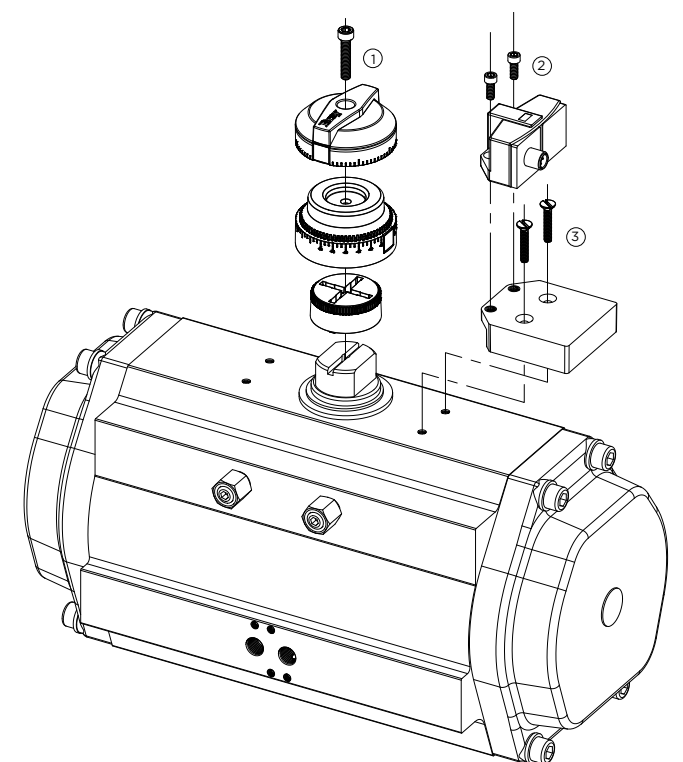
Size 160 to 255
NAMUR 30x130mm

Kit No. 54160A-14800536

①	Capscrew	M6	40mm Long	Not applicable for size 255
②	Capscrew	#10-32	7/16" Long	
③	Countersunk screw	#10-32	1" Long	

Kit No. 54160A-14850536

①	Capscrew	M6	40mm Long
②	Capscrew	M5	12mm Long
③	Countersunk screw	M5	25mm Long

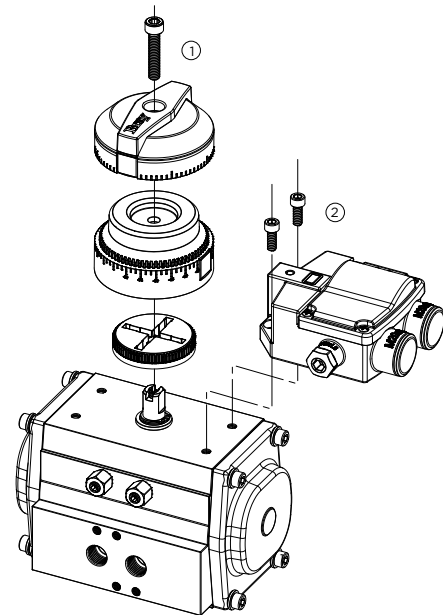


3.2.2 · Adjustable Activator - Rack and Pinion Actuator (continued)

Size 63 to 128
NAMUR 30x80mm

Kit No. 54063A-14800536			
①	Capscrew	M6	30mm Long
②	Capscrew	#10-32	5/8" Long

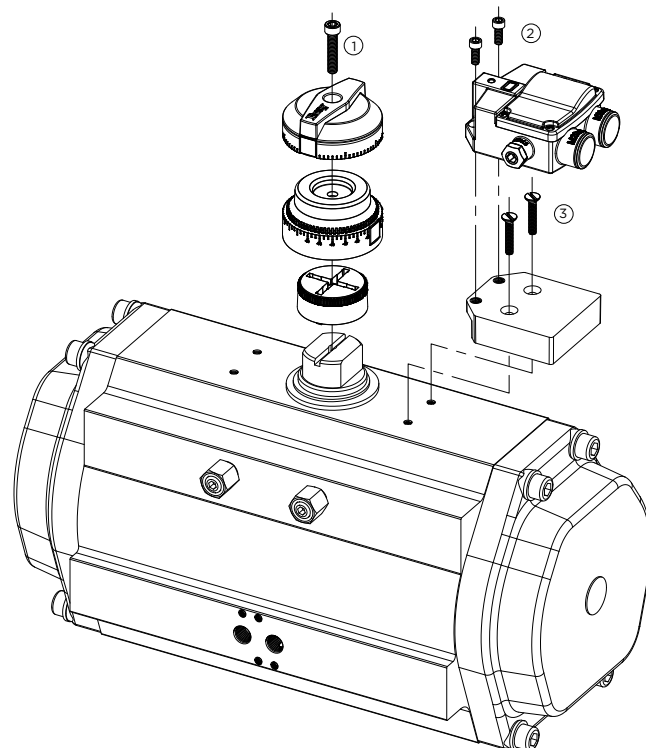
Kit No. 54063A-14850536			
①	Capscrew	M6	30mm Long
②	Capscrew	M5	15mm Long



Size 160 to 255
NAMUR 30x130mm

Kit No. 54160A-14800536			
①	Capscrew	M6	40mm Long
②	Capscrew	#10-32	5/8" Long
③	Countersunk screw	#10-32	1" Long

Kit No. 54160A-14850536			
①	Capscrew	M6	40mm Long
②	Capscrew	M5	15mm Long
③	Countersunk screw	M5	25mm Long

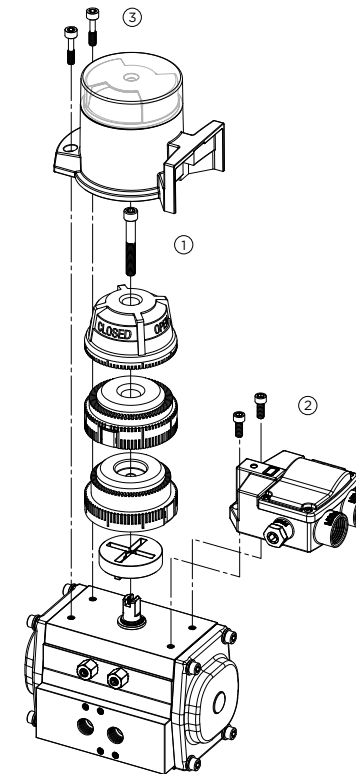


3.2.3 · Adjustable High Visibility Activator - Rack and Pinion Actuator

Size 63 to 128
NAMUR 30x80mm

Kit No. 54063C-14800536			
①	Capscrew	M6	30mm Long
②	Capscrew	#10-32	5/8" Long
③	Capscrew	#10-32	Captive

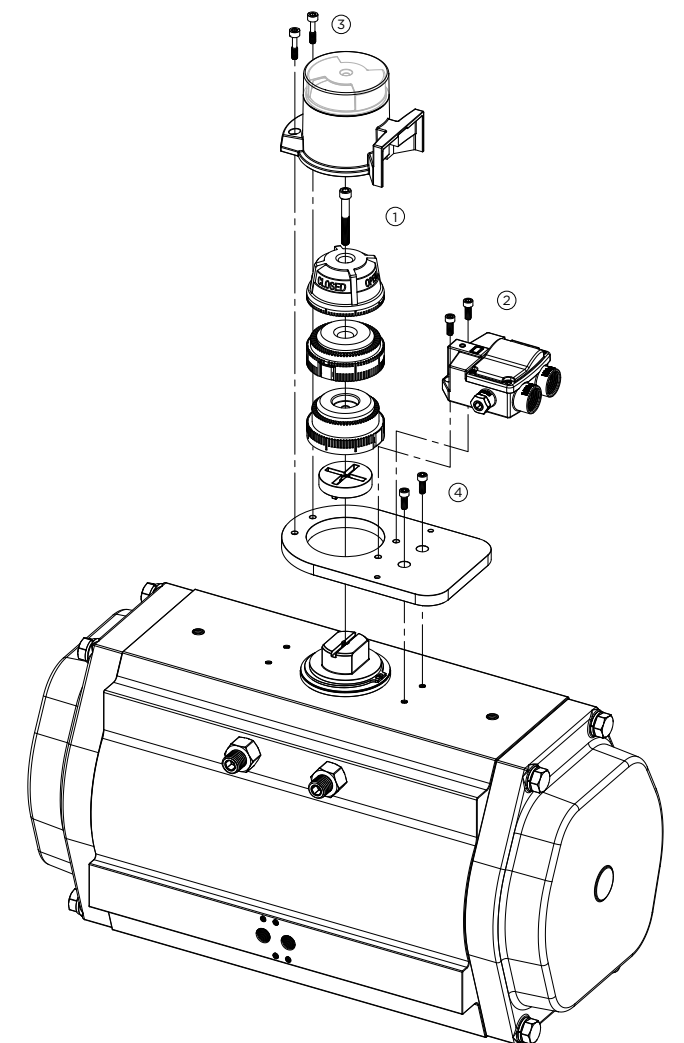
Kit No. 54063C-14850536			
①	Capscrew	M6	30mm Long
②	Capscrew	M5	15mm Long
③	Capscrew	M5	Captive



Size 160 to 255
NAMUR 30x130mm

Kit No. 54160C-14800536			
①	Capscrew	M6	40mm Long
②	Capscrew	#10-32	5/8" Long
③	Capscrew	#10-32	Captive
④	Capscrew	#10-32	5/8" Long

Kit No. 54160C-14850536			
①	Capscrew	M6	40mm Long
②	Capscrew	M5	15mm Long
③	Capscrew	M5	Captive
④	Capscrew	M5	16mm Long

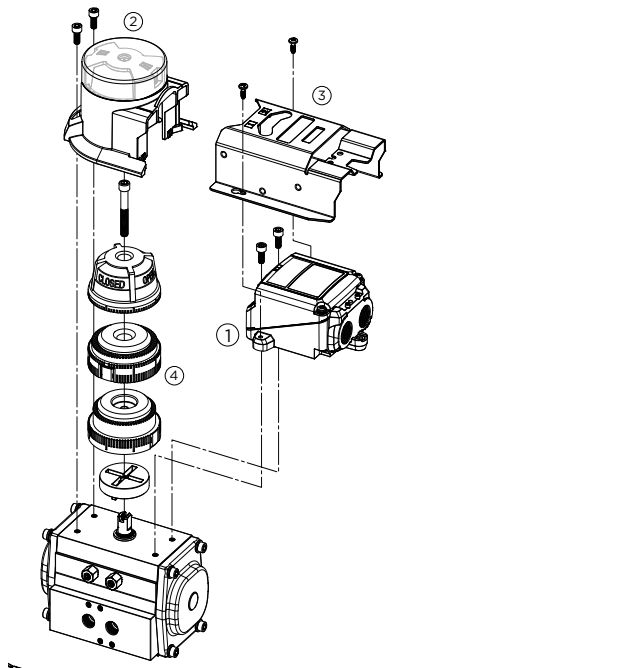


3.2.4 · Hazardous Location Proximity Sensort Kit - Rack and Pinion Actuator

Size 63 to 128
NAMUR 30x80mm

Kit No. 540102-12600536	
①	Sensor 540102-71104533
②	Activator assembly
③	Protective cover - Zone 2/22
④	Socket head capscrew #10-32X1/2, Stainless Steel

Kit No. 540102-12650536	
①	Sensor 540102-71104533
②	Activator assembly
③	Protective cover - Zone 2/22
④	Socket head capscrew M5X0.8X12, Stainless Steel

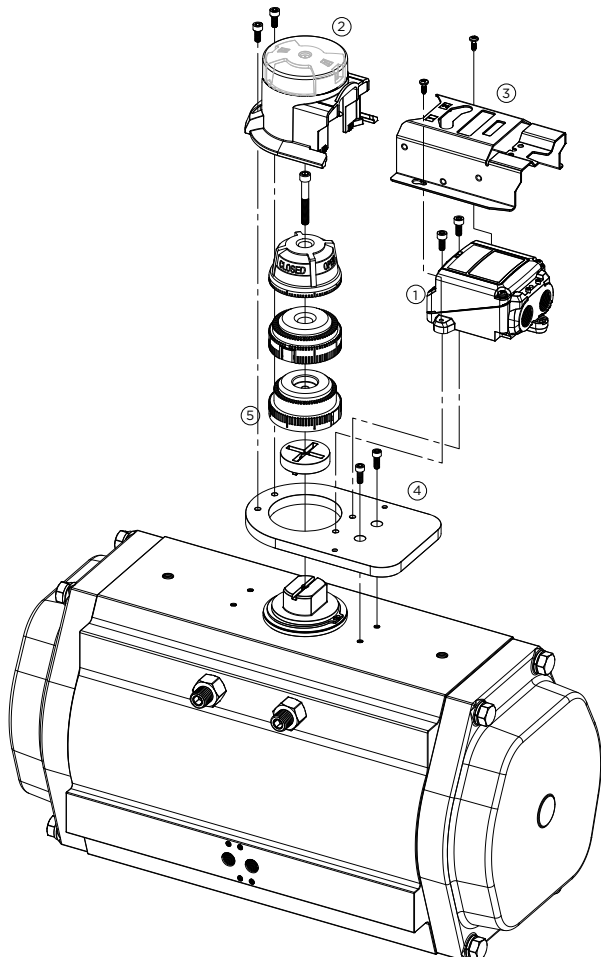


Size 160 to 255
NAMUR 30x130mm

Kit No. 540102-12601536	
①	Sensor 540102-71104533
②	Activator assembly
③	Protective cover - Zone 2/22
④	Mounting plate assembly
⑤	Socket head capscrew #10-32X3/8, Stainless Steel

Not applicable for size 255

Kit No. 540102-12651536	
①	Sensor 540102-71104533
②	Activator assembly
③	Protective cover - Zone 2/22
④	Mounting plate assembly
⑤	Socket head capscrew M5X0.8X10, Stainless Steel

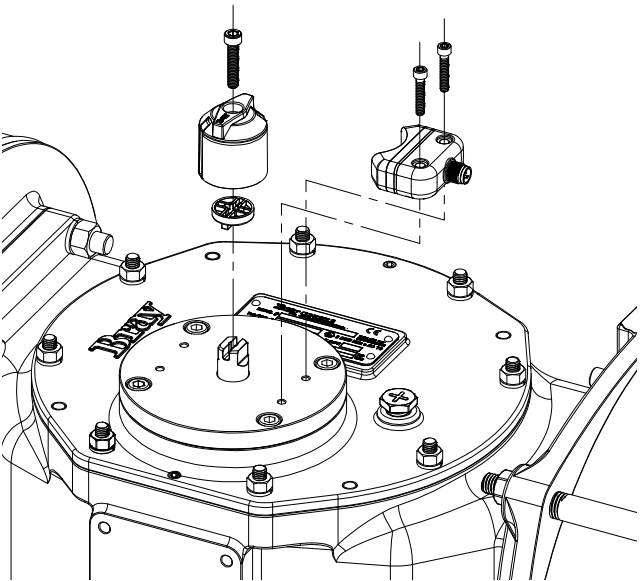


3.2.5 · Scotch Yoke Actuator

Series 98 mounting pattern matches rack and pinion size 63. Reference corresponding tables for mounting.

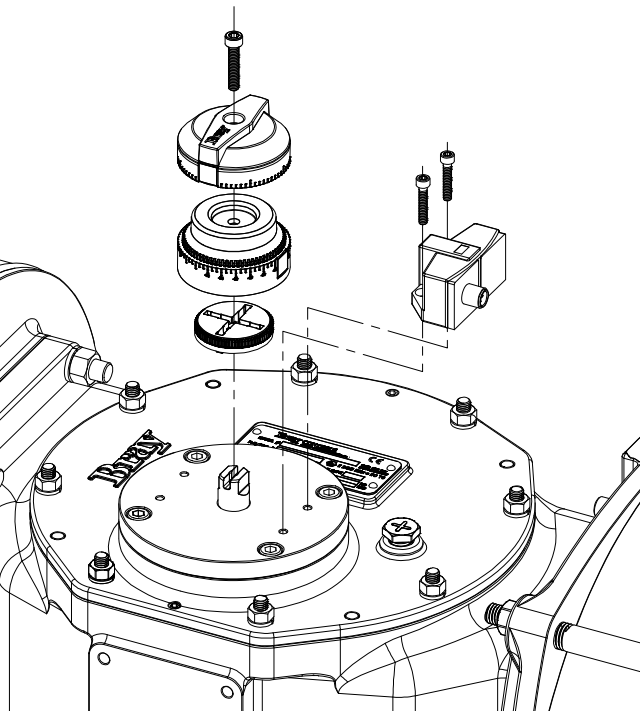
Fixed Activator

Thread Type	Series 98	Activator Kit PN
Metric	All Sizes	54063B-14850536

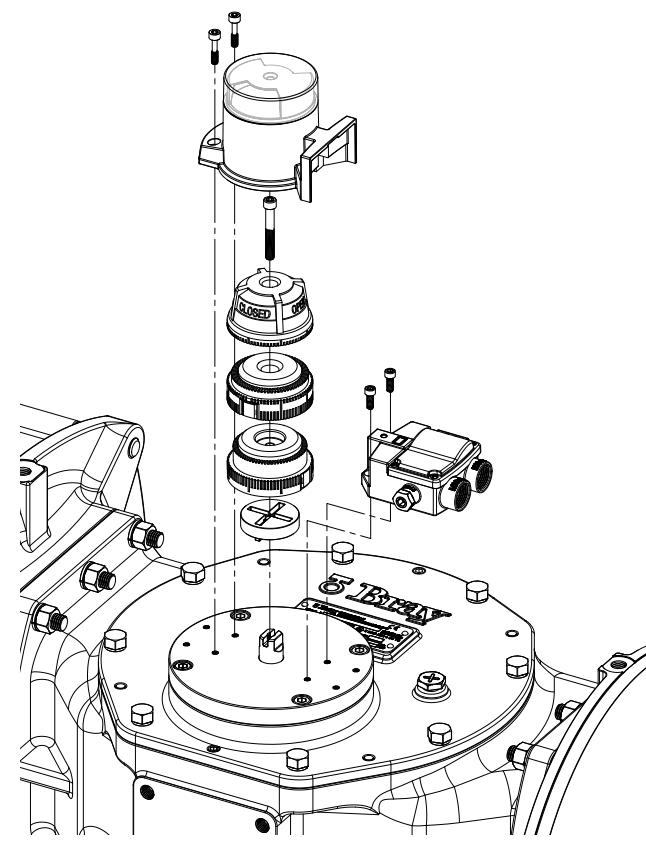


Adjustable Activator

Thread Type	Series 98	Activator Kit PN
Metric	All Sizes	54063A-14850536



3.2.5 · Scotch Yoke Actuator (continued)

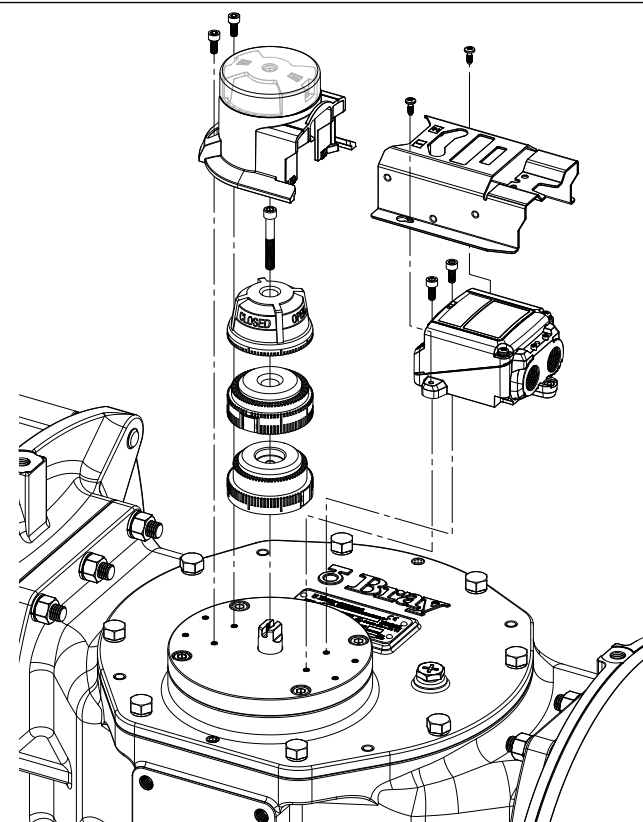


Adjustable High Visibility Activator

Thread Type	Series 98	Activator Kit PN
Metric	All Sizes	54063C-14850536

Explosion Proof Proximity Sensor Kit

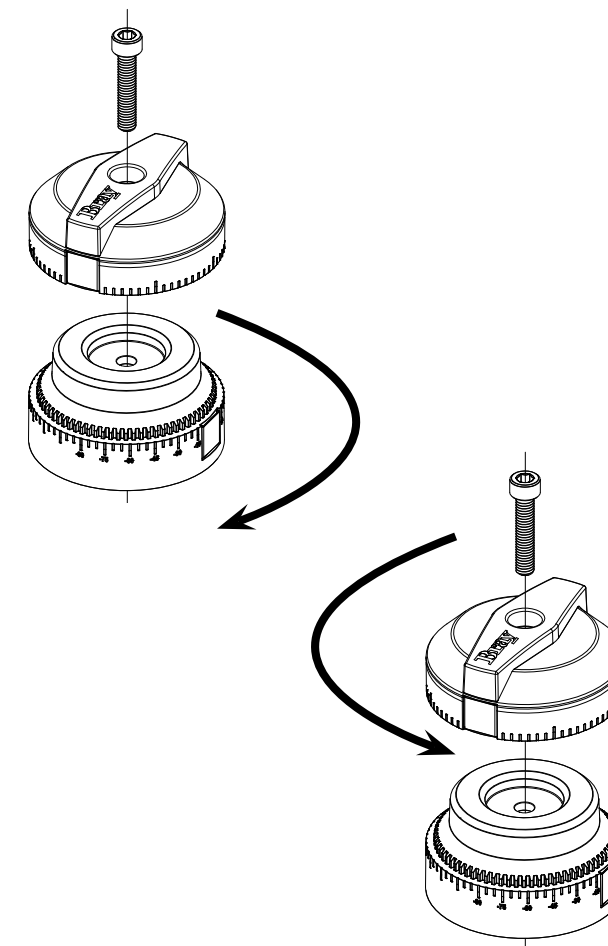
Thread Type	Series 98	Activator Kit PN
Metric	All Sizes	540102-12650536



3.3 · ADJUSTING THE ACTIVATOR

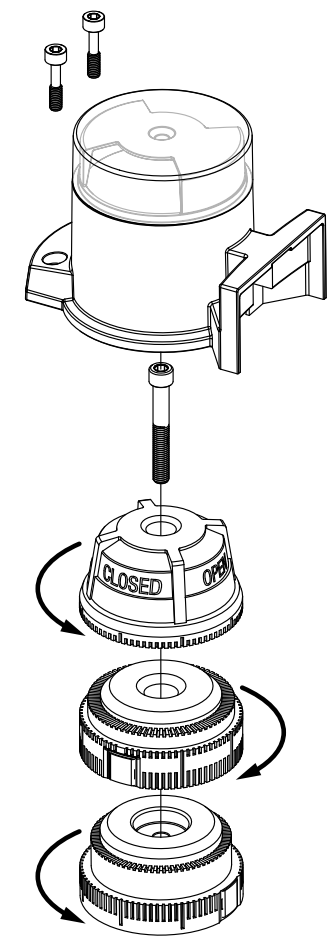
Adjustable activators are for customers that want the flexibility to position their indication limits outside of the standard zero to ninety degrees. The three pieces of the adjustable activator can be rotated in five degree increments. To adjust follow the steps below:

- Loosen the Allen head bolt which holds the three pieces of the activator on the pinion.
- Rotate the relevant piece until the desired amount of travel is achieved.
 - Use the incremental degree marks on the activator for reference.
- Ensure the yellow indicator is set to match the valve disc position.
- Tighten the Allen head bolt.



3.4 · ADJUSTABLE HIGH VISIBILITY ACTIVATOR

- Remove the two activator cover bolts.
- Remove activator cover by pulling up and away from the actuator.
- Loosen center Allen head bolt holding the activator to the pinion.
- Rotate the relevant piece of the activator until the desired amount of rotation is achieved.
 - Ensure that the open and close activator is visible when the cover shield is installed.
- Re-tighten the center Allen head bolt locking the activator to the pinion.
- Install the cover and mounting bolts.

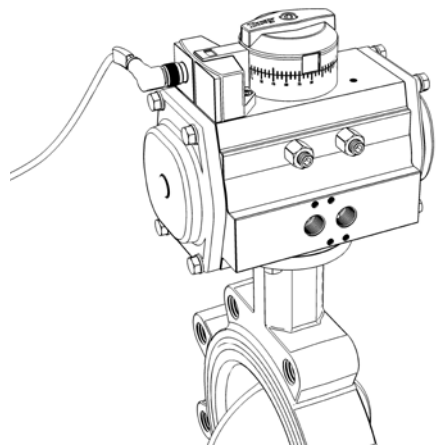


4.0 · CONNECTIONS (OPERATIONS)

Bray offers three different connections to satisfy the customer's application requirements. Each sensor's pin connection is listed in its respective technical manual. Turn off all power and lockout/tag out service panel before installing or modifying any electrical wiring.

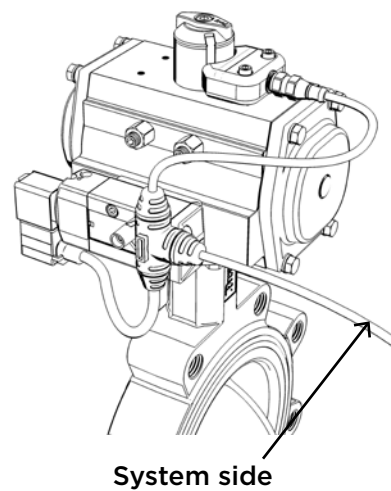
4.1 · SENSOR ONLY

Sensor connection supplies sensor power and signal output.



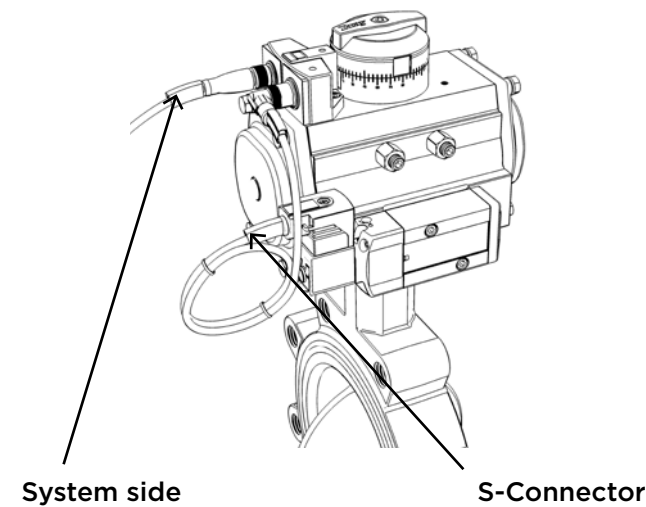
4.2 · SENSOR AND SOLENOID (SHARED)

Y-connectors are used to allow solenoid control on sensors without dedicated solenoid outputs. The system side line carries both the sensor and solenoid power. The system side line splits to supply power and signal to sensor and solenoid.



4.3 · SENSOR AND SOLENOID (INDEPENDENT)

Bray also offers sensors with dedicated solenoid outputs. In this set up the sensor signal and solenoid power are transmitted on the main system side line. The solenoid is activated via power supplied from the sensor through the S-connector. S-connector selection can be found in the sensor technical manual.



4.4 · CABLE GLAND CONNECTIONS

M20 cable gland connections are found on the following sensors:

540032-71104533

540013-71104533

540015-71104533

540102-71104533 (included in Kit PN 540102-126xx536)

In order to field-wire these models, follow these guidelines.

1. Take the sensor cover off. The cover should be kept on hand for reference.
2. Wire the sensor as per the wiring diagram on the outside of the sensor cover or technical specification sheet.
3. Close the cover and securely tighten cover screws.

Range of wire size gauge acceptable
(single conductor per terminal)

General: 16 to 28AWG

Industrial: 14 to 22AWG

Hazardous: 14 to 22AWG

NOTICE

Cable glands used must be certified in accordance with the application. The temperature range of cable glands must be selected according to application. The degree of ingress protection must not be reduced by cable glands.

The cable gland connections must be properly sealed to maintain the Ingress Protection rating of the Series 54 sensor. Use a seal that meet the requirements of the application.

If the sensor is mounted on a vertical pipe, it is recommended that the sensor be positioned with the cable glands on the bottom to prevent condensation from entering the sensor through its conduits.

In all cases, the conduit should be positioned to prevent drainage into the sensor.

Ensure adequate drainage of wiring conduit to prevent water contamination inside sensor.

5.0 • SENSOR PART NUMBERS

Bray Part Number	Electrical Output
540021-71104533	DC 3-wire PNP
540022-71104533	DC 2-wire
540032-71104533	DC 2-wire
540001-71104533	DC 3-wire PNP
540003-71104533	Intrinsically Safe
540013-71104533	Intrinsically Safe
540015-71104533	ASi-Interface + Out
540005-71104533	ASi-Interface + Out
540004-71104533	AC/DC
540041-71104533	DC 3w-wire PNP
540102-71104533*	DC 2 Wire - Hazardous Location + Out

*Included in Kit PN 540102-126xx536

6.0 • REQUIRED TOOLS

#5 Hex key wrench
#4 Hex key wrench
5/32 Hex key wrench



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