

PNEUCON AUTOMATION LIMIT SWITCHES



Installation, Maintenance and
Operating Instructions

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READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the limit switch.
 If you require additional assistance, please contact the manufacturer or manufacturer's representative.
 Addresses and phone numbers are printed on the back cover.
 See also www.metso.com/valves for the latest documentation.

SAVE THESE INSTRUCTIONS!

1. GENERAL

Introduction

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

PNEUCON AUTOMATION retains all the rights of this publication.

The aim of this manual is to support the use of products in the correct manner, and all the technical information provided in the catalogue.

All the details within the catalogue and this manual is subject to change without notice.

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 www.pneuconautomation.com at all times.

PNEUCON AUTOMATION will not be responsible for any damage whatsoever arising from the use of the limit switch box due to misuse or incorrect installation or misinterpretation of the information contained herein

Definitions

The following definitions given here are used in this document.

WARNING:

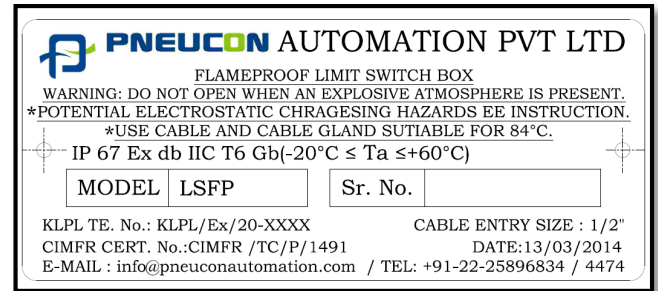
IF NOT OBSERVED, USER INCURS A HIGH RISK OF SEVERE DAMAGE TO THE PRODUCT AND/OR INJURY TO PERSONNEL.

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.

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



Safety precautions

CAUTION: NO MECHANICAL REWORK ALLOWED BY CUSTOMER!

MECHANICAL REWORK INCREASES THE RISK OF DEVICE MALFUNCTION. ONLY TRAINED AND SKILLED SERVICE PERSONNEL OF METSO 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.

Warranty

Warranty of the **PNEUCON AUTOMATION** 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 **PNEUCON AUTOMATION** Terms and Conditions.

2. OPERATING PRINCIPLE

The operating rod of the limit switch is engaged with the shaft of actuator (or any other rotary device), on rotation of the actuator shaft the limit switch operating rod rotates and thus provided the electrical and visual signal as desired

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 ... +60 °C / -4 ... +140 °F

Protection class: IP67

Body:

Epoxy powder coated, low copper die cast aluminum (LM6) /

Internal parts:

Shaft: AISI304
Cams: ABS
PCB: Grade FR4
Fasteners: AISI 304
Sealing: Nitrile rubber (NBR)

Switches :

- | | |
|--------------------|--|
| 01: | Mechanical micro switch,
Honeywell V15S05-
CZ100A05-01 |
| Electrical values: | 5 A @ 125/250 VAC, 0.1Amp @
48 VDC , NO / NC |
| 03: | Inductive proximity switch, P+F
NJ2-12GM-N 2-wire type, Namur NC |
| Supply voltage: | 8 V DC , NC |
| 05: | Inductive proximity switch, P+F
NBN4-12GM40-Z0 2-wire type,
NO |
| Supply voltage: | 5 - 60 V DC |
| 11: | Inductive proximity switch, P+F
NJ2-V3-N 2-wire type, Namur NC |
| Supply voltage: | 8 V DC, 3mA, NC |
| 12: | Inductive proximity switch, P+F
NBB3-V3-Z4 2-wire type, NO |
| Supply voltage: | 10-60 V DC, 100mA, NO |
| 13: | Inductive proximity switch, P+F
NBB3-V3-Z4 2-wire type, NO |
| Supply voltage: | 10-60 V DC, 100mA, NO |

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 CERTIFIED 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

limit switch mounting face follows the ISO 5211 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 ISO 5211 mounting standard. To mount the limit switch on 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.

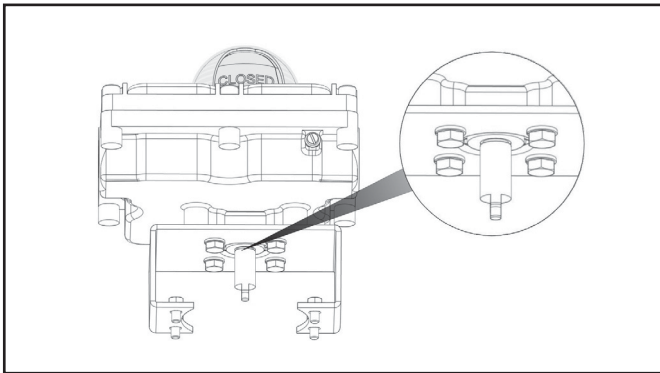


Figure 1. Example of mounting bracket

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

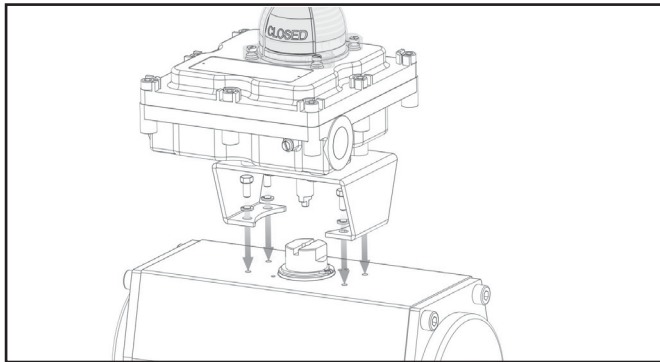


Figure 2 Mounting on an actuator

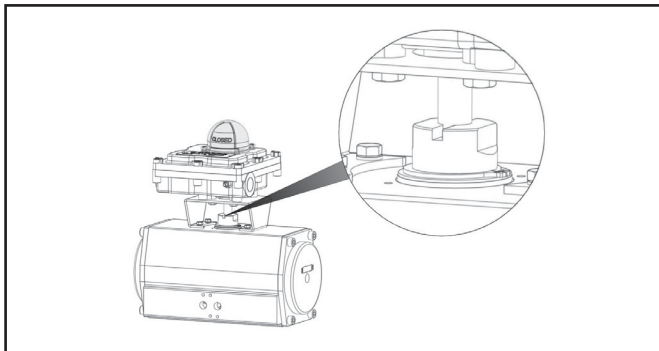


Figure 3 Aligning the shaft

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

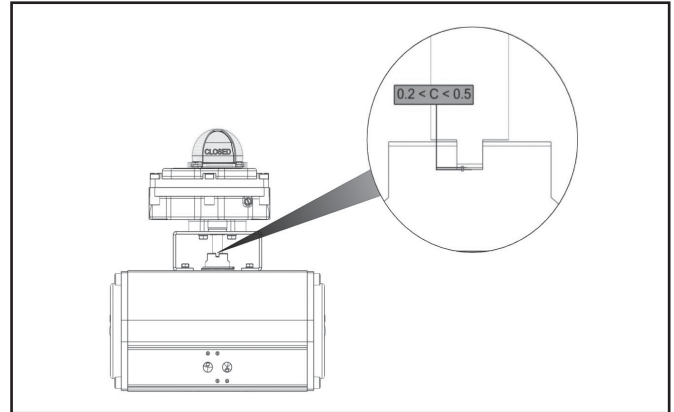


Figure 4 Clearance of the shaft

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.

5.2 Cam setting

5.2.1 Switch type 01, 11

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.

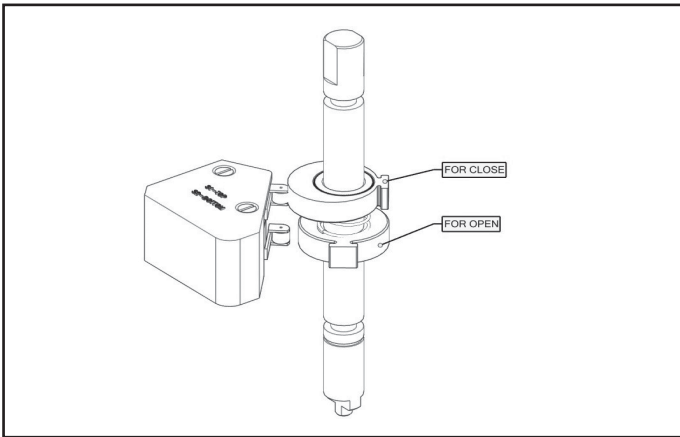


Figure 5 Cam placement on devices with 01 & 11 switches

Operate the actuator to bring the valve in closed position. Use the upper (red) cam to set the closed position. Switch should not be actuated. Press the cam down and rotate it to same direction as the actuator rotation while driving to close position (typically clockwise) 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

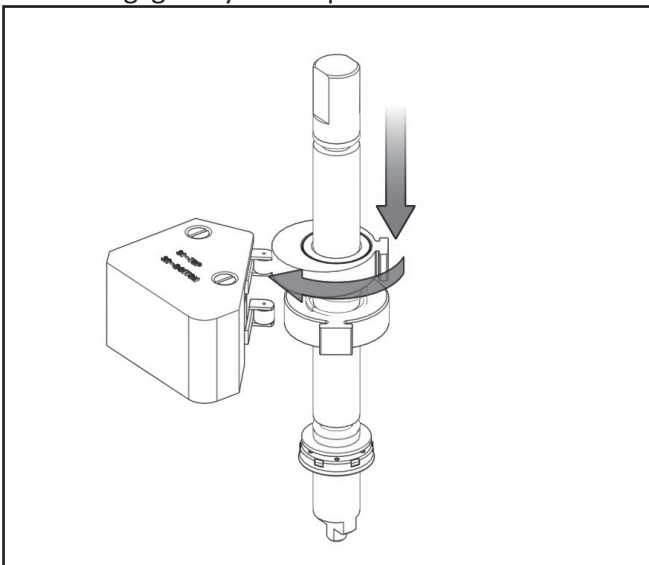


Figure 6 Adjusting the upper cam

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.

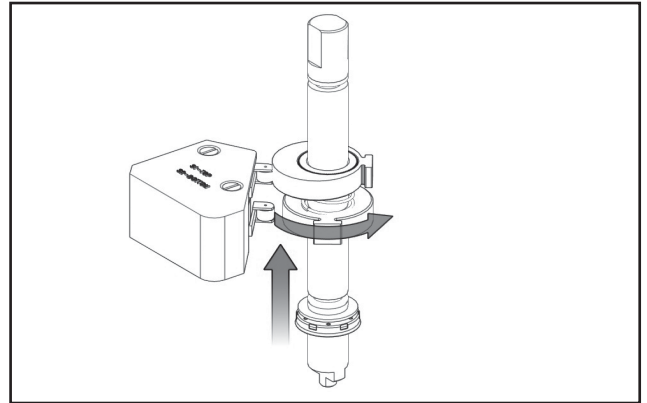


Figure 7 Adjusting the lower cam

5.2.2 Switch type 03

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.

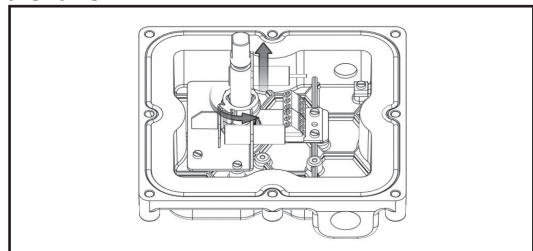


Figure 8 Adjusting the twin cam

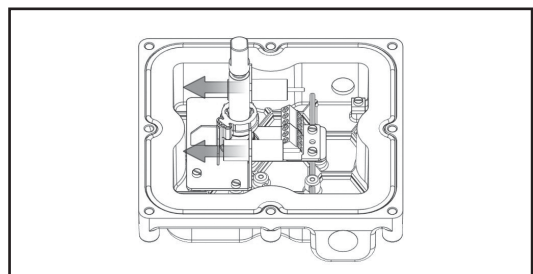


Figure 9 Adjusting the inductive sensors

5.2.3 Switch type13

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

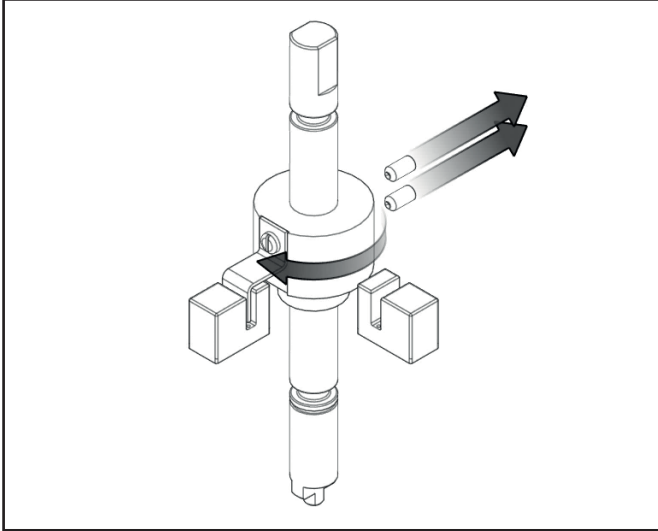


Figure 10 Adjusting the cam clockwise

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.

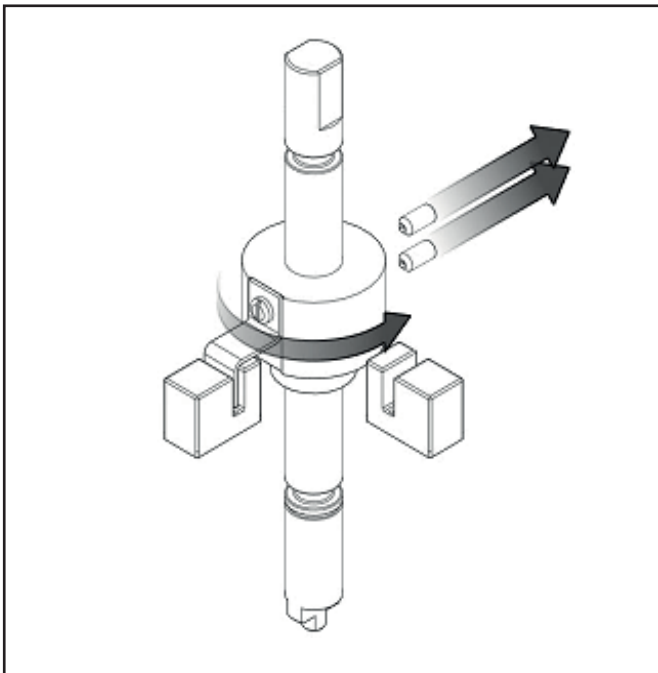


Figure 11 Adjusting the cam Counter clockwise

5.3 Wiring diagrams

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

5.3.1 Switch type 01, 11 & 13

Below are the wiring diagram and the locations of the terminal strips on the PCB for limit switch type 01. 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).

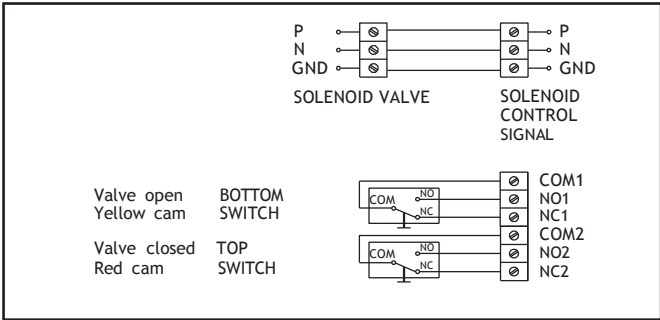


Figure 12 Mechanical micro switch, 01, 11 and 13

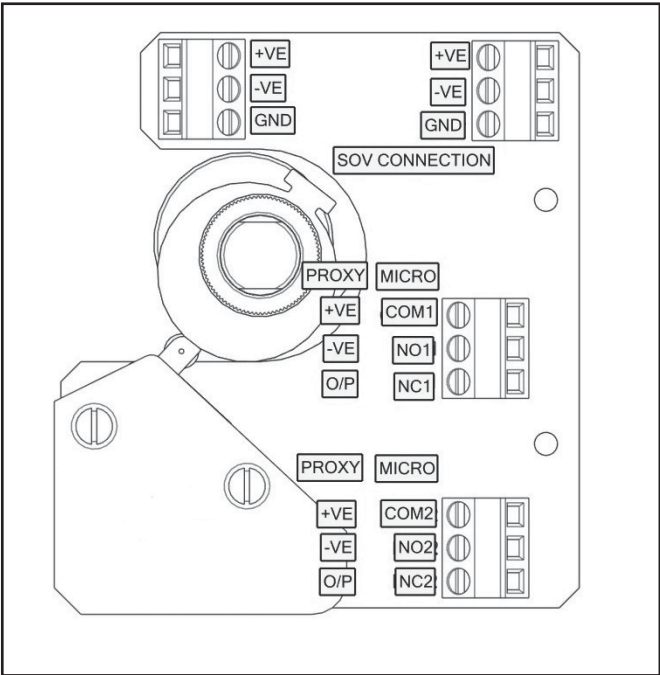


Figure 13 PCB layout of devices with 01 switches

5.3.2 Switch type 03

Below are the wiring diagram and the location of the terminal strip on the PCB for limit switch type 03.

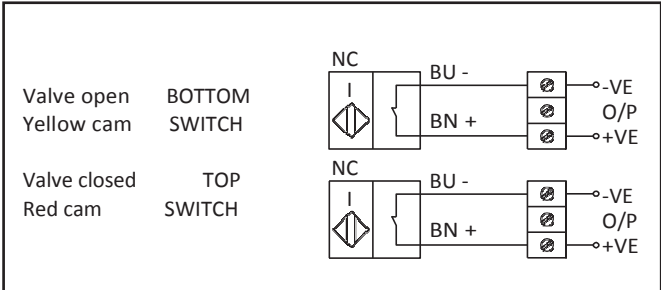


Figure 14 Wiring diagram of 03 switches

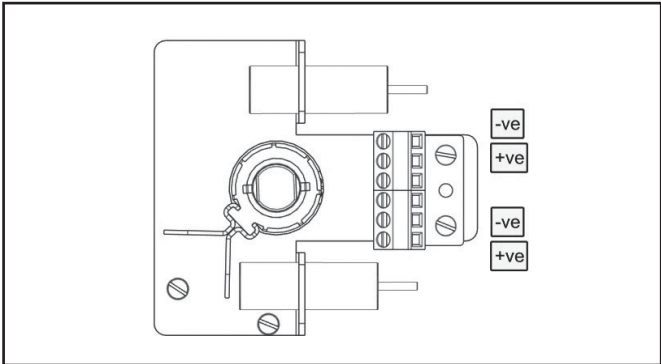


Figure 15 PCB layout of devices with 03 switches

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 :

- 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 db EQUIPMENT

- 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
- The information regarding the minimum ambient temperature for the switch as provided in the datasheet must also be observed.
- PNEUCON AUTOMATION limit switch is provided with the interface in accordance with ISO 5211.
- PNEUCON AUTOMATION has maintained larger lengths and more stringent gaps that required by standard. The user must be refer to manufacture before carrying out any repair or refurbishment to the equipment. The gap gaps observed in approved drawing must never be exceeded.
- The fastening screw for housing and cover with flange joint shall be stainless steel socket head cap screw of size M6 x 1P x 20L - 6g, property class A2-70 and minimum yield stress of 450Mpa.
- Potential electrostatic charging hazard-clean with damp cloth.
- Use cable and cable gland suitable for temperature of 84°C.

7. BENCH TESTING

To test the limit switch operation, follow these instructions

Testing of micro switch 01, 11 & 13

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

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

Testing of the proximity switch 03

Initial check before testing proximity sensors:

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

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.

8. MAINTENANCE

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

The 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.

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 METSO SPARE PART KIT (REFER TO CHAPTER 7 FOR THE RIGHT KIT)

Cover disassembly

Open the cover screws and remove the cover by lifting it vertically. For flameproof or weatherproof pl figure16.

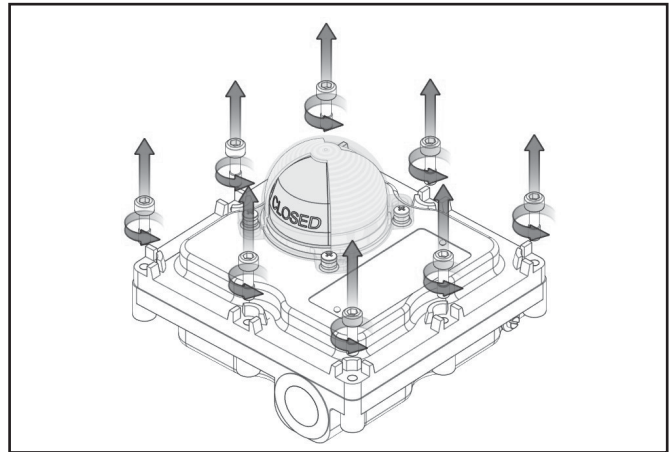


Figure 16 Removing the cover of limit switch (WP or FP)

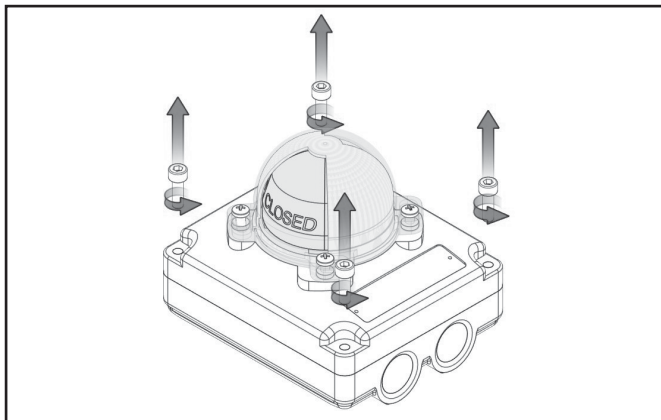


Figure 17 Removing the cover of limit switch(WP or FP)

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

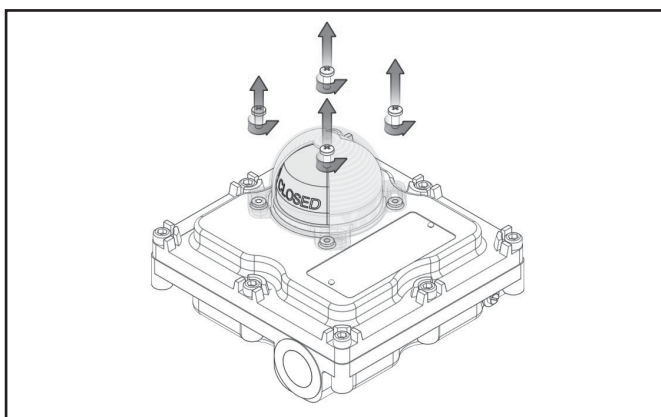


Figure 18 Visual indicator screws

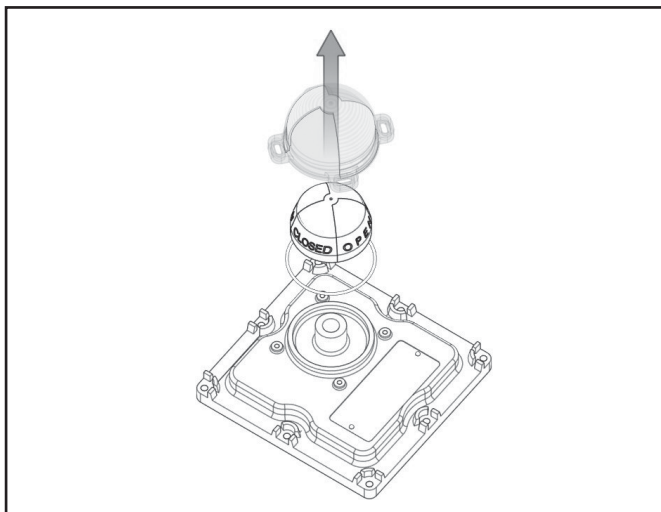


Figure 19 Disassembly of the visual indicator

9.2 operating rod 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 21 - 23** for 01, 03, 11, 13 switches.

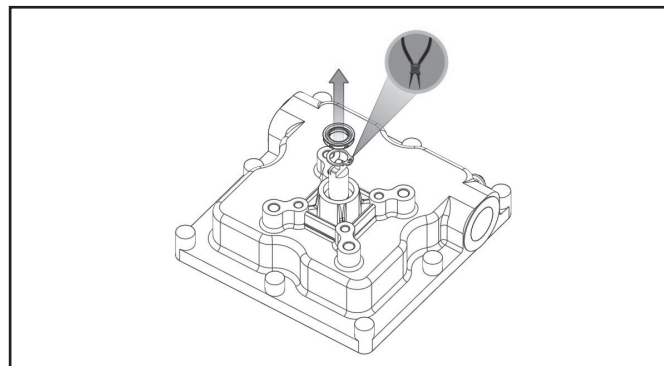


Figure 20 Removing the circlip

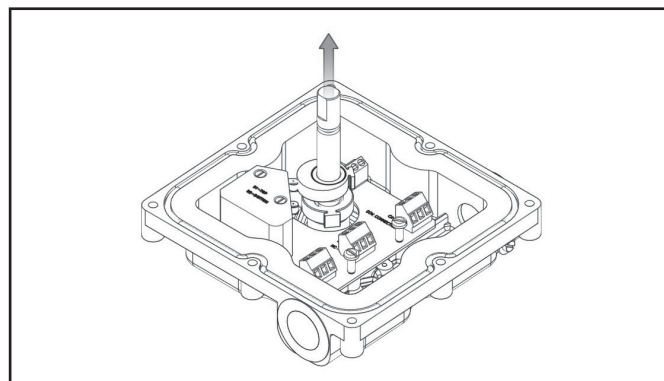


Figure 21 Removing the operating rod of devices with V1 and W1 switches

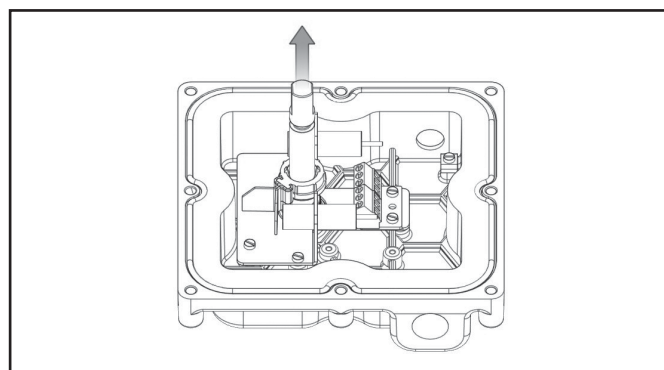


Figure 22 Removing the operating rod of devices with A1 switches

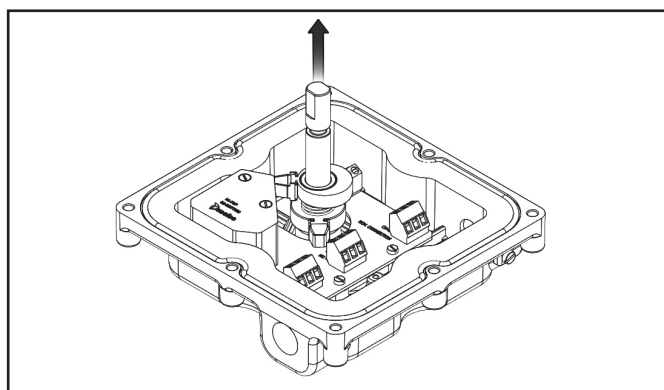


Figure 23 Removing the operating rod of devices with D1 switches

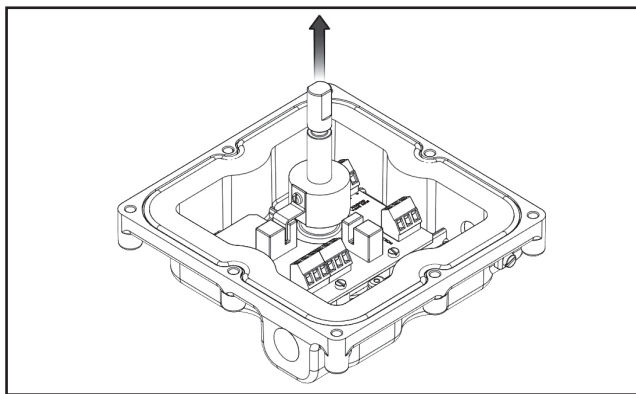


Figure 24. Removing the operating of devices with 13 switches

9.3 Switch disassembly

9.3.1 Disassembly of switch switch 01, 11

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.

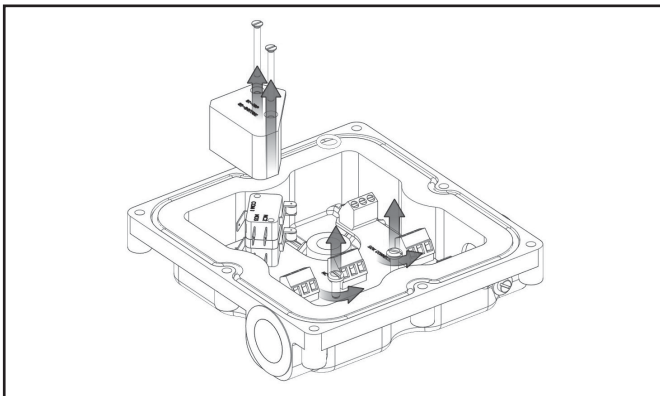


Figure 25. Removing the PCB and switch cover of 01, 11 switches

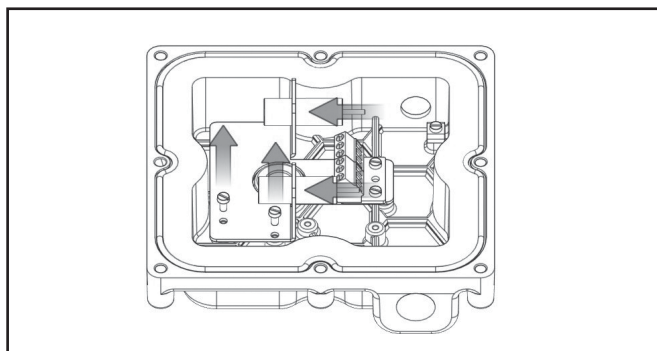


Figure 26. Removing the switch mounting plate and 03 switches

9.3.3 Disassembly

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

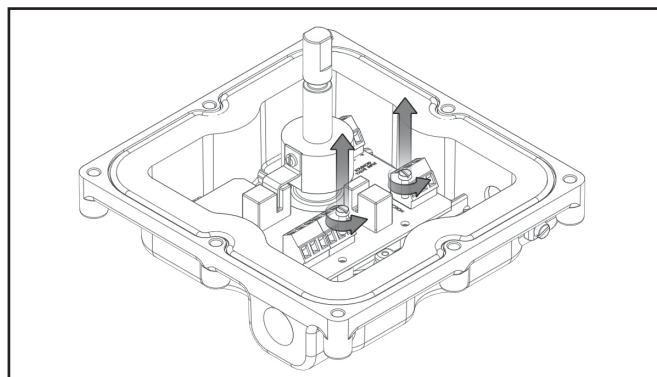


Figure 27. Removing the switch mounting plate and 13 switches

10. ASSEMBLY

CAUTION: 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.

Assembly of 01, 11 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.

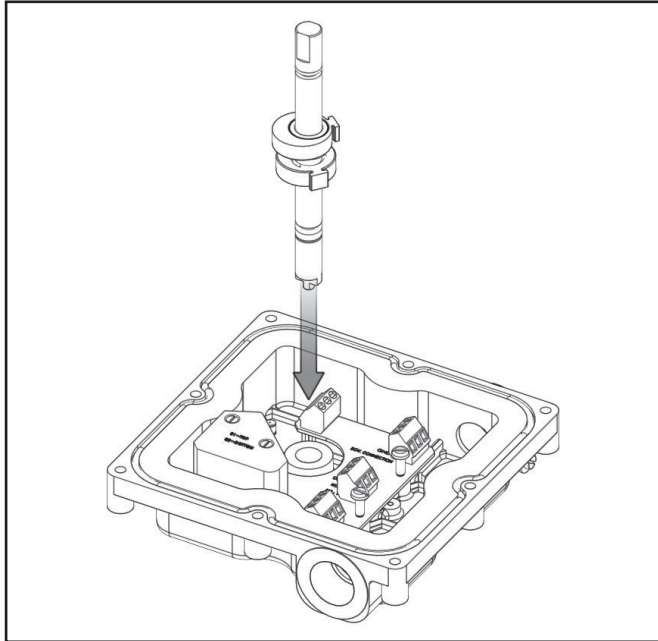


Figure 28. Inserting the operating rod to a device with 01, 11 switches

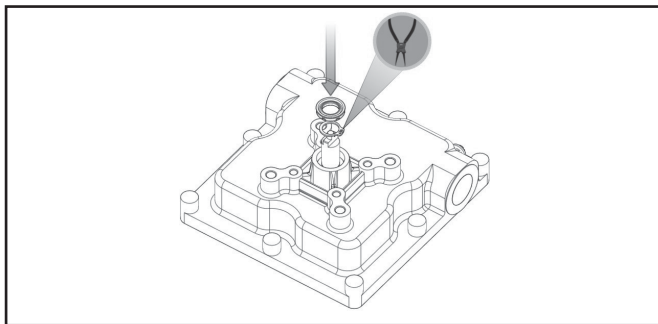


Figure 29. Inserting the circlip

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.

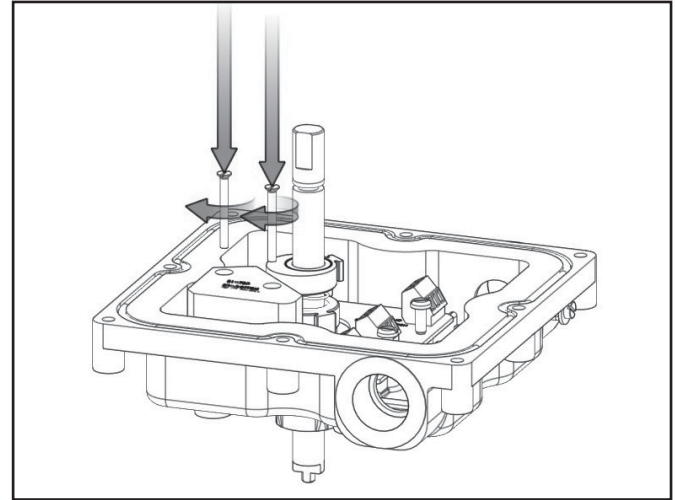


Figure 30. Inserting the switch cover of 01, 11 switches

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.

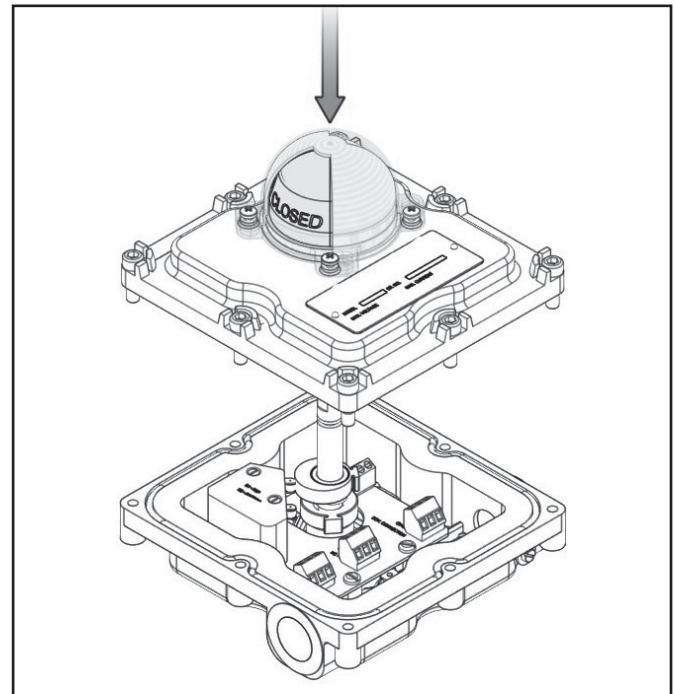


Figure 31. Assembling the cover

Assembly of 03 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.

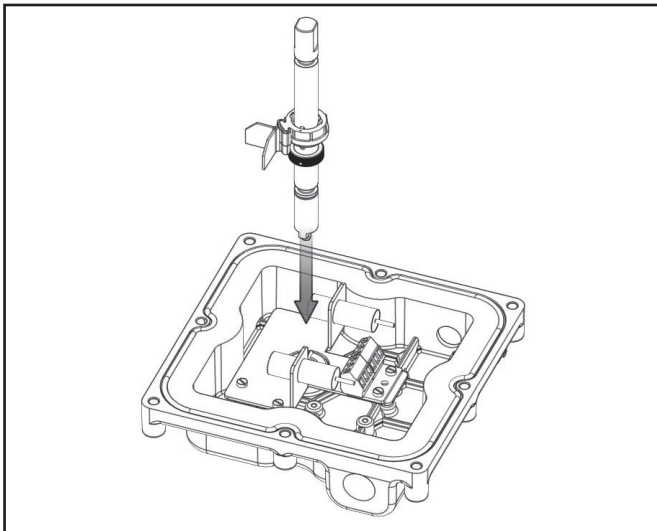


Figure 32. Inserting the operating rod to a device with 03 switches

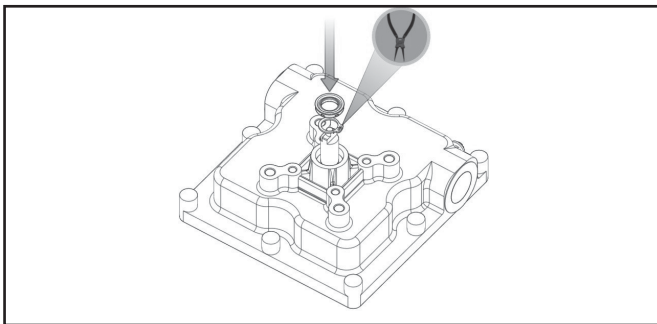


Figure 33. Inserting the circlip

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.

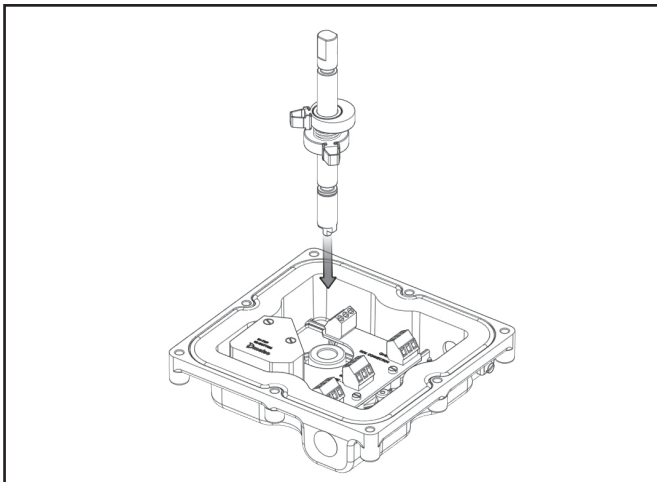


Figure 34. Inserting the operating rod to a device with 11 switches

Assembly of 13 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.

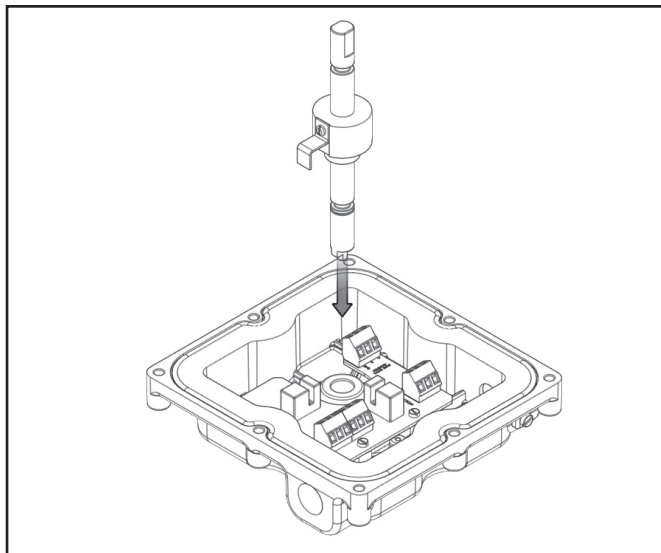


Figure 35. Inserting the operating rod to a device with 13 switches

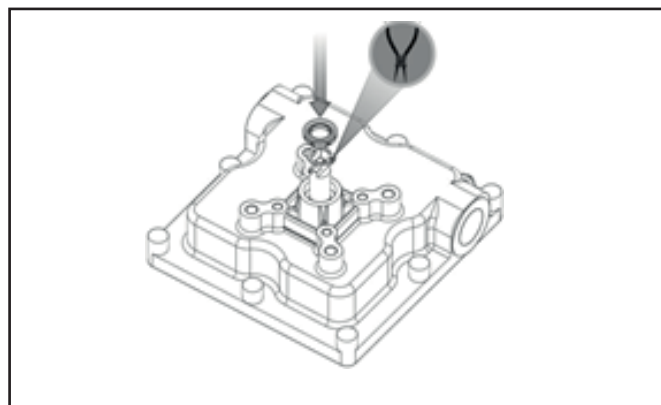


Figure 36. Inserting the circlip

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.

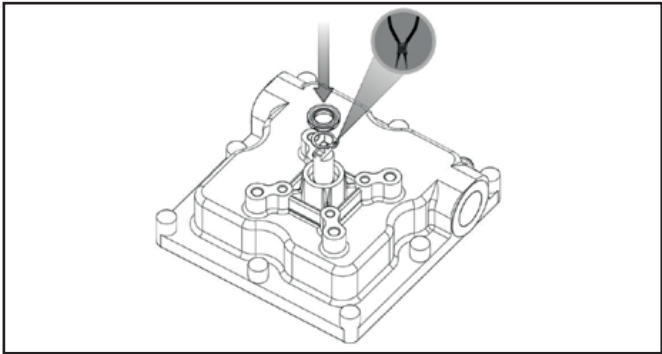


Figure 37. Inserting the circlip

- 1. Secure the PCB with the two screws.
- 2. 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.

11. EXPLODED VIEW AND PARTLISTS

An exploded view diagram of a limit switch assembly. The diagram shows the housing (17) at the bottom, with various internal components like the PCB (13), operating rod assembly (14), and proximity sensor bracket (15) shown in their relative positions. The cover (6) is shown at the top, with an indicator (3) and indicator cover (2) on top of it. A gasket (8) is shown between the cover and the housing. A wiper seal (18) is shown at the bottom of the housing. A name plate (7) is shown on the side of the housing. A three-way terminal block (12) is shown on the side of the housing. A slot head screw (11) is shown on the side of the housing. An earthing screw (9) and earthing plate (10) are shown on the side of the housing. A Phillips head screw (1) is shown on the top of the cover. A non-falling screw (5) is shown on the top of the cover. An O-ring (4) is shown on the top of the cover. A proximity sensor (16) is shown on the side of the housing.

LIMIT SWITCH		
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	Operating rod assembly	1
15	Proximity sensor bracket	1
16	Proximity sensor	2
17	Housing	1
18	Wiper seal	1

Subject to change without prior notice.



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