Neles Easyflow™

K series limit switches
KC and KS

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Installation, maintenance and
operating instructions



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READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the valve.

If you require additional assistance, please contact the manufacturer or manufacturer's representative.

SAVE THESE INSTRUCTIONS!

Addresses and phone numbers are printed on the back cover.

1. GENERAL

1.1 INTRODUCTION

This instruction manual contains important information regarding the installation, operation and maintenance of Neles Easyflow K series limit switches. Please read these instructions carefully and save them for future reference.

The manual can be changed or revised without any prior notice. Any changes in product's specification, structure, and/or any components may not result immediate revised version of the manual. The latest version of this document can be found from neles.com/products at all times.

1.2 DEFINITIONS

The following definitions given here are used in this document.

WARNING:
IF NOT OBSERVED, USER INCURS A HIGH RISK OF SEVERE DAMAGE TO THE PRODUCT AND/OR INJURY TO PERSONNEL.

CAUTION: If not observed, user may incur damage to the product and/or injury to personnel.

NOTE: Advisory and information comments provided to assist maintenance personnel and end users to carry out maintenance procedures and to ensure safe usage of the device.

1.3 MARKINGS

The device has a title label plate attached to the cover. The label plate markings identify e.g. Type code, ID-number, manufacturing serial number, ambient temperature range and electrical ratings of the switches of the device.

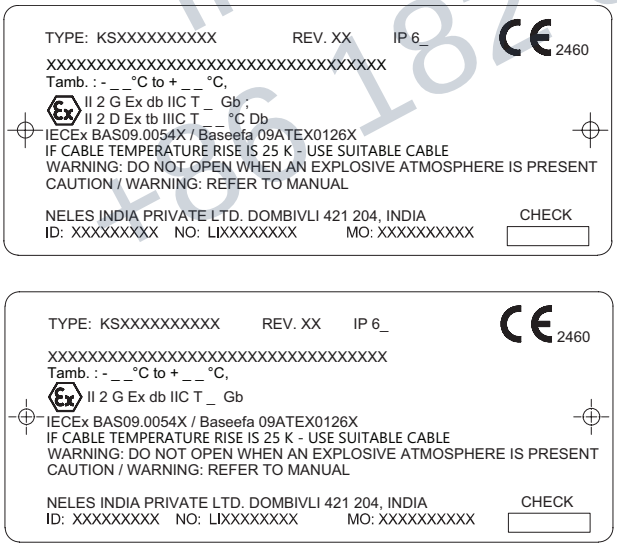


Figure 1. Examble of KS title label Atex / IEC ex Exd approved

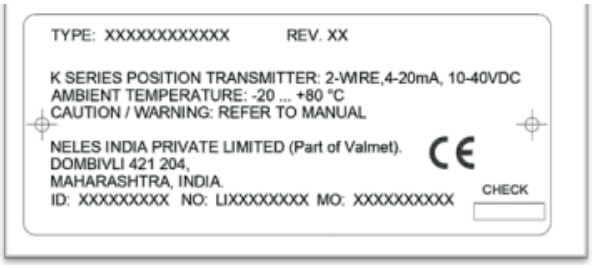


Figure 2. Example of KS with PTR title label

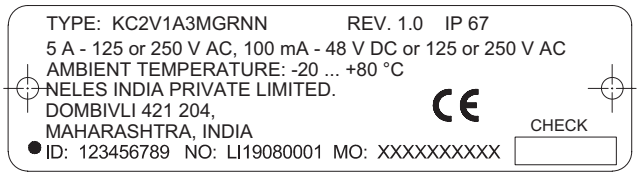


Figure 3. KC title label

Manufacturing serial number format is TTYYWWNNNN, where:

TT = Device and factory sign
YY = Year of manufacturing WW = Week of manufacturing
NNNN = Consecutive number

Example: LI19140001 = Limit switch, year 2019, week 14, consecutive number 1

1.4 CE MARKING

The limit switch meets the requirements of the European Directives 2014/35/EU, 2014/30/EU and has been marked according to the Directives.

1.5 SAFETY PRECAUTIONS

CAUTION: NO MECHANICAL REWORK ALLOWED BY CUSTOMER!

MECHANICAL REWORK INCREASES THE RISK OF DEVICE MALFUNCTION. ONLY TRAINED AND SKILLED SERVICE PERSONNEL OF VALMET MAY REWORK THE PRODUCT.

WARNING:
DANGEROUS CURRENTS AND VOLTAGES INSIDE DEPENDING ON THE SWITCH TYPE THERE ARE POTENTIALLY DANGEROUS CURRENTS AND VOLTAGES INSIDE THE LIMIT SWITCH ENCLOSURE.

NOTE: ALL LAWS, GUIDELINES AND RULES APPLICABLE WITHIN THE COUNTRY OF USAGE MUST BE FOLLOWED. THERE ARE ALSO ADDITIONAL SAFETY REGULATIONS WHICH ARE PLANT OR AREA RELATED.

ABOVE MENTIONED ARE NOT COVERED BY THIS MANUAL.

1.6 WARRANTY

Warranty of the K series limit switches will be void with any misuse of the devices, lack of maintenance described in this document or other unintended use of the limit switches.

Warranty details are defined in Valmet Terms and Conditions.

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2. OPERATION PRINCIPLE

Neles Easyflow K series limit switch is suitable for sensing the preset valve travel limits for rotary valves and actuators. The limit information can be wired out from the limit switch for information to user or monitoring devices.

The K series limit switches include from two to four inductive, mechanical or reed type switch elements. They are activated by cams that are directly driven by the actuator shaft through the limit switch shaft. As the actuator shaft turns the limit switch shaft follows the movement as it is mechanically attached to the actuator shaft. Cams are set by the customer to be activated at the desired rotary travel limits.

The switches are prewired to terminal strip in the enclosure, permitting easy connection of switch output to external electrical monitoring system or indication devices.

K series limit switches also include a visual indicator on top of the enclosure cover that indicates 90° rotary travel between open and closed valve position.

3. TRANSPORTATION AND STORAGE

Upon receiving the product check the limit switch and the accompanying devices for any damage that may have occurred during transportation.

WARNING:

DO NOT USE THE DEVICE IF IT IS DAMAGED DURING TRANSPORTATION!

IF THE DEVICE HAS SUFFERED DAMAGE DURING TRANSPORTATION DO NOT INSTALL OR USE IT. IN CASE OF NOTICING DAMAGE TO THE DEVICE UPON RECEIVING IT PLEASE CONTACT THE SUPPLIER.

Store the limit switch carefully. Storage indoors in a cool, dry place. Temperature limit for the storing is from 4 °C to 40 °C (39 °F – 104 °F). The limit switch should be left in its original packing until it is required for the use. Do not remove protective plugs until installing the limit switches.

4. TECHNICAL SPECIFICATION

Ambient temperature:
- General: -20 ... +80 °C / -4 ... +176 °F
- Cold: -40 ... +80 °C / -40 ... +176 °F
- High: -20 ... +100 °C / -4 ... +212 °F (Not applicable with polycarbonate body)

Protection class: IP67 Body:
- KS series: Epoxy powder coated, low copper die cast aluminum (LM6) / stainless steel (CF8M)
- KC series: Epoxy powder coated, low copper die cast aluminum (LM6) / stainless steel (CF8M) / polycarbonate (LEXAN 3412R)

Pointer cover: Shatter proof polycarbonate (INFINO SC-1220UR)

Internal parts:
- Shaft: AISI304 / AISI316 (SS body)
- Cams: ABS
- PCB: Grade FR4
- Fasteners: AISI304

Sealing: Nitrile rubber (NBR) (General temp range)
Silicon (Cold temp range)
Fluoro silicon (Arctic temp range)
Viton (High temp range)

Conduit entry:
- KS series: 2 x M20 or 2 x 1/2 NPT or 2 x 3/4 NPT 4 x M20 or 4 x 1/2 NPT or 4 x 3/4 NPT
- KC series: 3 x M20 or 3 x 1/2 NPT

Weight:
- KS series: Die cast aluminum 1.7 kg / 3.8 lbs, stainless steel 4.5 kg / 9.9 lbs
- KC series: Die cast aluminum 0.7 kg / 1.6 lbs, stainless steel 2.5 kg / 5.5 lbs, polycarbonate 0.6 kg / 1.3 lbs

Weight:
KS series: Die cast aluminum 1.7 kg / 3.8 lbs, stainless steel 4.5 kg / 9.9 lbs
KC series: Die cast aluminum 0.7 kg / 1.6 lbs, stainless steel 2.5 kg / 5.5 lbs, polycarbonate 0.6 kg / 1.3 lbs

Switches:

A1: Inductive proximity switch, P+F NJ2-12GM-N 2-wire type, Namur NC
- Supply voltage: 5 - 25 V DC, nominal 8 V DC (Ri = approx. 1 kOhm)
- Output current:
- Active face free: > 3 mA
- Active face covered: < 1 mA
- Nominal sensing range: 2 mm

A3: Inductive proximity switch, P+F NBN4- 12GM40-Z0 2-wire type, NO
- Supply voltage: 5 - 60 V DC
- Output current:
- Operating current: 2 - 100 mA
- Off-state current: 0 - 0,5 mA
- Nominal sensing range: 4 mm

D1: Inductive proximity switch, P+F NJ2-V3-N 2-wire type, Namur NC
- Supply voltage: 5 - 25 V DC, nominal 8 V DC (Ri = approx. 1 kOhm)
- Output current:
- Active face free: > 3 mA
- Active face covered: < 1 mA
- Nominal sensing range: 2 mm

D2: Inductive proximity switch, P+F NBB3- V3-Z4 2-wire type, NO
- Supply voltage: 5 - 60 V DC Output current:
- Operating current: 4 - 100 mA
- Off-state current: 0,4 - 0,55 mA
- Nominal sensing range: 3 mm

F1: Inductive proximity switch, P+F SJ3.5-N 2-wire type, Namur NC
- Supply voltage: 5 - 25 V DC, nominal 8 V DC (Ri = approx. 1 kOhm)
- Output current:
- Active face free: > 3 mA
- Active face covered: < 1 mA Slot width: 3,5 mm

F2: Inductive proximity switch, P+F SJ3.5-SN 2-wire type, Namur NC
- Supply voltage: 5 - 25 V DC, nominal 8 V DC (Ri = approx. 1 kOhm)
- Output current:
- Active face free: > 3 mA
- Active face covered: < 1 mA
- Slot width: 3,5 mm

R1: Reed proximity switch, Neles R1
- Supply voltage: 220 V AC/DC
- Output current:
- Operating current: 2000 mA
- Off-state current: 0 mA

V1: Mechanical micro switch, Honeywell V15S05-CZ100A05-01, SPDT type

Electrical values: 5 A @ 125/250 VAC, 100 mA @ 48 VDC or 125/250 VAC

W1: Mechanical micro switch, Honeywell V15S05-CZ100A05-01, DPDT type

Electrical values: 5 A @ 125/250 VAC, 100 mA @ 48 VDC or 125/250 VAC

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4.1 PTR SPECIFICATION:

Limit Switch with PTR	
	Digital Transmitter
Output	2- wire 4-20 mA
Supply Source	10-40 VDC
Indication	Red/ Green LED
Span Range	35 ° to 320°
Maximum Loading	683 ohms @ 24 VDC
Refresh Rate	< 5 ms
Linearity Error	+/- 0.35°
Cycle	-
Vibration Tolerance	Outstanding

5. INSTALLATION

CAUTION: THE FOLLOWING MUST BE TAKEN INTO CONSIDERATION WHILE INSTALLING THE LIMIT SWITCHES!

- THE CURRENT AND VOLTAGE LIMITATION HAS TO BE OBSERVED AS PER THE ID PLATE
- THE WIRING AND CONNECTION SHOULD BE CARRIED OUT USING IP67 CERITIFIED CABLE GLANDS TO AVOID WATER INTRUSION TO THE ENCLOSURE
- ANY PLASTIC OR TEMPORARY PROTECTIVE PLUG ARE TO BE REMOVED AND IP67 CERTIFIED METALLIC PLUG TO BE USED INSTEAD

5.1 MOUNTING

K series limit switch mounting face follows the VDI/VDE 3845 standard. A suitable mounting kit is needed to mount the device on an actuator. Below are the instructions for mounting the limit switch to an actuator following the same VDI/VDE 3845 mounting standard. To mount the limit switch to other than VDI/VDE actuators the instructions for every case need to be considered separately.

The limit switch box is installed on the bracket, that suits the actuator, with fastener and left loose.

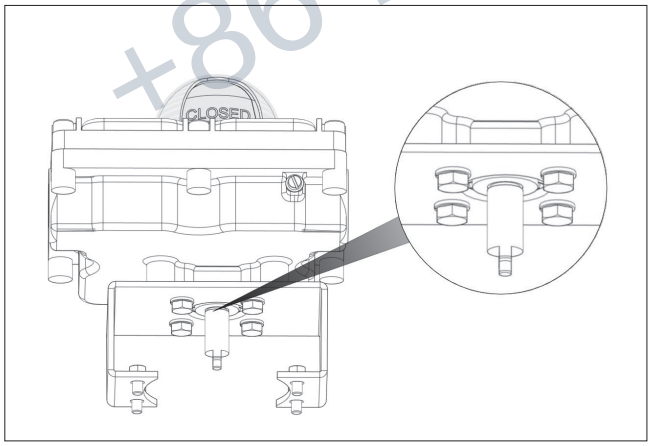


Figure 4. Example of VDI/VDE mounting bracket

The box is then mounted on the actuator while taking care that the shaft enters in the slot of the actuator shaft.

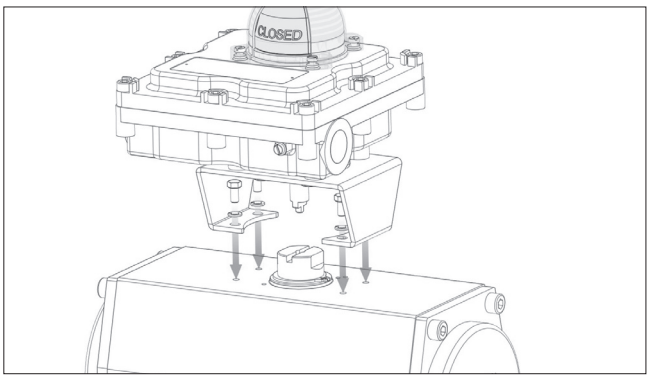


Figure 5. Mounting on an actuator

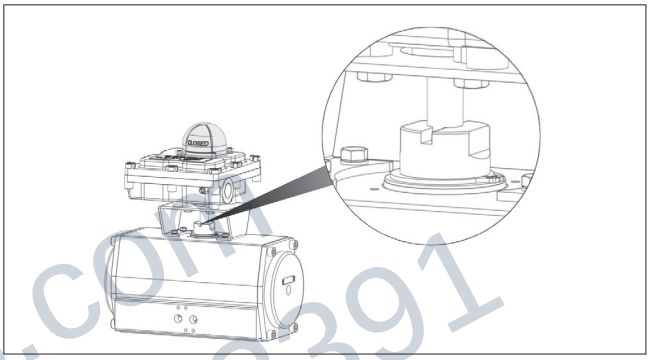


Figure 6. Aligning the shaft

Bracket is attached to the actuator mounting holes, check the alignment of the limit switch shaft and actuator shaft. No radial or axial forces should be present. After alignment has been verified tighten the bracket properly on both actuator and limit switch side. Bracket should never be left loose. A clearance ‘C’ between the actuator shaft slot bottom and the limit switch shaft should be from 0,2 mm to 0,5 mm.

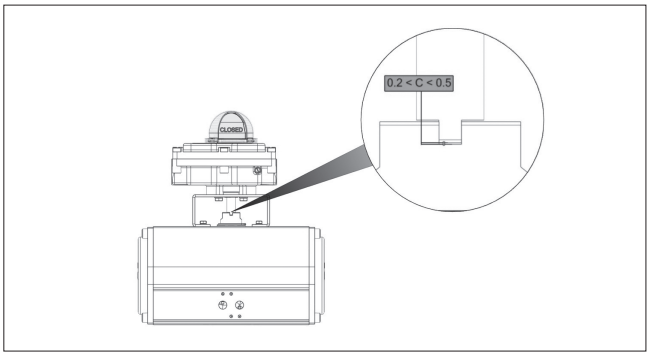


Figure 7. Clearance of the shaft

Connect the wiring through a suitable cable gland and connect the wires to the terminal strip. Terminal strip connections are marked on the PCB separately for proximity and micro switches. For proximity switches as “V+”, “V-“, and for mechanical switches as “COM-1”, “NO-1” and “NC-1” for the switch 1 and “COM-2”, “NO-2” and “NC-2” for the switch 2. Switch 1 is the bottom switch and switch 2 is the top switch.

Connections:

V+: Positive voltage (proximity switch)

V-: Ground voltage (proximity switch)

COM: - Common terminal.

NC: - Normally closed contact, open when actuated.

NO: - Normally open contact, closed when actuated.

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K series Limit Switch with positioner transmitter face follows the VDI/VDE 3845 standard. A suitable mounting kit is needed to mount (Limit Switch Box with PTR) Device on an Actuator along with Limit Switch Box with Mounting Linkages. Flow the instruction of mounting of Limit switch box on an actuator as it follows the same standard VDI/VDE 3845.

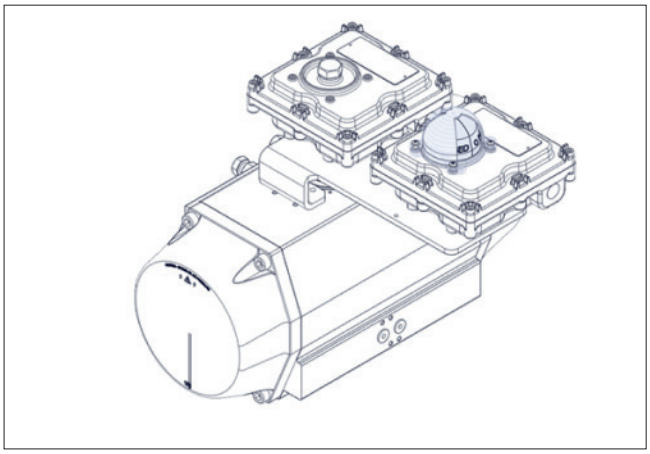


Figure 8. Mounting of Limit Switch with PTR on Actuator

5.2 CAM SETTING

SWITCH TYPE V1, D1 & W1

The rotary travel limits are adjusted by setting the cams to the desired positions. The cams in K series limit switches are easily adjustable due to their self-locking mechanism. Cams are also color coded to make the installation easier.

The top cam is red and is typically used for closed position indication and actuated with clockwise rotation of the shaft. The bottom switch is yellow and is typically used for open position indication and actuated with counterclockwise rotation.

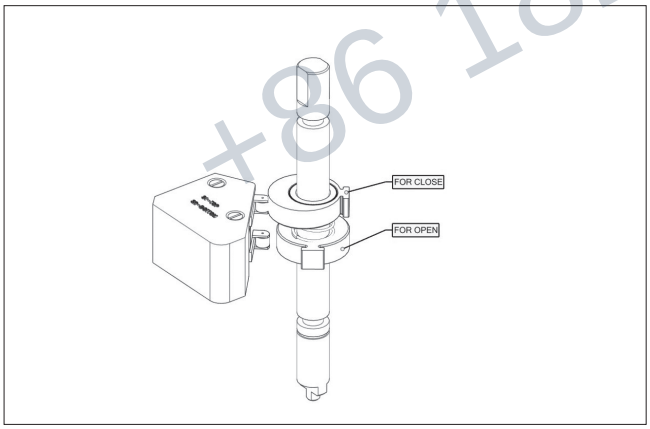


Figure 9. Cam placement on devices with V1, D1 & W1 switches

Operate the actuator to bring the valve in open position. Use the lower (yellow) cam to set the open position. Switch should not be actuated. Lift the cam up and rotate it to same direction as the actuator rotation while driving to open position (typically counterclockwise) until the switch is actuated. This can be heard as a click from the switch while the cam is rotated. Release the cam and make sure it is locked in place with the self-locking mechanism. The cam should engage fully to the splines.

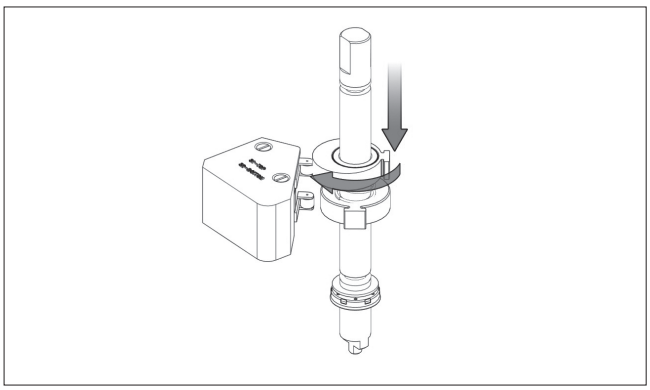


Figure 10. Adjusting the upper cam

Operate the actuator to bring the valve in open position. Use the lower (yellow) cam to set the open position. Switch should not be actuated. Lift the cam up and rotate it to same direction as the actuator rotation while driving to open position (typically counterclockwise) until the switch is actuated. This can be heard as a click from the switch while the cam is rotated. Release the cam and make sure it is locked in place with the self-locking mechanism. The cam should engage fully to the splines.

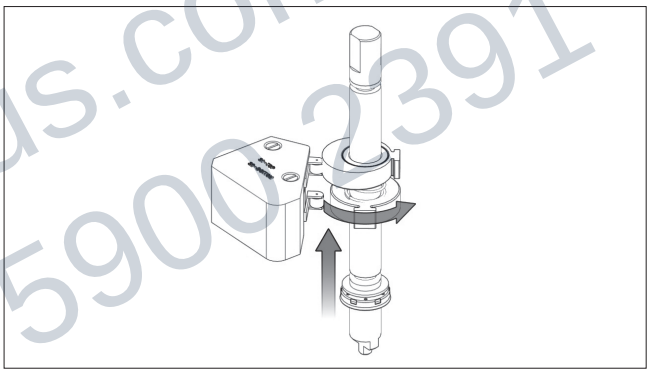


Figure 11. Adjusting the lower cam

SWITCH TYPE A1

Operate the actuator to bring the valve in closed position. Turn the twin cam to bring one edge of it to close proximity of the closed sensor sensing head. Leave a gap of less than 2 mm between the cam and the sensor. Operate the actuator to bring the valve in open position and check that the other edge of the twin cam is close to the open sensor sensing head. If needed move the sensors forward or backward to ensure approximately 2 mm gap between the twin cam edges and the open and close sensors in respective positions of the valve.

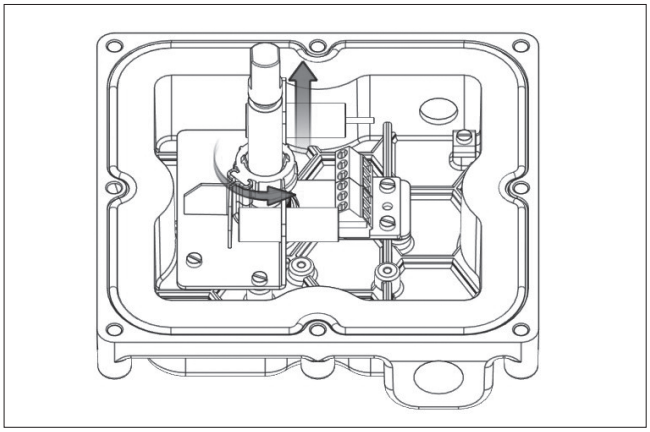


Figure 12. Adjusting the twin cam

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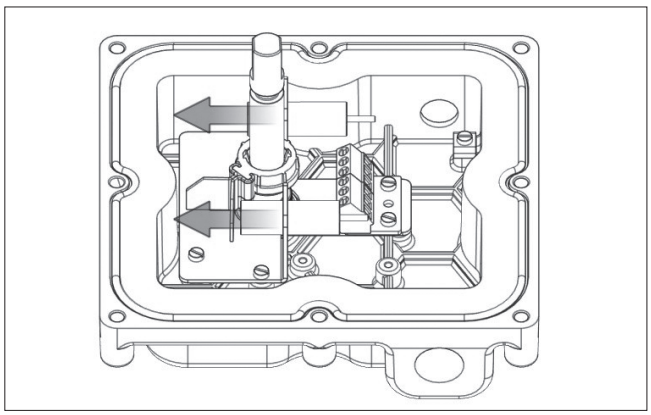


Figure 13. Adjusting the inductive sensors

SWITCH TYPE F1

First loosen the locking screw. Now rotate the valve to ensure that cam rotation is right, if not adjust the cam accordingly. Operate the actuator to bring the valve in closed condition. Cam must be rotated (clock wise) till the multimeter gives sensation for fully closed valve position.

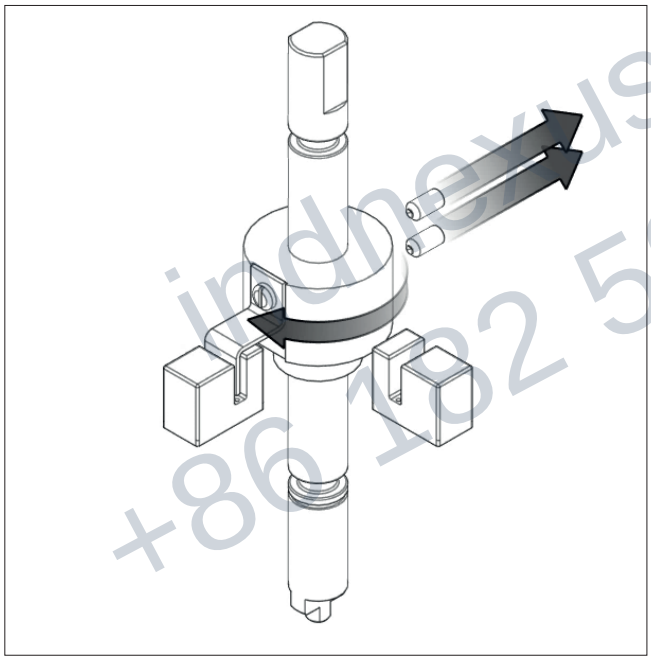


Figure 14. Adjusting the cam clockwise.

First loosen the locking screw. Now rotate the valve to ensure that cam rotation is right, if not adjust the cam accordingly. Operate the actuator to bring the valve in open condition. Cam must be rotated (counter clock wise) till the multimeter gives sensation for fully closed valve position.

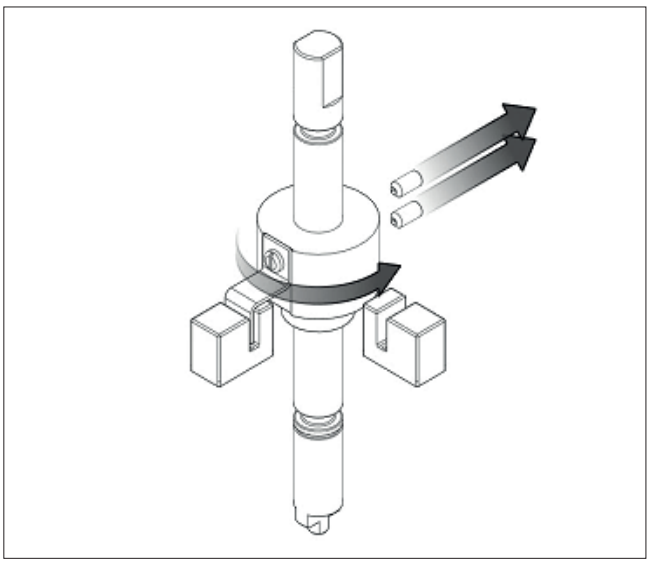


Figure 15. Adjusting the cam Counter clockwise.

SWITCH TYPE R1

Operate the actuator to bring the valve in closed condition. Use the red cam to set the closed position. The cam has to be depressed and rotated (clock wise) till the multimeter gives sensation for fully closed valve position.

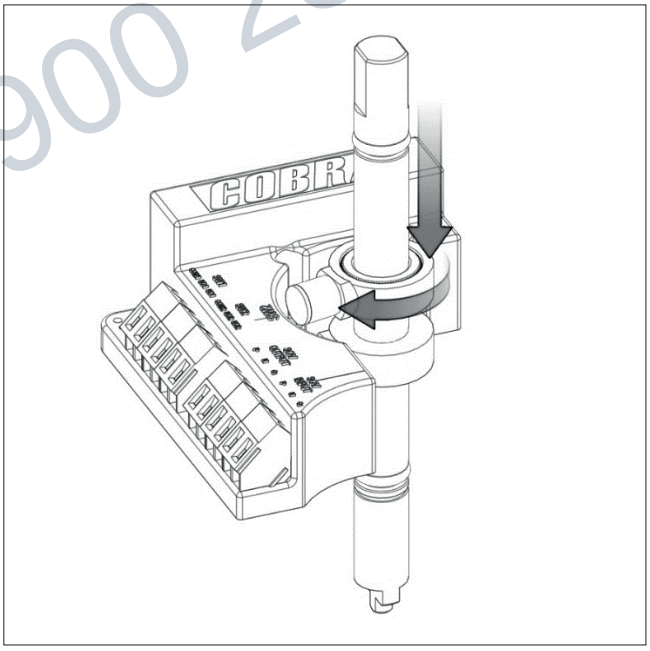


Figure 16. Adjusting the upper cam

Operate the actuator to bring the valve in open condition. Use the yellow cam to set the open position. The cam has to be lifted and rotated (counter clock wise) till the multimeter gives sensation for fully open valve position.

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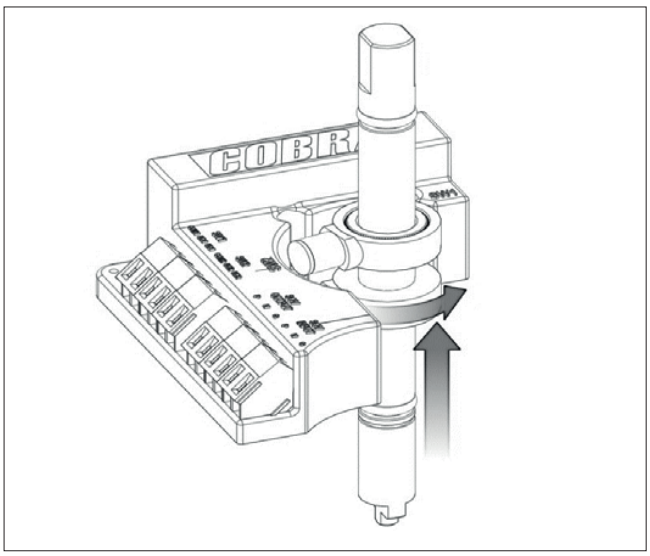


Figure 17. Adjusting the lower cam

5.3 WIRING DIAGRAMS

All wiring diagrams are presented in normal state (not actuated) of the switches.

SWITCH TYPE V1

Below are the wiring diagram and the locations of the terminal strips on the PCB for limit switch type V1. SOV connection terminals are meant for terminating the solenoid valve inside the limit switch enclosure. The terminal with labels “COM1”, “NO1” and “NC1” is for the switch 1 (bottom switch) and the terminal with labels “COM2”, “NO2” and “NC2” is for the switch 2 (top switch).

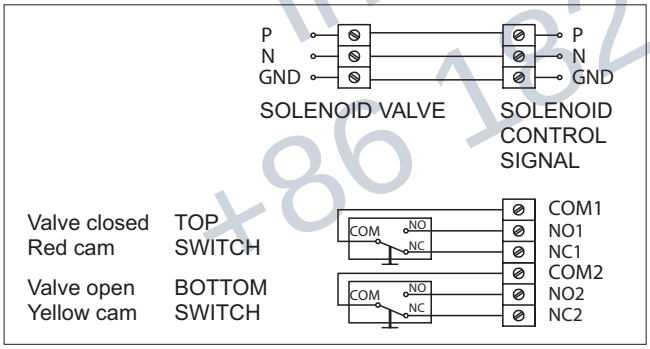


Figure 18. Mechanical micro switch, V1

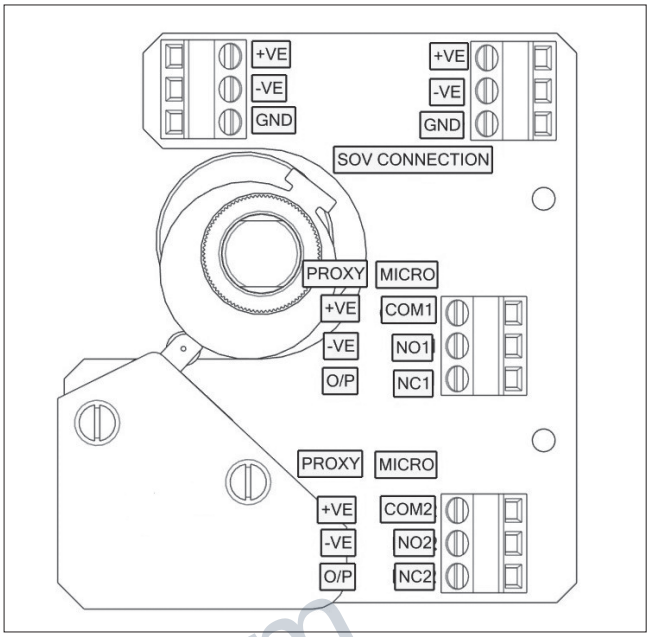


Figure 19. PCB layout of devices with V1 switches

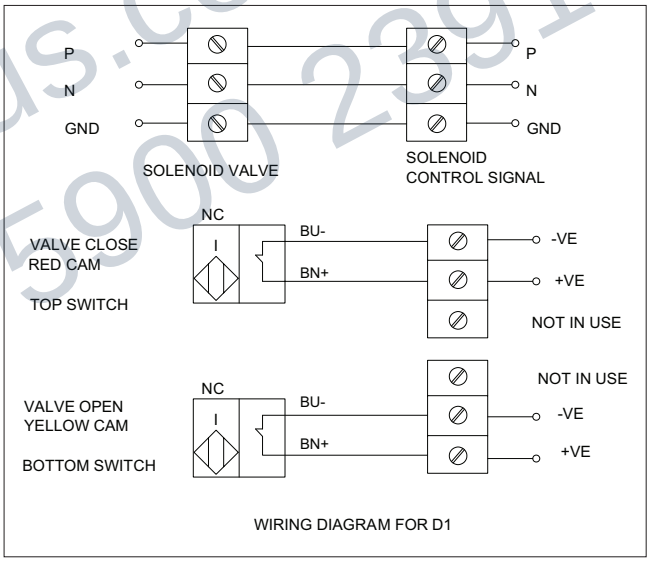


Figure 20. Wiring diagram for D1

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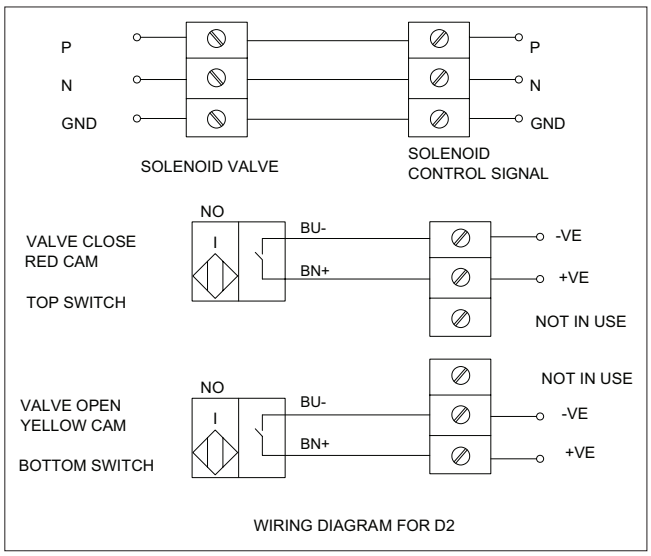


Figure 21. Wiring diagram for D2

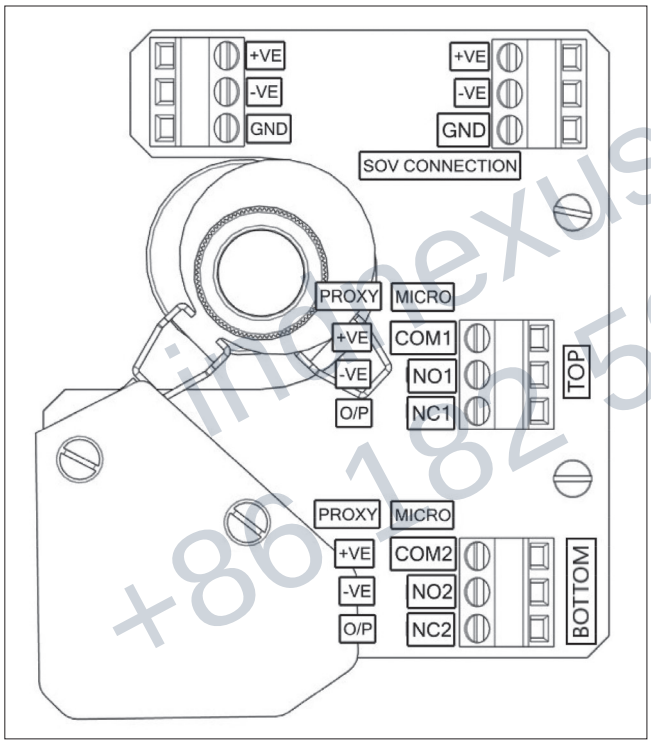


Figure 22. PCB layout of devices with D1 switches

SWITCH TYPE A1

Below are the wiring diagram and the location of the terminal strip on the PCB for limit switch type A1.

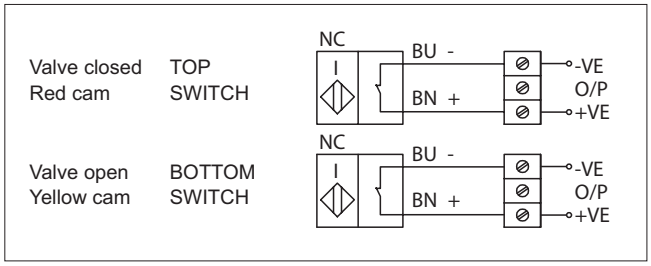


Figure 23. Wiring diagram of A1 switches

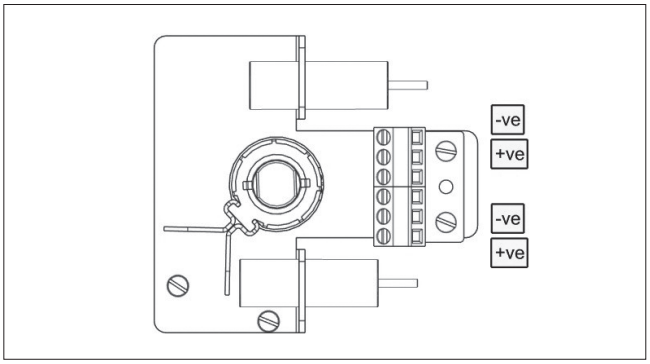


Figure 24. PCB layout of devices with of A1 switches

SWITCH TYPE W1

Below are the wiring diagram and the location of the terminal strip on the PCB for limit switch type W1.

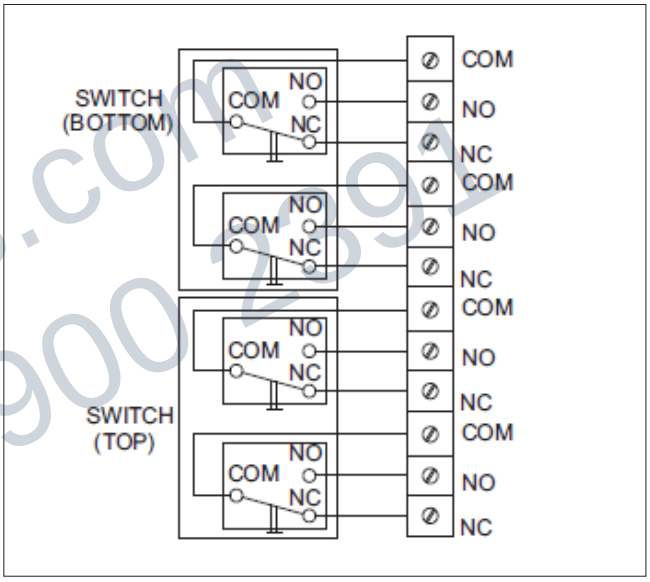


Figure 25. Mechanical microswitch W1 switches

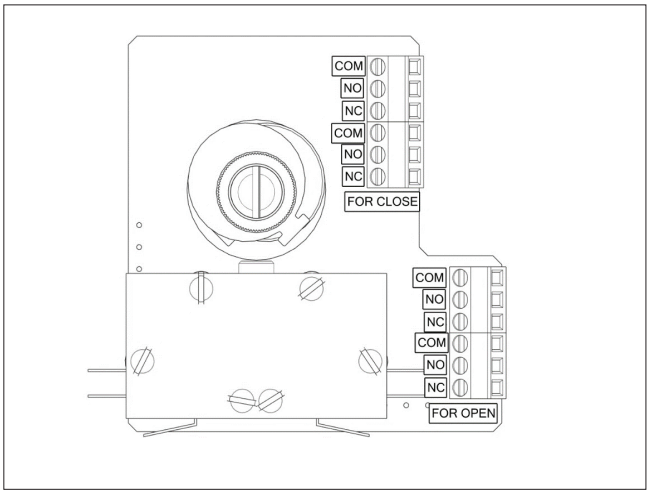


Figure 26. PCB layout of devices with W1 switches

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SWITCH TYPE R1

Below are the wiring diagram and the location of the terminal strip on the PCB for limit switch type.

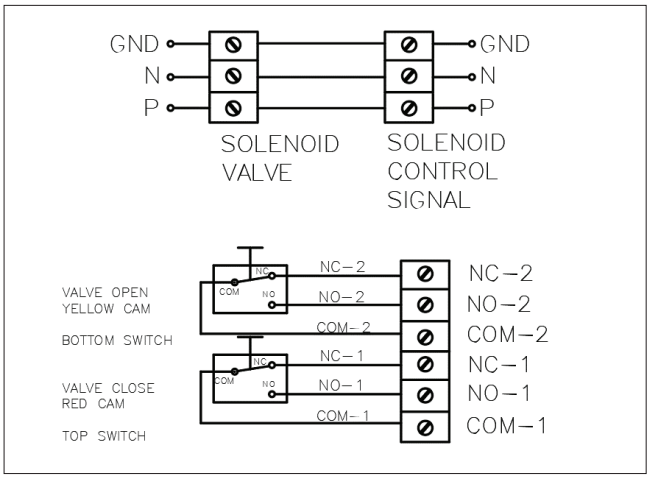


Figure 27. Mechanical microswitch R1 switches

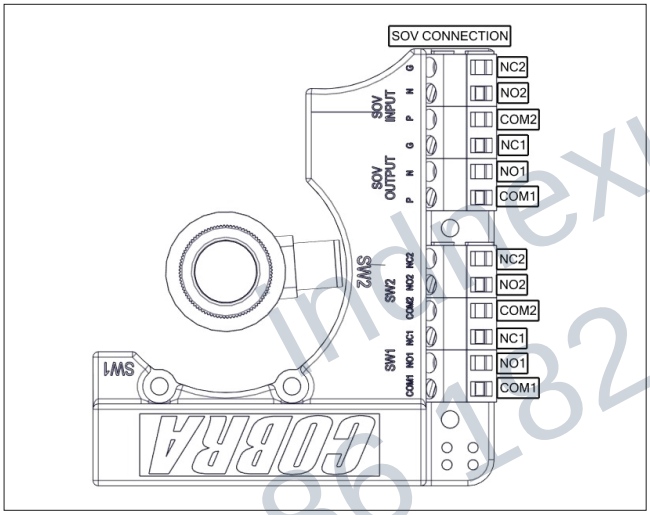


Figure 28. PCB layout of devices with R1 switches

5.4 WIRING DIAGRAM FOR ST466036 (PTR):

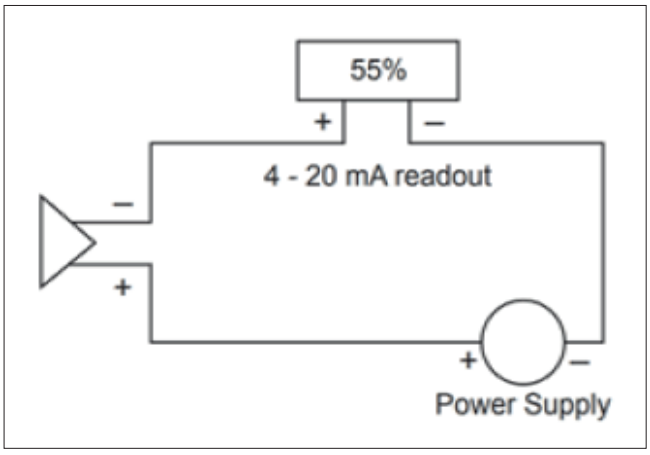


Figure 29. Wiring diagram for ST466036 (PTR):

6. WARNINGS

- Ensure that Supply Voltage should not exceed more than > 20 % of Rated voltage. (for current and voltage ratings refer catalogue)
- No mechanical rework allowed by customer. Mechanical rework can increase clearance between Housing and cover.
- Do not open cover / cable gland when limit switch is under operation or in energized condition.

CAUTION:

- The current and voltage limitation has to be observed as per the tag plate.
- The wiring and connection should be carried out with proper gland and care should be taken to avoid water seepage.
- Confirm the area is non-hazardous before opening the cover of the enclosure for making electrical connections.
- The plugs given along with box are to be removed and metallic plug to be used.
- Ensure cable gland is properly fitted using sound engineering practice ensuring that rain water / other fluids do not enter in the limit switch box.
- The person who operates the limit switch should have enough knowledge of electrical engineering.

CAUTION IP67 / IP68:

- Ensure cable gland and gasket is properly fitted using sound engineering practice ensuring that rain water / other fluids do not enter in the limit switch box.
- Tighten the cover bolts fully to avoid water seepage inside the limit switch box.
- Use UCIL SYNCHEM make GRIP SEAL CABLE JOINING COMPOUND or equivalent to seal cable gland. For precaution & application of sealing compound use original manufacturers operational manual.

SPECIFIC CONDITIONS FOR USE OF Ex ia EQUIPMENT

- Only a damp cloth must be used while cleaning the surface of the limit switch.
- Supply has to be provided thru Exia approved barrier for intrinsically approved switches.
- Appropriate certified cable glands and plugs to be used.
- The plugs given along with box are to be removed and metallic plug to be used.
- Operating temperature range should not exceed then the mentioned on the tag plate
- Avoid electrostatic charges that can cause electrostatic discharge when installing.
- The information regarding the minimum ambient temperature for the switch as provided in the datasheet must also be observed.

SPECIFIC CONDITIONS FOR USE OF Ex d EQUIPMENT

- Equipment intended for use in explosive dust atmospheres may not be used at power levels exceeding 5A.
- The Equipment is rated as IP66 or IP68 (2m for 24 hours

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7. BENCH TESTING

To test the limit switch operation, follow these instructions

7.1 TESTING OF MICRO SWITCH V1, D1 & F1

1. Connect multi-meter (ohm-meter) across COM & NO terminal.
2. Check micro switch operation with continuity test.

When the switch is not actuated continuity should not exist between COM and NO. As the switch is actuated there should be continuity.

7.2 TESTING OF THE PROXIMITY SWITCH A1

Initial check before testing proximity sensors:

3. Ensure voltage is 8 V DC in open wire (PLC/DCS output) before connecting to V+ and V- terminals.
4. Connect the wires to V+ and V- terminals with right polarity. Make sure the connections are not loose.
5. Ensure target (metal) is in front of the switch sensing area (adjust both cams accordingly with respect to valve operation).
6. Ensure distance between target & switch sensing area should be as specified (from 1 to 3 mm)

Testing of proximity sensors:

1. Connect multi-meter (milli-ammeter) in series with V+ and V- terminals
2. Measure the current from V+ to V-

Current should be lower than 1 mA when target is in front of the switch.

When target is not in front of the switch, the current should be higher than 3 mA.

7.3 TESTING OF LIMIT SWITCH WITH PT

SECTION I: Test Setup

1. Connect the "+" of 24 V DC power supply to the "+" lead of the ammeter.
2. Connect the "-" lead of the ammeter to terminal 1 of the Transmitter.
3. Connect the "-" of the 24V DC power supply to terminal 2 of the Transmitter.

Test Transmitter by following SECTION II: Testing Procedure:

SECTION II: Testing Procedure:

Note:

1. Calibrate CLOSED/ 0° position:
   a. Set Limit Switch's shaft to COLSED / 0° condition of Limit Switch. Hold the "SET 4mA" button of Transmitter(T-) module until the red LED turns on or flashes.
2. Calibrate OPEN / 90° position:
   a. Rotate Limit Switch's shaft counterclockwise to OPEN / 90° condition of Limit Switch. Hold the "SET 20mA" button of Transmitter(T-) module until the green LED turns on or flashes.
3. Verify Calibration:
   a. Rotate Limit Switch's shaft between COLSED / 0° and OPEN / 90° several times. Verify currents at COLSED / 0° and OPEN / 90° are according to Table 1. Verify that ammeter's value change in a "smooth" manner when transitioning between 4mA to 20 mA. If unit fails, check calibration, andre-verify. If unit continue to fail, quarantine unit.

Function	CLOSED / 0° Criteria:	OPEN/ 90° Criteria:	Transition Criteria:
T	3.9 to 4.1mA	19.9 to 20.1mA	Smooth

8. MAINTENANCE

NOTE: THE LIMIT SWITCH MUST BE REMOVED FROM INSTALLATION AND WIRING MUST BE DISCONNECTED PRIOR TO MAINTENANCE. USE ONLY NELES ORIGINAL PARTS AS REPLACEMENTS.

The K series limit switches are designed to operate one million cycles without maintenance. It is recommended that preventive maintenance is done before reaching the one million cycles.

Verify the model and the version of the limit switch box and spares to be replaced.

Available spare part sets:

PCB assembly:

Sensors + PCB + terminals + screws

Seal kit:

Shaft seals + cover gasket

Shaft assembly:

Shaft + cam + O-rings

Select the correct spare part set ID from the table below

Table 1. Spare part kit ID-codes per device model			
Limit switch model	PCB assembly kit	Shaft assembly kit	Seal kit
KC2A1...	H166867	H166871	H166875
KC2V1...	H166868	H166872	H166875
KS2A1...	H166869	H166873	H166876
KS2V1...	H166870	H166874	H166876

9. DISASSEMBLY

WARNING:
ALL ELECTRIC AND PNEUMATIC CONNECTIONS SHOULD BE REMOVED BEFORE STARTING THE DISASSEMBLY.

CAUTION: MAKE SURE THE EXTRACTED PARTS WILL REMAIN CLEAN AND DO NOT GATHER ANY IMPURITIES WHILE DISASSEMBLING THEM.

NOTE: IT IS ADVISABLE TO REPLACE ALL THE RUBBER PARTS USING ORIGINAL NELES SPARE PART KIT (REFER TO CHAPTER 7 FOR THE RIGHT KIT)

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9.1 COVER DISASSEMBLY

Open the cover screws and remove the cover by lifting it vertically.

For KS series refer to **Figure 30** and for KC series refer to **Figure 31**.

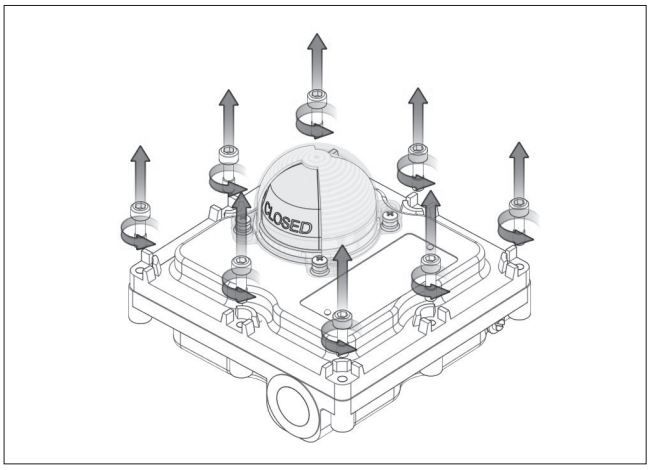


Figure 30. Removing the cover of KS series

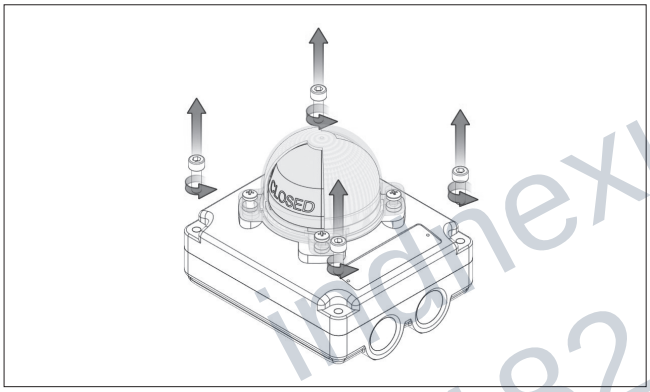


Figure 31. Removing the cover of KC-series

To disassemble the visual indicator, remove the four screws holding it in place and lift the dome vertically.

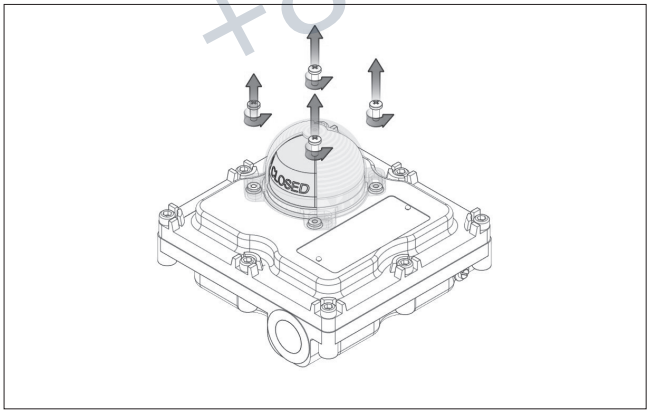


Figure 32. Visual indicator screws

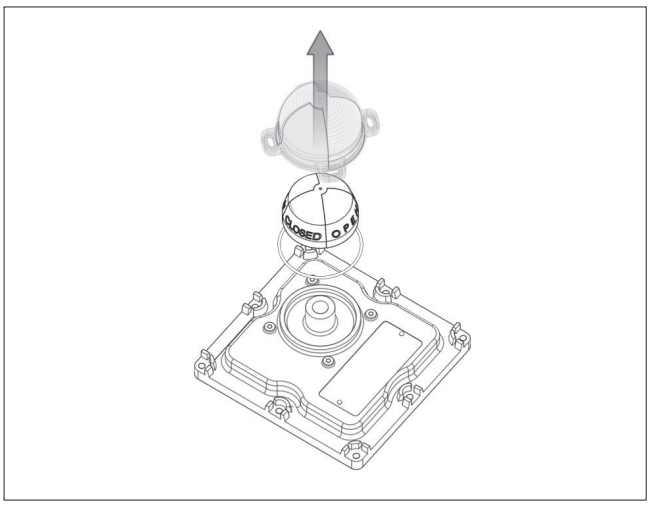


Figure 33. Disassembly of the visual indicator

9.2 SHAFT DISASSEMBLY

When disassembling the shaft of the device, pay attention to the O-rings and cams for not damaging them. In case they are damaged replace the shaft assembly.

To remove the shaft from the housing the circlip needs to be removed first. Use pliers to remove the circlip. Remove the shaft like in Figures 34 - 39 for V1, W1, A1, D1, F1 and R1 switches.

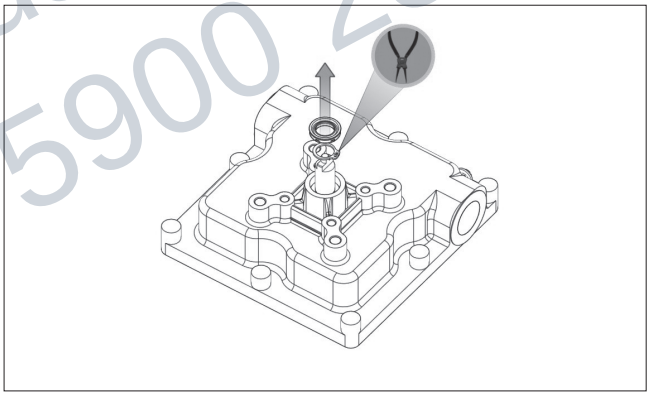


Figure 34. Removing the circlip

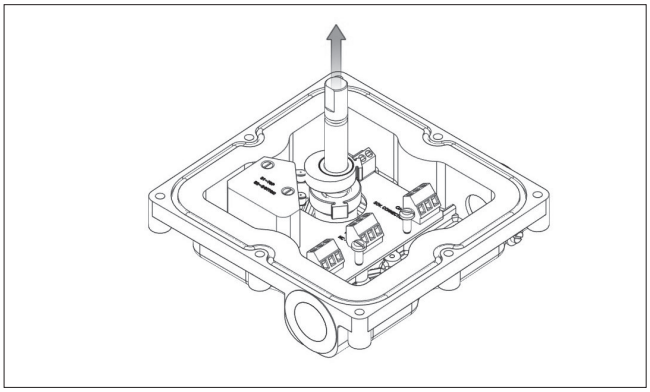


Figure 35. Removing the shaft of devices with V1 and W1 switches

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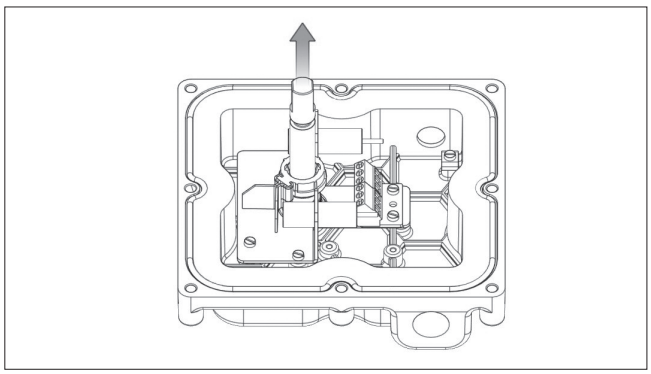


Figure 36. Removing the shaft of devices with A1 switches

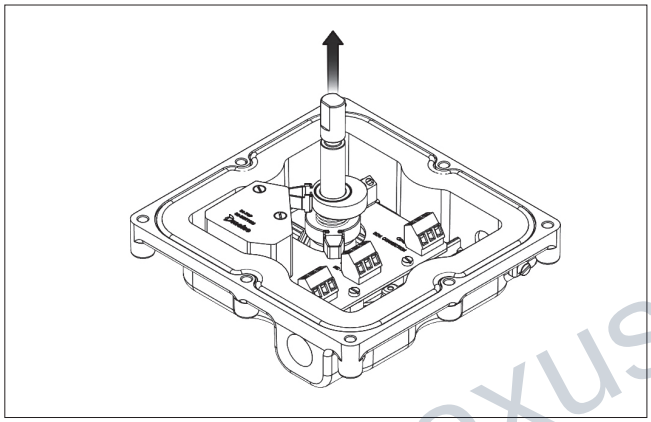


Figure 37. Removing the shaft of devices with D1 switches

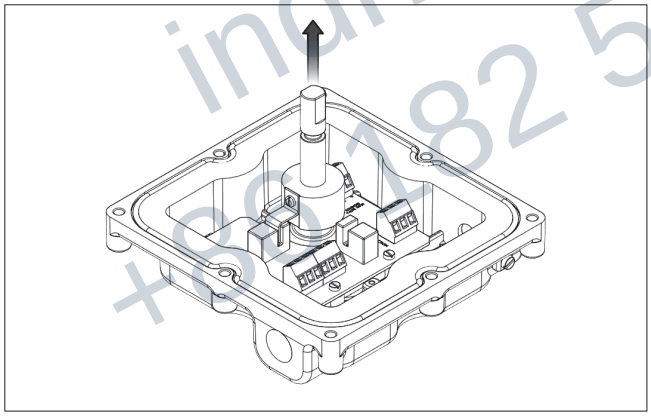


Figure 38. Removing the shaft of devices with F1 switches

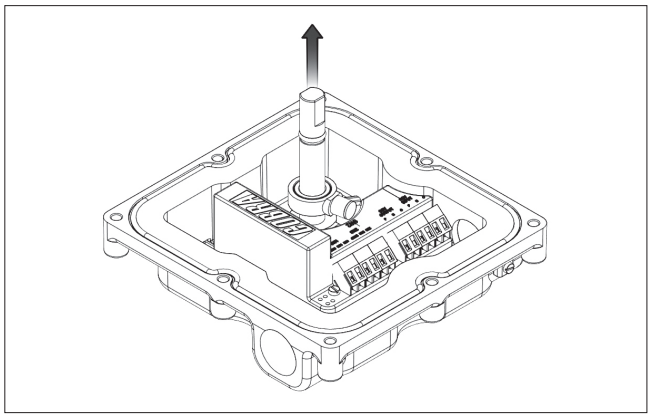


Figure 39. Removing the shaft of devices with R1 switches

9.3 SWITCH DISASSEMBLY

DISASSEMBLY OF SWITCH SWITCH V1, D1 & W1

Open the two screws holding the PCB in the housing and take out the PCB. Open the screws on top of the switch cover and lift the cover vertically to gain access to the switches.

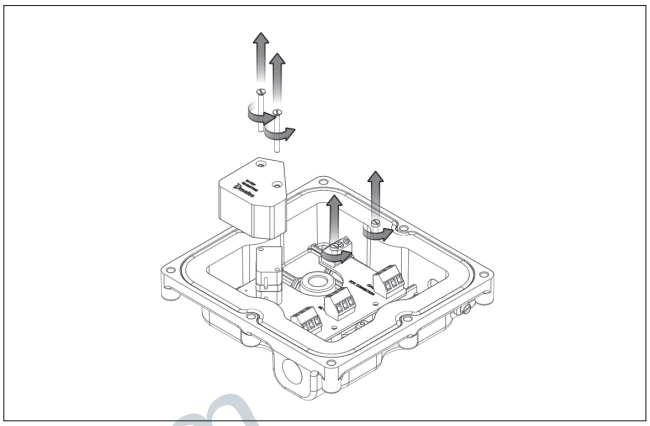


Figure 40. Removing the PCB and switch cover of V1, D1 and W1 switches

DISASSEMBLY OF SWITCH A1

Disconnect the switches from the terminal strip. Remove the screws holding the sensor mounting plate in place and remove the mounting plate from the housing. Remove the nuts holding the switches on the mounting plate and remove the switches.

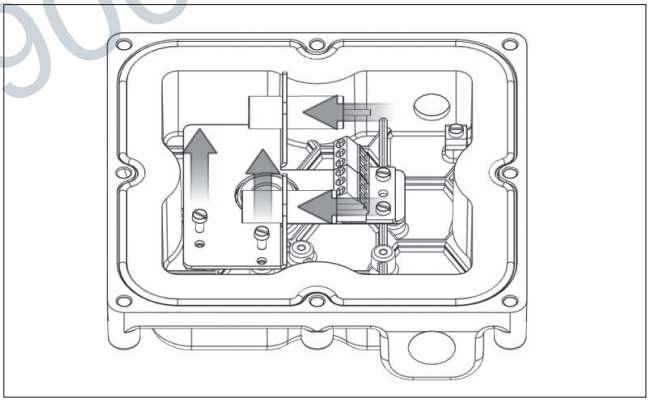


Figure 41. Removing the switch mounting plate and A1 switches

DISASSEMBLY OF SWITCH F1

Open the two screws holding the PCB in the housing and take out the PCB.

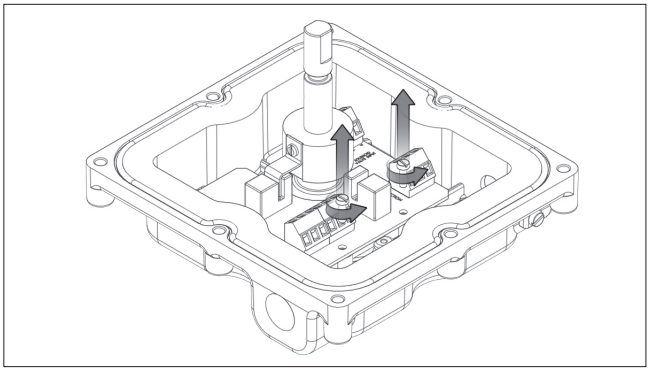


Figure 42. Removing the switch mounting plate and F1 switches

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DISASSEMBLY OF SWITCH R1

Dismantle the screw to take out the PCB. Dismantle the screw to take out the hermetically sealed micro switch. In case of burnt contact the contacts may show open contact. Replace the PCB completely with the switches

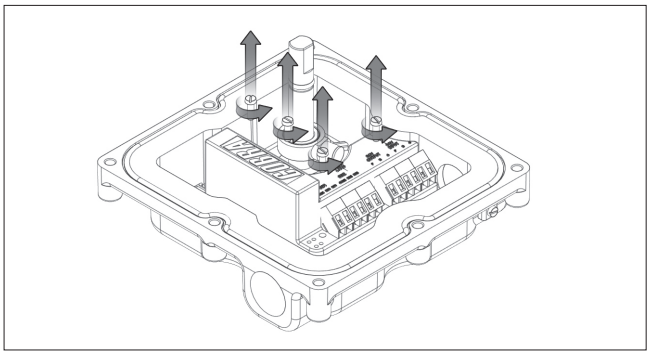


Figure 43. Removing the switch mounting plate and R1 switches

10. ASSEMBLY

<u>CAUTION:</u> WHEN ASSEMBLING THE PARTS BACK TO THE DEVICE MAKE SURE THAT CABLE GLAND IS PROPERLY FITTED TO ENSURE THE IP67 INGRESS PROTECTION CLASS FOR THE UNIT.

10.1 ASSEMBLY OF V1, D1 AND W1 SWITCHES

1. Insert the PCB to the housing and Install the shaft to the housing using grease as lubricant to avoid damage to the O-ring. Secure the shaft to the housing with the circlip and check the rotation and the vertical play of the shaft. The play should not exceed 0,05 mm.

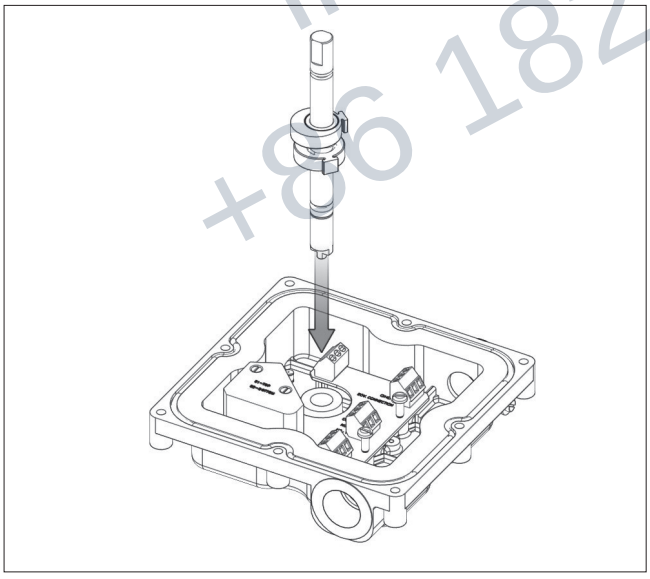


Figure 44. Inserting the shaft to a device with V1, D1 and W1 switches

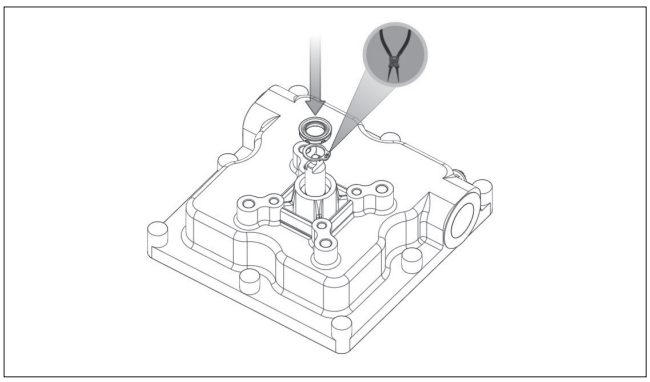


Figure 45. Inserting the circlip

2. Secure the PCB with the screws and reapply the switch cover on top of the switches. Secure the switch cover with the two screws. Set the cams as instructed in section 5.2.1.

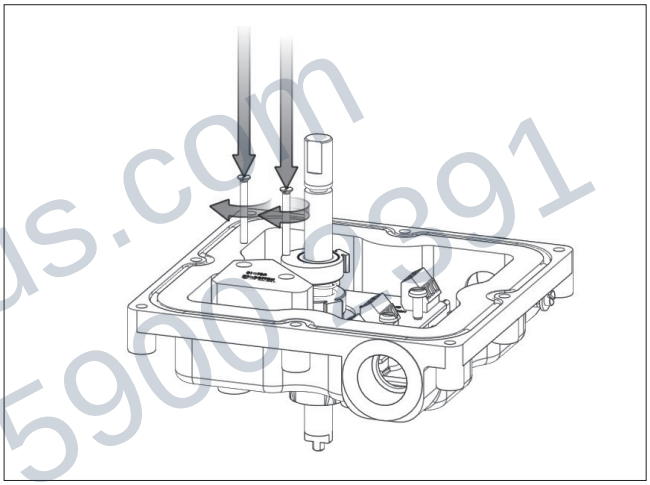


Figure 46. Inserting the switch cover of V1, D1 and W1 switches

3. Before reinserting the cover make sure the gasket between the housing and the cover is properly in its place and intact. Insert the cover on the unit by inserting the top end of the lubricated shaft to the indicator. If the shaft does not glide into the indicator, rotate the cover until it slides down on the shaft. Align the cover and housing and tighten the cover screws fully.

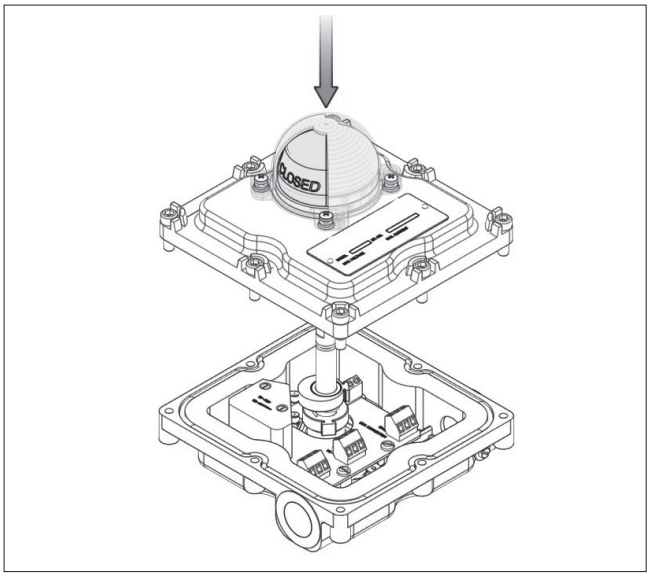


Figure 47. Assembling the cover

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10.2 ASSEMBLY OF A1 SWITCHES

1. Insert the switch mounting plate to the housing and Install the shaft to the housing using grease as lubricant to avoid damage to the O-ring. Secure the shaft to the housing with the circlip and check the rotation and the vertical play of the shaft. The play should not exceed 0,05 mm.

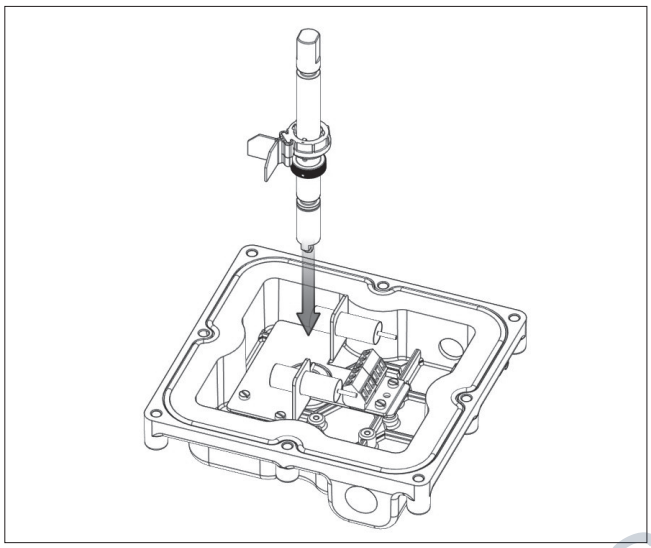


Figure 48. Inserting the shaft to a device with A1 switches

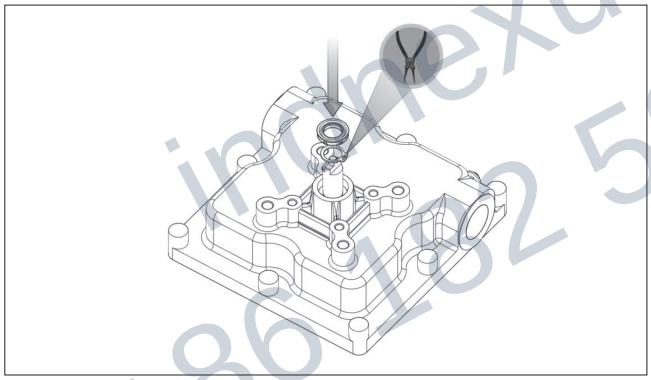


Figure 49. Inserting the circlip

2. Secure the switch mounting plate with the screws and set the twin cam as instructed in section 5.2.2.
3. Before reinserting the cover make sure the gasket between the housing and the cover is properly in its place and intact. Insert the cover on the unit by inserting the top end of the lubricated shaft to the indicator. If the shaft does not glide into the indicator, rotate the cover until it slides down on the shaft. Align the cover and housing and tighten the cover screws fully.

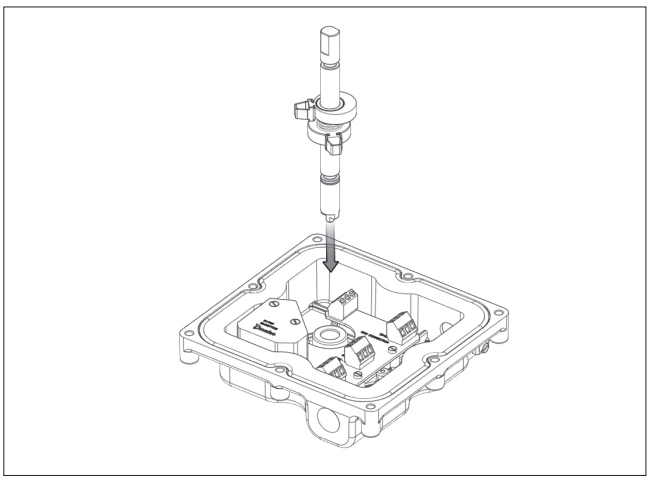


Figure 50. Inserting the shaft to a device with D1 switches

10.3 ASSEMBLY OF F1 SWITCHES

1. Insert the PCB to the housing and Install the shaft to the housing using grease as lubricant to avoid damage to the O-ring. Secure the shaft to the housing with the circlip and check the rotation and the vertical play of the shaft. The play should not exceed 0,05 mm.

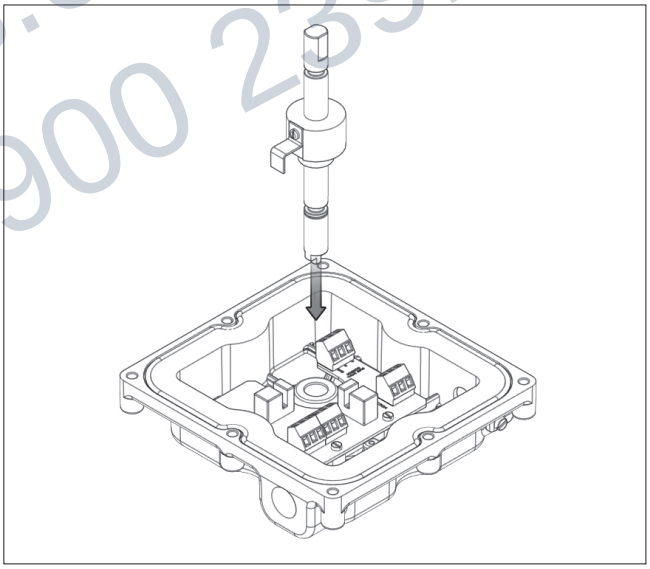


Figure 51. Inserting the shaft to a device with F1 switches

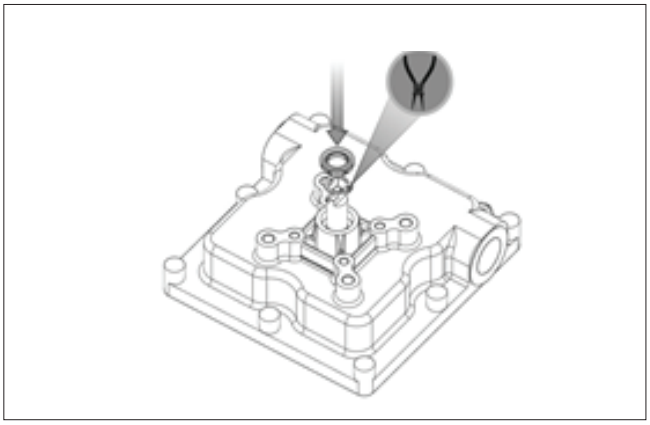


Figure 52. Inserting the circlip

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2. Secure the PCB with the two screws.
3. Before reinserting the cover make sure the gasket between the housing and the cover is properly in its place and intact. Insert the cover on the unit by inserting the top end of the lubricated shaft to the indicator. If the shaft does not glide into the indicator, rotate the cover until it slides down on the shaft. Align the cover and housing and tighten the cover screws fully.

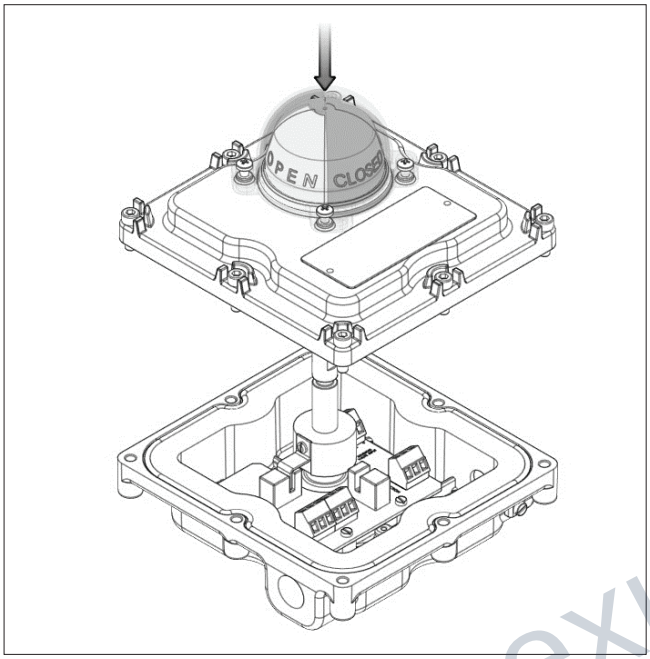


Figure 53. Assembling the cover

10.4 ASSEMBLY OF R1 SWITCHES

1. Insert the PCB to the housing and Install the shaft to the housing using grease as lubricant to avoid damage to the O-ring. Secure the shaft to the housing with the circlip and check the rotation and the vertical play of the shaft. The play should not exceed 0,05 mm.
2. Secure the PCB with the two screws.
3. Before reinserting the cover make sure the gasket between the housing and the cover is properly in its place and intact. Insert the cover on the unit by inserting the top end of the lubricated shaft to the indicator. If the shaft does not glide into the indicator, rotate the cover until it slides down on the shaft. Align the cover and housing and tighten the cover screws fully.

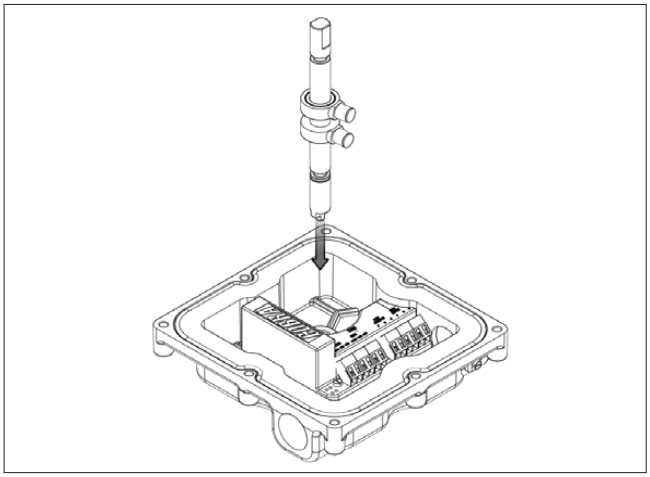


Figure 54. Inserting the shaft to a device with R1

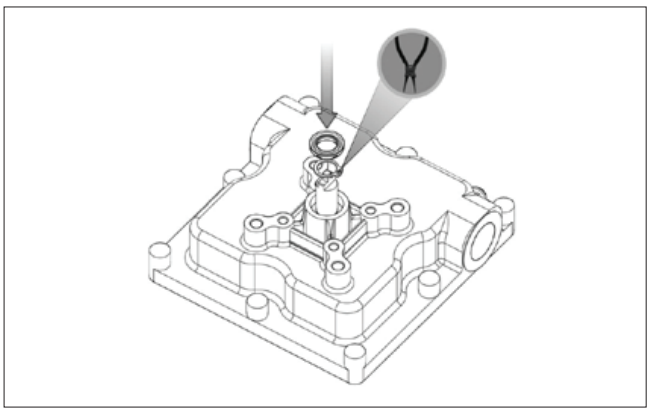


Figure 55. Inserting the circlip

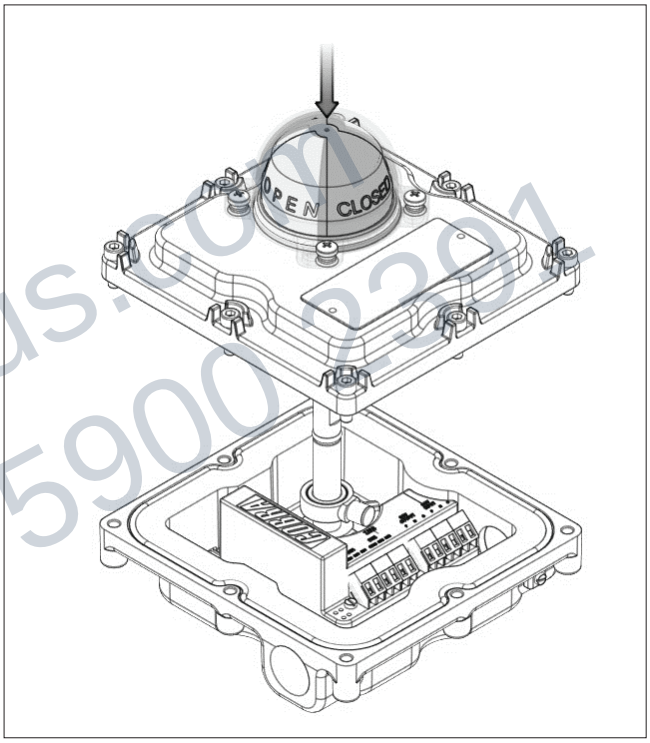


Figure 56. Assembling the cover

11. DISASSEMBLY

11.1 LIMIT SWITCH WITH PTR COVER DISASSEMBLY

1. Open the cover screw and remove the cover by lifting it vertically. For (KS + PTR) Series refer to Figure. 57 & for (KC + PTR) Series refer to Figure. 58.

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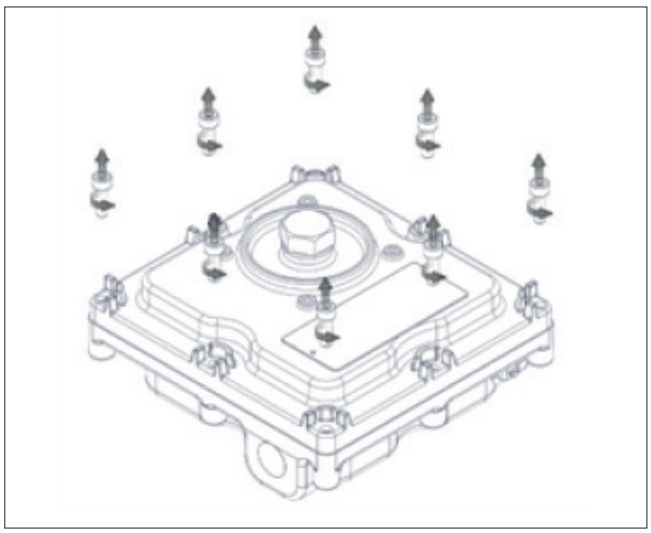


Figure 57. Remove the Cover of (KS + PTR) Series

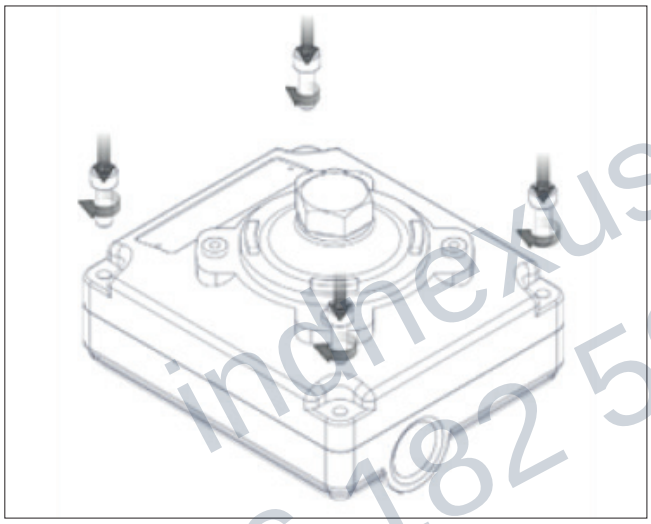


Figure 58. Remove the Cover of (KC + PTR) Series

2. Disassemble the Hexagonal Bolt, Washer & O-ring from the Cover as shown in Figure 59

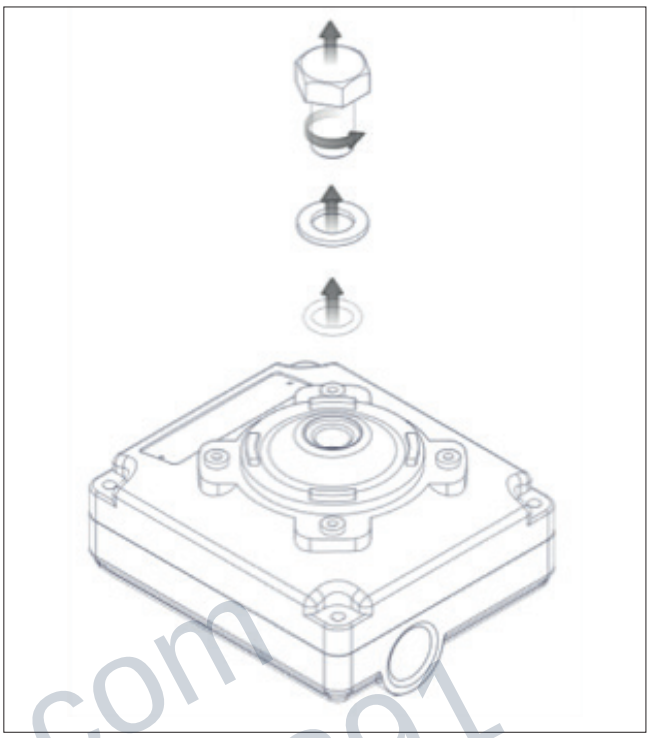


Figure 59. Remove the Hexagonal Bolt, Washer & O-ring

11.2 SHAFT DISASSEMBLY

NOTE: Before removing the Shaft from the device; follow the disassembly procedure of Positioner Transmitter (PTR) from the Housing Assembly. As it is mounted above the shaft.

When disassembly the shaft of the device, pay attention to the O-rings, Magnet & Magnet Holder for not damaging them. In case they are damaged replace the shaft assembly.

To remove the shaft assembly from the housing, the circlip needs to be removed first. Use pliers to remove the circlips. Remove the shaft like in Figure 60 for Limit Switch with PTR.

After removing the shaft assembly from the Housing; remove the Magnet, Magnet Holder, Pin, O-ring like shown in Figure 61.

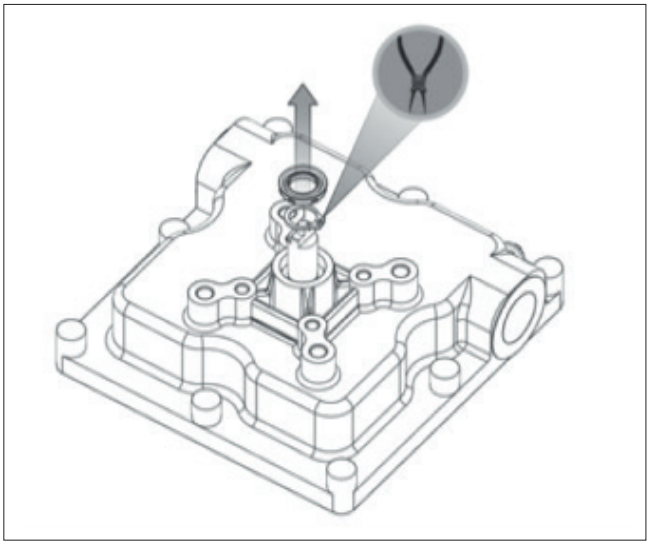


Figure 60. Removing the Circlip

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Figure 61. Removing the Shaft, Magnet & Magnet Holder

11.3 POSITIONER & MOUNTING PLATE DISASSEMBLY: -

Open the 2 Screw which are holding the Positioner transmitter (PTR) in the housing and lift the PTR as shown in Figure 62.

Remove the Mounting plate by removing the 3 Screw as shown in Figure 63.

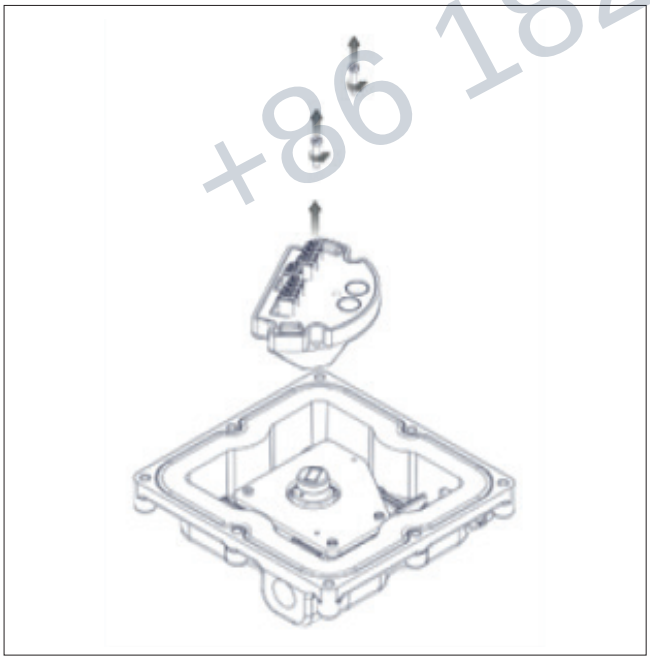


Figure 62. Removing the screw & Positioner Transmitter



Figure 63. Removing Mounting plate.

12. ASSEMBLY: -

12.1 ASSEMBLY OF POSITIONER & SHAFT ASSEMBLY

1. Mount the Magnet & Magnet Holder with the help of pin. And assemble the O-ring on the shaft.
   Install the shaft to the housing using grease as lubricant to avoid damage to the O-ring. Secure the shaft to the Hosing with circlip and check the rotation and the vertical play of the shaft. The play should not exceed 0.05mm.



Figure 64. Inserting the Shaft Assembly on the Housing.

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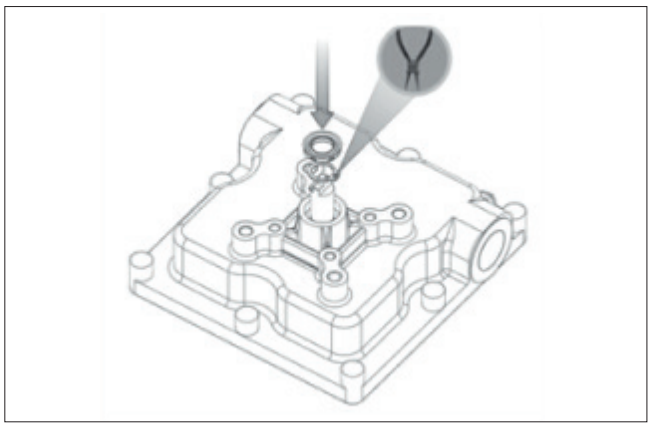


Figure 65. Inserting Circlip

2. Mount the Mounting Plate on the Housing with the help of 3 screw as shown in Figure 66

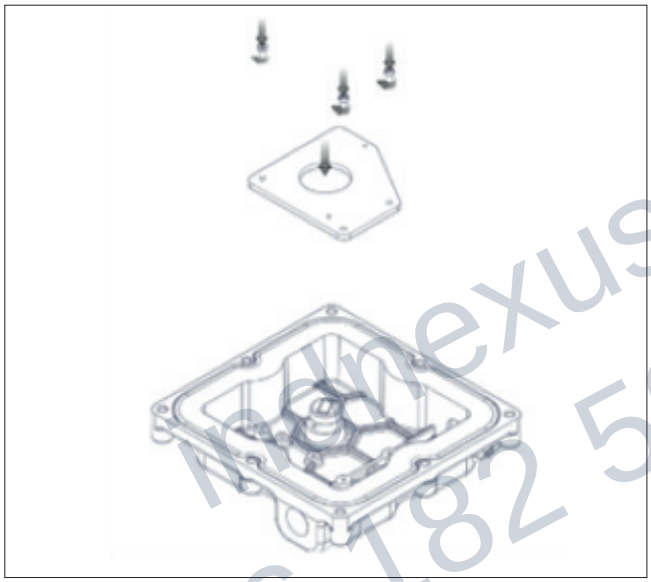


Figure 66. Assembling the Mounting Plate

3. Mount the Positioner Transmitter on the Housing Assembly with the 2 Screw as shown in Figure 67

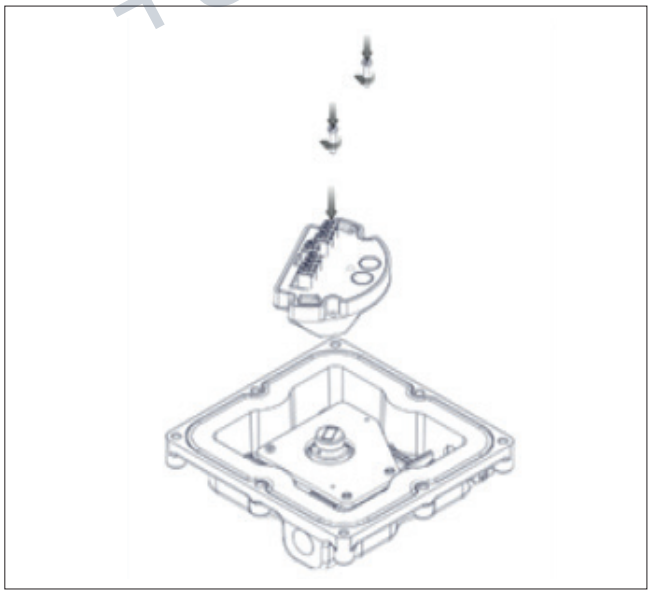


Figure 67. Assembling the Positioner Transmitter on Housing

4. Before reinserting the Cover make sure the gasket between the housing and the cover is properly in its place and intact. Insert the cover on the Unit & align the cover with the housing and tighten the Cover Screw fully as shown in Figure 68 for KS + PTR Series & Figure 69 for KC + PTR Series.
5. And assemble the Hexagonal Bolt with washer & O-ring on the Cover as shown in Figure 70

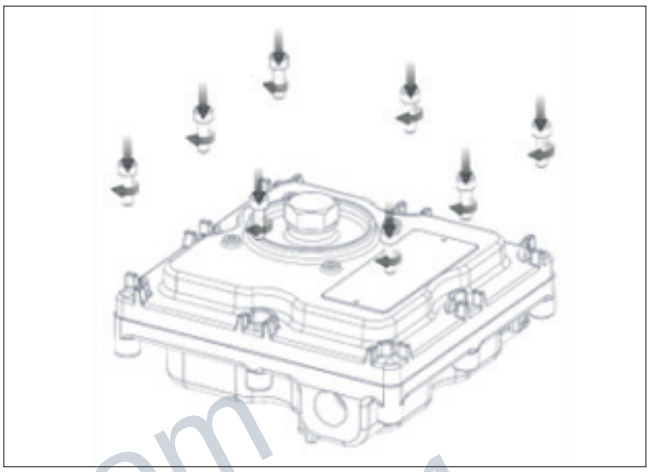


Figure 68. Assembling the Cover of (KS + PTR) Series

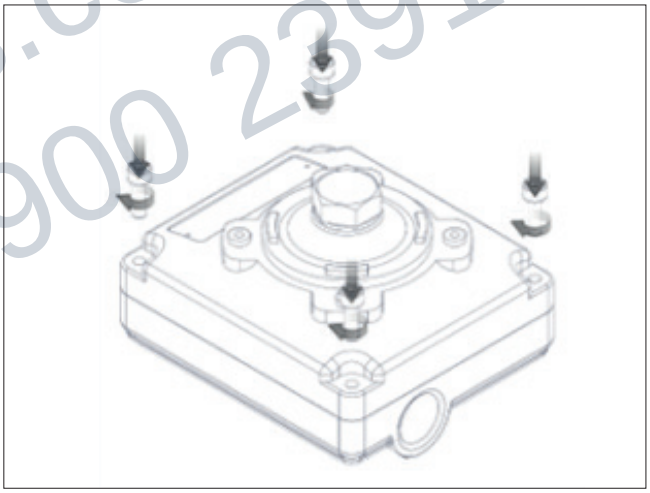


Figure 69. Assembling the Cover of (KC + PTR) Series

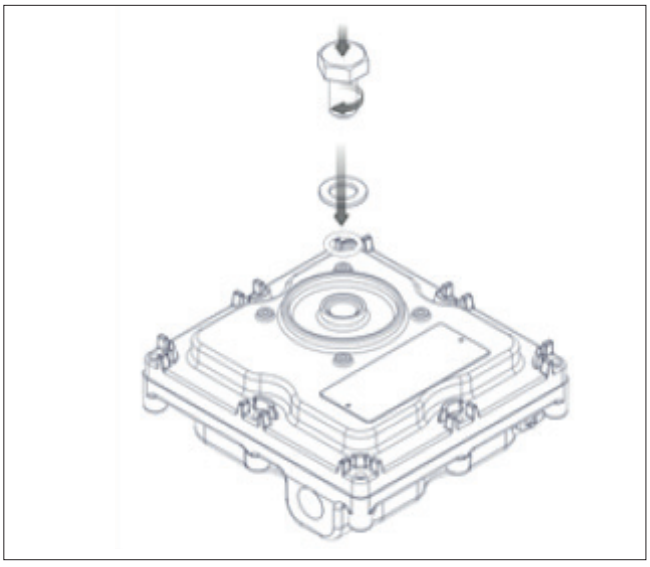


Figure 70. Assembling the Hexagonal Bolt, Washer & O-ring

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13. TROUBLE SHOOTING

Table 2. Trouble shooting of mechanical V1 and W1 switches		
Failure	**Check list**	**Corrective action**
No feedback	Check voltage & current	Make sure the DCS output is on a correct level / Tighten loose connections if found
	Check cam position	Adjust cam properly
	PCB soldering issue / PCB tack issue due to corrosion	Replace PCB
	Faulty micro switches	Replace micro switch

Table 3. Trouble shooting of inductive A1, D1, F1, R1 switches		
Failure	**Check list**	**Corrective action**
No feedback	Check polarity	Change the polarity if needed
	Check voltage & current	Make sure the DCS output is on a correct level / Tighten loose connections if found
	Check target (twin cam) position and its distance from sensing the area of the switch sensor	Adjust cam properly (adjust target position as specified by max. 1 to 3 mm distance)
	PCB soldering issue / PCB tack issue due to corrosion	Replace PCB
	Faulty proximity sensors	Replace sensors

Table 4. Trouble shooting of inductive R1 switches		
Failure	**Check list**	**Corrective action**
No feedback	Check polarity	Change the polarity if needed
	Check voltage & current	Make sure the DCS output is on a correct level / Tighten loose connections if found
	Check target (twin cam) position and its distance from sensing the area of the switch sensor	Adjust cam properly (adjust target position as specified by max. 1 to 3 mm distance)
	PCB soldering issue / PCB tack issue due to corrosion	Replace PCB
	Faulty proximity sensors	Replace sensors

14. TOOLS

Table 5. Needed tools for disassembling and assembling the devices	
Tool	**Tool specification**
1. Screw driver (tip style - sloted) for switch	3 mm
2. Screw driver (tip style - sloted) for plug	6-8 mm
Screw driver (tip style - phillips) for dome indicator	4 mm
4. Allen key for cover	4 mm
5. Nose plier for external circlip	(5 inch) 127 mm

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15. DIMENSIONS

KC Series with PTR

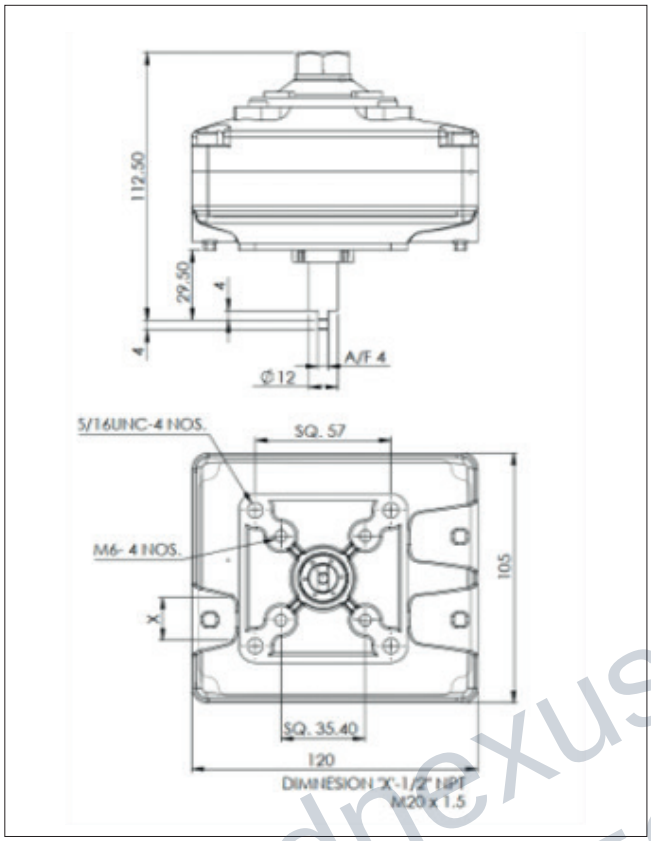


Figure 71. Dimensional drawing of the KC Series with PTR

KS Series with PTR

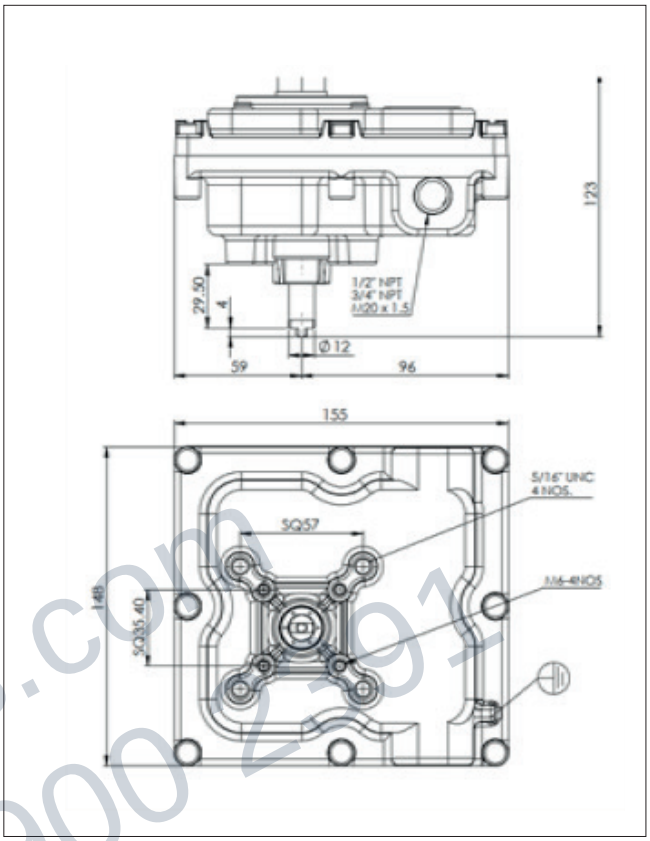


Figure 72. Dimensional drawing of the KS Series with PTR

KC series

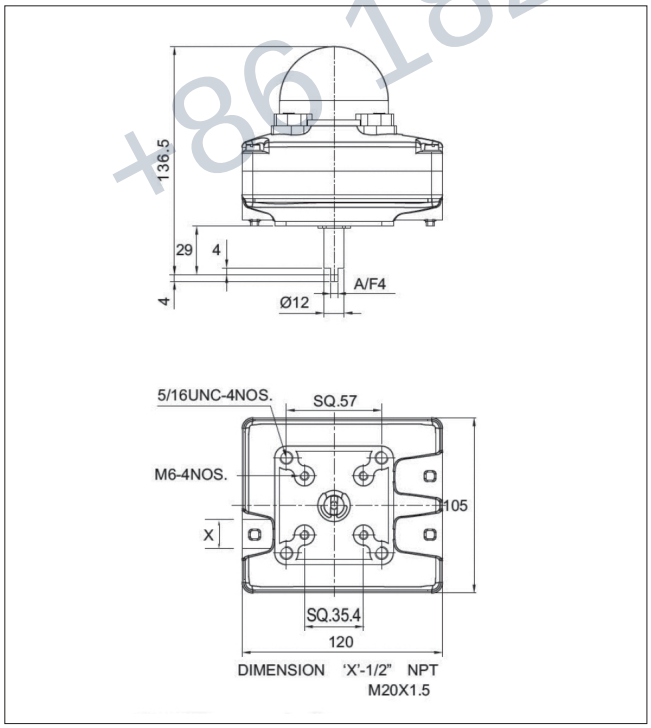


Figure 73. Dimensional drawing of the KC series

KS series

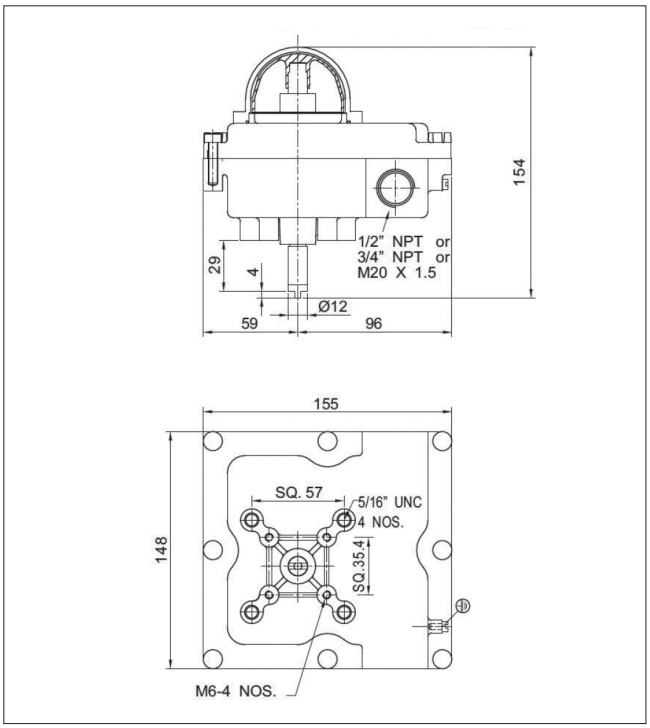
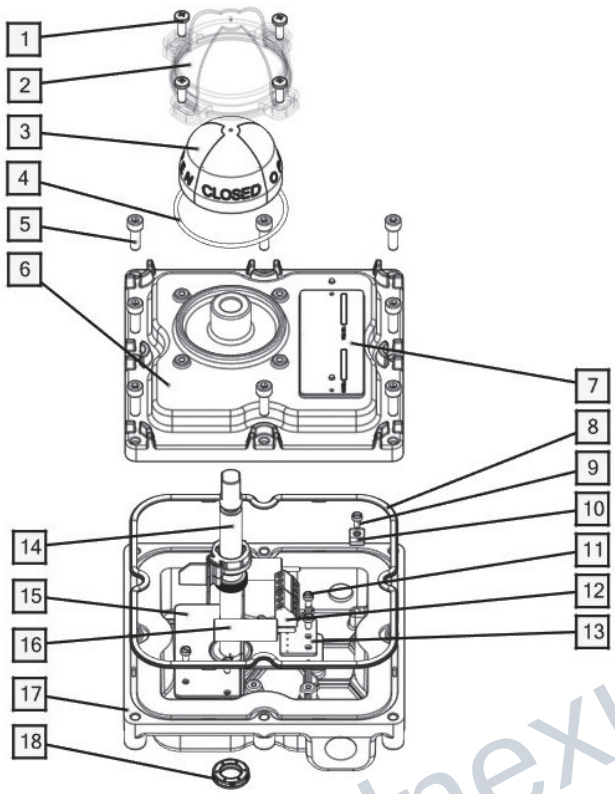


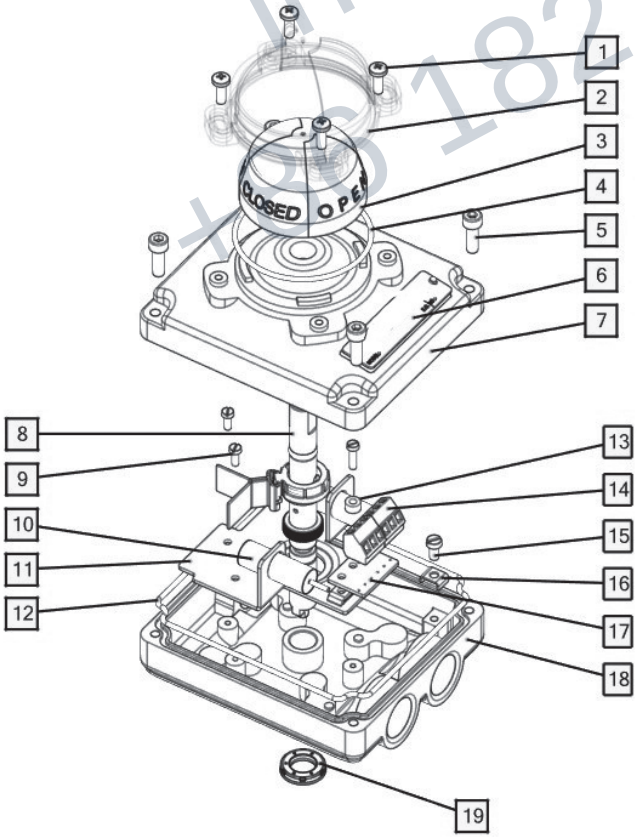
Figure 74. Dimensional drawing of the KC series

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16. EXPLODED VIEW AND PART LISTS

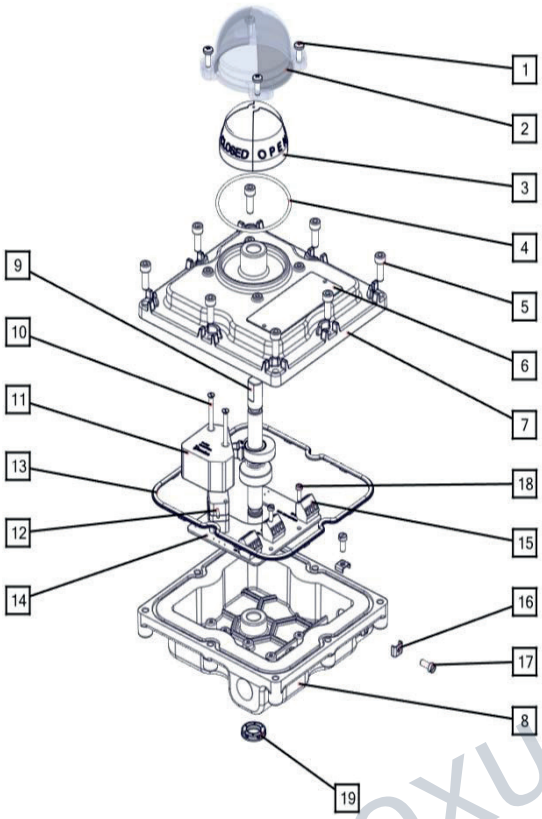


KS2A1		
SR NO.	**DESCRIPTION**	**QTY.**
1	Phillips head screw	4
2	Indicator cover	1
3	Indicator	1
4	O-ring	1
5	Non-falling screw	8
6	Cover	1
7	Name Plate	1
8	Gasket	1
9	Earthing screw	1
10	Earthing plate	1
11	Slot head screw	4
12	Three-way terminal block	2
13	PCB	1
14	Shaft assembly	1
15	Proximity sensor bracket	1
16	Proximity sensor	2
17	Housing	1
18	Wiper seal	1

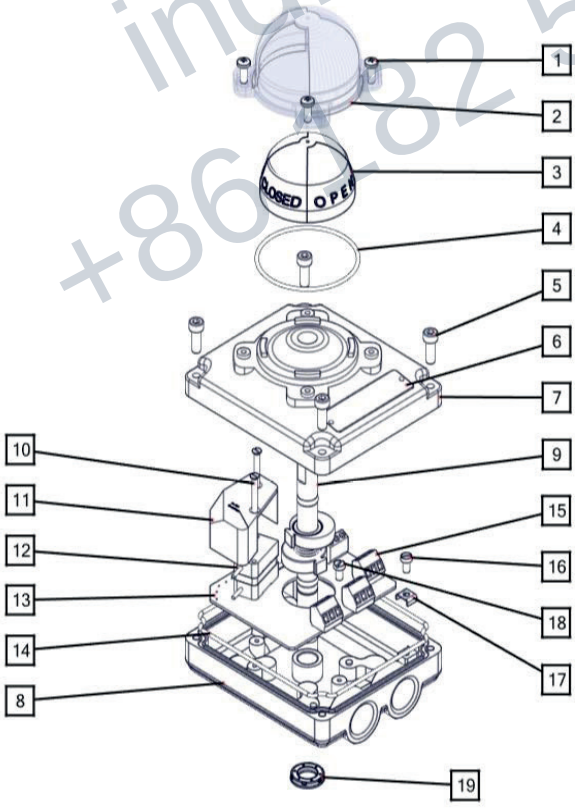


KC2A1		
SR NO.	**DESCRIPTION**	**QTY.**
1	Phillips head screw	4
2	Indicator cover	1
3	Indicator	1
4	O-ring	1
5	Non-falling screw	4
6	Name plate	1
7	Cover	1
8	Shaft assembly	1
9	Slot head screw	4
10	Proximity sensor	2
11	Proximity sensor bracket	1
12	Gasket	1
13	Bush	1
14	Three-way terminal block	2
15	Earthing screw	1
16	Earthing plate	1
17	PCB	1
18	Housing	1
19	Wiper Seal	1

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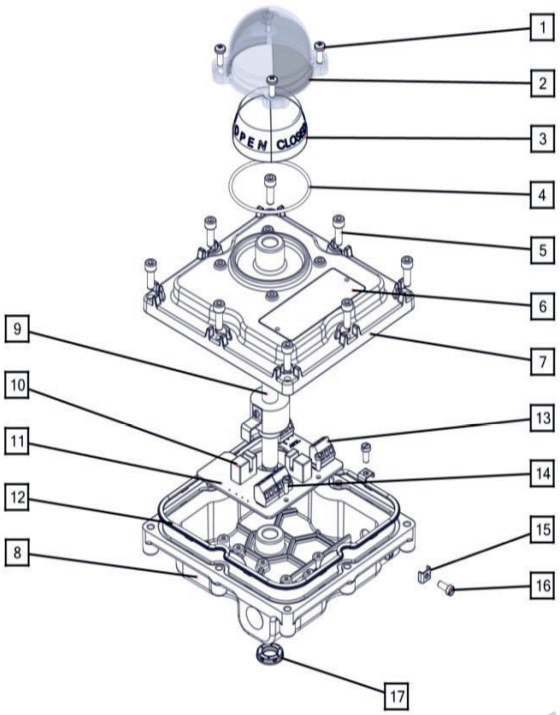


KS2D1		
SR NO.	**DESCRIPTION**	**QTY.**
1	Phillips head screw	4
2	Indicator cover	1
3	Indicator	1
4	O-ring	1
5	Non-falling screw	8
6	Name Plate	1
7	Cover	1
8	Housing	1
9	Shaft assembly	1
10	CHK Slot head screw	2
11	Microswitch cover	1
12	Microswitch	2
13	Gasket	1
14	PCB	1
15	Three-way terminal block	3
16	Earthing screw	2
17	Earthing plate	2
18	Slot head screw	2
19	Wiper seal	1

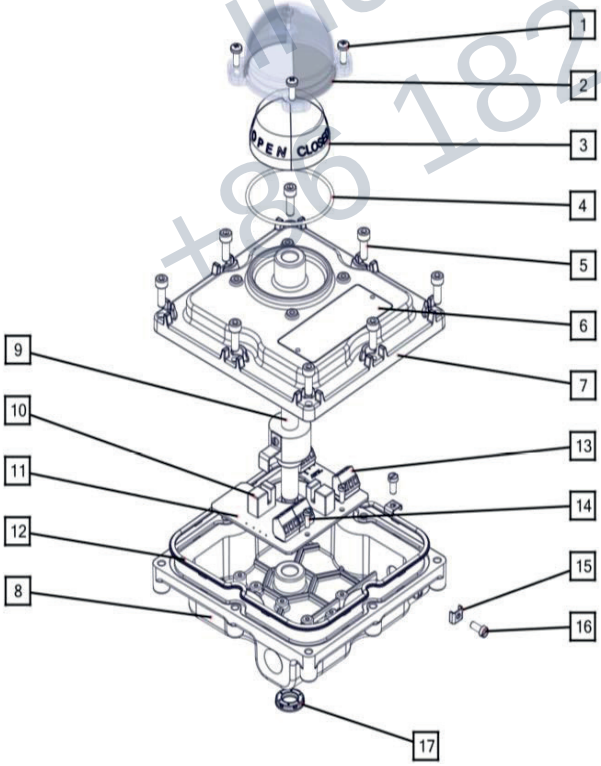


KC2D1		
SR.NO	**DESCRIPTION**	**QTY**
1	Phillips head screw	4
2	Indicator cover	1
3	Indicator	1
4	O-ring	1
5	Non-falling screw	4
6	Name plate	1
7	Cover	1
8	Housing	1
9	Shaft assembly	1
10	CHK Slot head screw	2
11	Microswitch cover	1
12	Microswitch	2
13	PCB	1
14	Gasket	1
15	Three way terminal block	4
16	Earthing screw	1
17	Earthing plate	1
18	Slot head screw	1
19	Wiper seal	1

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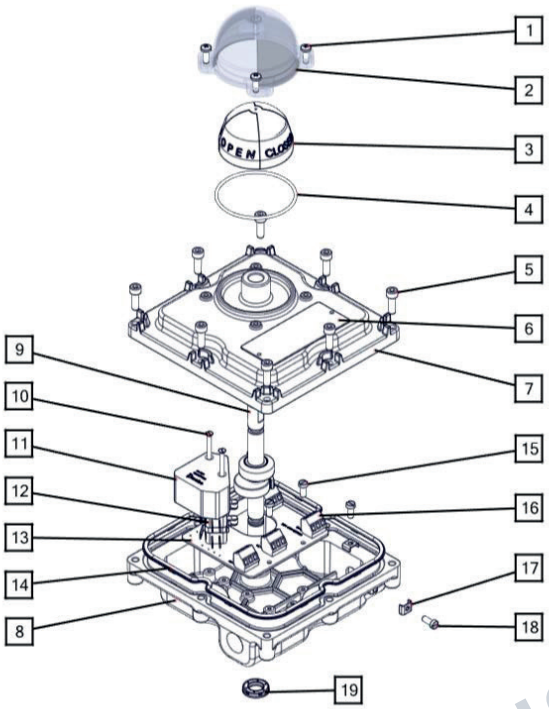


KS2F1		
SR.NO	**DESCRIPTION**	**QTY**
1	Phillips head screw	4
2	Indicator cover	1
3	Indicator	1
4	O-ring	1
5	Non-falling screw	8
6	Name plate	1
7	Cover	1
8	Housing	1
9	Shaft assembly	1
10	Proximity sensor	2
11	PCB	1
12	Gasket	1
13	Three-way terminal block	4
14	Slot head screw	2
15	Earthing plate	2
16	Earthing screw	2
17	Wiper seal	1

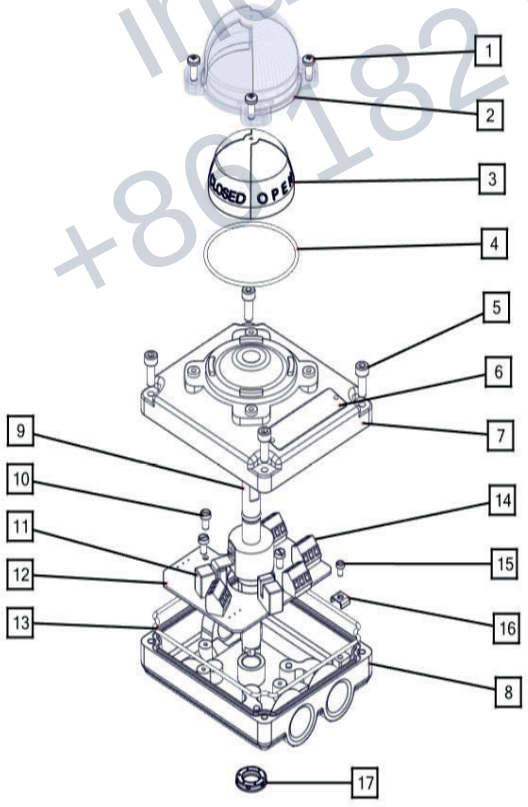


KC2F1		
SR.NO	**DESCRIPTION**	**QTY**
1	Phillips head screw	4
2	Indicator cover	1
3	Indicator	1
4	O-ring	1
5	Non-falling screw	4
6	Name plate	1
7	Cover	1
8	Housing	1
9	Shaft assembly	1
10	Slot head screw	3
11	Proximity sensor slot type	2
12	PCB	1
13	Gasket	1
14	Three-way terminal block	4
15	Earthing screw	1
16	Earthing plate	1
17	Wiper seal	1

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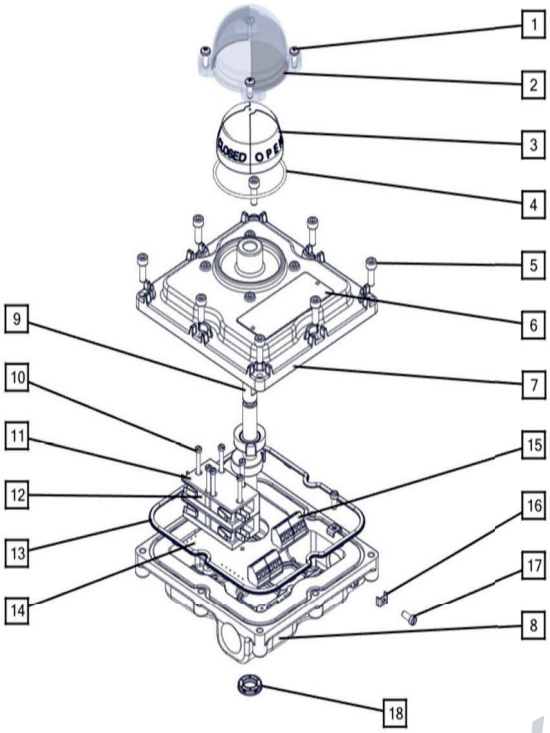


KS2V1		
SR NO.	**DESCRIPTION**	**QTY.**
1	Phillips head screw	4
2	Indicator cover	1
3	Indicator	1
4	O-ring	1
5	Non-falling screw	8
6	Name Plate	1
7	Cover	1
8	Housing	1
9	Shaft assembly	1
10	CHK Slot head screw	2
11	Microswitch cover	1
12	Microswitch	2
13	PCB	1
14	Gasket	1
15	Slot head screw	2
16	Three-way terminal block	4
17	Earthing plate	2
18	Earthing screw	2
19	Wiper seal	1

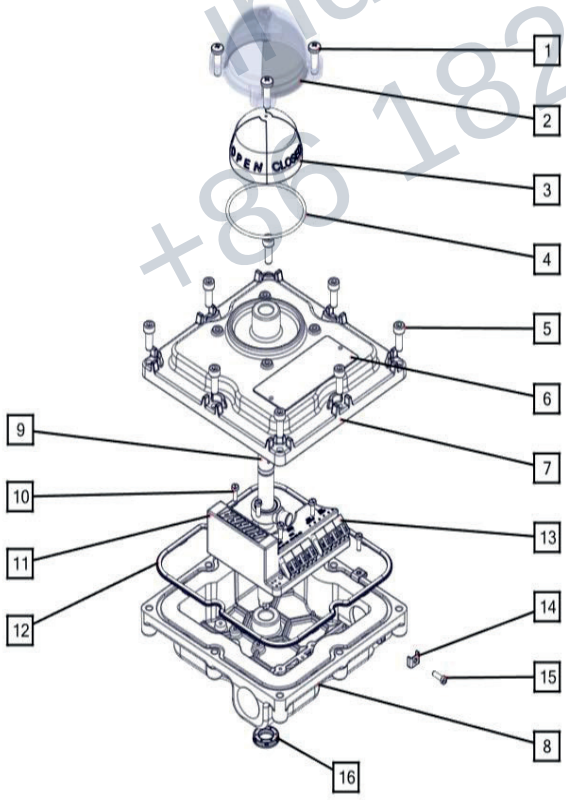


KC2F1		
SR.NO	**DESCRIPTION**	**QTY**
1	Phillips head screw	4
2	Indicator cover	1
3	Indicator	1
4	O-ring	1
5	Non-falling screw	4
6	Name plate	1
7	Cover	1
8	Housing	1
9	Shaft assembly	1
10	Slot head screw	3
11	Proximity sensor slot type	2
12	PCB	1
13	Gasket	1
14	Three-way terminal block	4
15	Earthing screw	1
16	Earthing plate	1
17	Wiper seal	1

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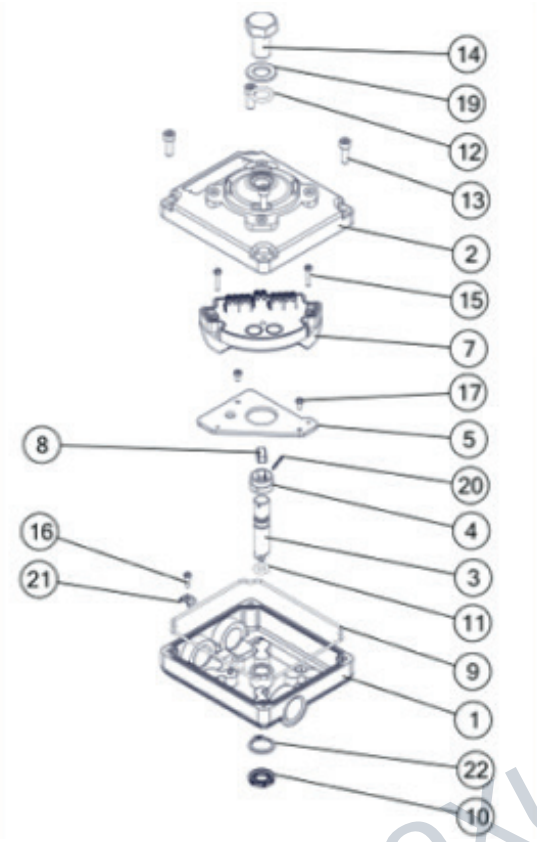


KS2W1		
SR NO.	**DESCRIPTION**	**QTY.**
1	Phillips head screw	4
2	Indicator cover	1
3	Indicator	1
4	O-ring	1
5	Non-falling screw	8
6	Name Plate	1
7	Cover	1
8	Housing	1
9	Shaft assembly	1
10	Slot head screw	6
11	Microswitch cover	2
12	Microswitch	4
13	Gasket	1
14	PCB	1
15	Three-way terminal block	4
16	Earthing plate	2
17	Earthing screw	2
18	Wiper seal	1

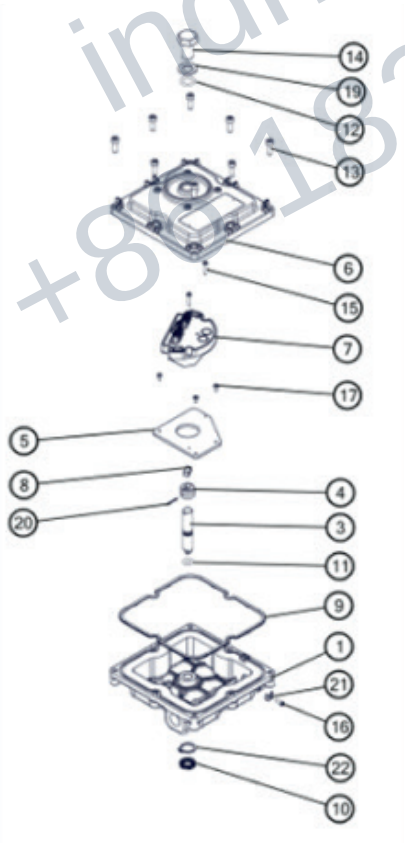


KS2R1		
SR NO.	**DESCRIPTION**	**QTY.**
1	Phillips head screw	4
2	Indicator cover	1
3	Indicator	1
4	O-ring	1
5	Non-falling screw	8
6	Name Plate	1
7	Cover	1
8	Housing	1
9	Shaft assembly	1
10	CHK Slot head screw	4
11	Reed switch	1
12	Gasket	1
13	Three-way terminal block	4
14	Earthing plate	2
15	Earthing screw	2
16	Wiper seal	1

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KC with PTR		
SR NO.	**DESCRIPTION**	**QTY.**
1	Cover	1
2	Housing	1
3	Shaft	1
4	Shaft Bushing	1
5	Mounting Plate	1
6	Name Plate	1
7	Sensor	1
8	Magnet	1
9	Gasket	1
10	Wiper Seal	1
11	O-ring 7.59 x 2.62 C/S	1
12	O-ring 13.95 x 2.62 C/S	1
13	Non-Falling Screw	4
14	Hexagonal Bolt	1
15	Screw M3 X 16	2
16	Screw M4 X 8	2
17	Screw M3 X 8	3
18	Round Head Screw	2
19	Washer	1
20	Spring Pin	1
21	Clamp	2
22	Retainer Ring	1
23	Plug	3



KS with PTR		
SR NO.	**DESCRIPTION**	**QTY.**
1	Cover	1
2	Housing	1
3	Shaft	1
4	Shaft Bushing	1
5	Mounting Plate	1
6	Name Plate	1
7	Sensor	1
8	Magnet	1
9	Gasket	1
10	Wiper Seal	1
11	O-ring 7.59 x 2.62 C/S	1
12	O-ring 13.95 x 2.62 C/S	1
13	Non-Falling Screw	8
14	Hexagonal Bolt	1
15	Screw M3 X 16	2
16	Screw M4 X 8	2
17	Screw M3 X 8	3
18	Round Head Screw	2
19	Washer	1
20	Spring Pin	1
21	Clamp	2
22	Retainer Ring	1
23	Plug	2

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