

ECON Ex-d, Ex-ia and Ex-tb Limit Switch Box Fig. 79653



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Installation & Operation Manual for Limit Switch Box: Fig. 79653

Contents

	Page
1. INTRODUCTION	2
2. SWITCH BOX SPECIFICATION	2
3. SWITCH TYPE SELECTION	2
4. SWITCH BOX MARKING	3
5. STANDARD FEATURES	4
6. PRE-INSTALLATION AND INITIAL INSPECTION	5
6.1 Pre-Installation for use in potentially explosive atmosphere	5
6.2 Cable Connections	5
6.3 Groundings	5
6.4 Special Condition for safe use ("X" marking)	5
6.5 Initial inspection	5
7. STORAGE	5
8. INSTALLATION	6
8.1 Mounting of the limit switch box	6
8.2 Setting of switch/sensor cams	6
8.3 Cam types	7
8.4 Wiring of the limit switch box	7
8.4.1 Mechanical switch - 2 SPDT	8
8.4.2 Mechanical switch - 3 SPDT	8
8.4.3 Mechanical switch - 4 SPDT	8
8.4.4 Mechanical switch - 2 DPDT	9
8.4.5 Mechanical switch – 2 SPDT with potentiometer	9
8.4.6 Mechanical switch – 2SPDT with CPT, Current position Transmitter	9
8.4.7 Proximity switch – P&F NJ2-V3-N	10
8.4.8 Proximity switch - P&F NBB3-V3-Z4 and NBB3-V3-Z4L	10
8.4.9 Proximity switch - P&F NBB2-V3-E2	10
8.4.10 REED switch, MS-B301	11
8.5 Settings of the Current Position transmitter unit – CPT (Optional)	11
8.5.1 Calibration of the potentiometer	12
8.5.2 Calibration of the zero span	12
9. MAINTENANCE	12
10. TROUBLESHOOTING	13
11. TOOLS	13
12. GENERAL INSTALLATION AND MAINTENANCE TIPS	13

1 INTRODUCTION

The ECON Fig. 79653 explosion proof limit switch box is designed to provide accurate and reliable valve position information of actuated valves and hand operated valves.

The Fig. 79653 limit switch box consists of an aluminium body, a polycarbonate visual position indicator, quick-set cam assemblies, terminal strip, switch assemblies and an easy mounting bracket. Quick-set cams enable rapid manual switch adjustments. Tools are not required.

2 SWITCH BOX SPECIFICATION

Model:	Fig. 79653
Weather proof enclosure rating:	IP67, NEMA 4, 4X and 6. (optional IP68, NEMA 6P)
Explosion proof enclosure rating:	See below table
Enclosure:	High grade anodized Aluminum alloy or Stainless steel
Ambient temperature range:	See below table
Conduit entries:	2x M20x1,5 or 2x NPT 3/4" (for North America versions). Optional: NPT1/2", M25 or G3/4"
Travel angle:	90° +/- 10%
Visual position indicator:	Open: Yellow; Closed: Red. Language: English (Open / Closed)
Switch types:	See chapter 3 for standard switch types
Terminal strip:	8 point (optional: 9 to 14 points)
External coating:	Thermally hardened dry polyester powder
Potentiometer (optional):	1kΩ (optional: 0~5kΩ , 0~10kΩ)
Current output signal unit (optional):	4~20mA, 20~4mA

3 SWITCH TYPE SELECTION

ECON code	Switch type	Switch specifications	Ambient Temperature	Certificate No.: EPS 19 ATEX 1 085 X	Certificate No. IECEX 19.0045X
EC7965300AMSXD	Micro Switch, 2-SPDT	Zippy, VA2-16	-40°C (-40°F) up to +60°C (140°F)	II 2G Ex d IIC T6 Gb II 2D Ex tb IIIC T85°C Db	Ex d IIC T6 Gb Ex tb IIIC T85°C Db
EC7965300AP SXI	Proximity sensor, 2-wire	Pepperl & Fuchs, NJ2-V3-N	-20°C (-4°F) up to +60°C (140°F)	II 2G Ex d IIC T6 Gb II 2G Ex ia IIC T6 Gb II 2D Ex tb IIIC T85°C Db	Ex d IIC T6 Gb Ex ia IIC T6 Gb Ex tb IIIC T85°C Db
EC7965300APS2XD	Proximity sensor, 2-wire	Pepperl & Fuchs, NBB3-V3-Z4	-20°C (-4°F) up to +60°C (140°F)	II 2G Ex d IIC T6 Gb II 2D Ex tb IIIC T85°C Db	Ex d IIC T6 Gb Ex tb IIIC T85°C Db
EC7965300APS2XD0	Proximity sensor, 2-wire	Pepperl & Fuchs, NBB3-V3-Z4L	-20°C (-4°F) up to +60°C (140°F)	II 2G Ex d IIC T6 Gb II 2D Ex tb IIIC T85°C Db	Ex d IIC T6 Gb Ex tb IIIC T85°C Db
EC7965300APS3XD	Proximity sensor, 3-wire	Pepperl & Fuchs, NBB2-V3-E2	-20°C (-4°F) up to +60°C (140°F)	II 2G Ex d IIC T6 Gb II 2D Ex tb IIIC T85°C Db	Ex d IIC T6 Gb Ex tb IIIC T85°C Db
EC7965300ARSXD	REED switch	MS-B301	-20°C (-4°F) up to +60°C (140°F)	II 2G Ex d IIC T6 Gb II 2D Ex tb IIIC T85°C Db	Ex d IIC T6 Gb Ex tb IIIC T85°C Db

Other switches or sensors can be fitted upon request as mentioned below. Please contact your local distributor.

Mechanical switch - Ambient temperature: -40°C (-40°F) up to +60°C (140°F)

- 3-SPDT (Zippy VA2-16)
- 4-SPDT (Zippy VA2-16)
- 2-SPST (Zippy VA2-16)
- 2-DPDT (Omron : DZ-10GW-1B, -25°C (-13°F) to +60°C (140°F))
- 2-SPDT + Potentiometer (Zippy VA2-16)
- 2-SPDT + Signal Unit (4~20mA) (Zippy VA2-16)

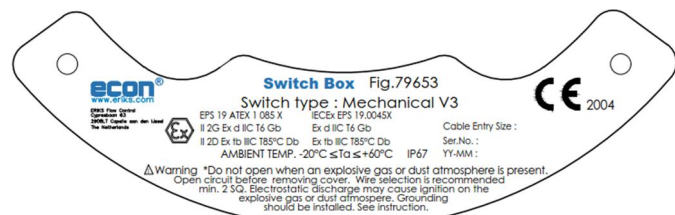
Proximity switch - Ambient temperature: -20°C (-4°F) up to +60°C (140°F)

- Proximity Sensor (Autonics : PS17-5DNU)
- Proximity Sensor (P&F : NJ4-12GM-N)
- Proximity Sensor (P&F : NBB2-V3)
- Proximity Sensor (P&F : NJ2-V3-N) + Potentiometer
- Proximity Sensor (P&F : NJ2-V3-N) + Signal Unit(4~20mA)

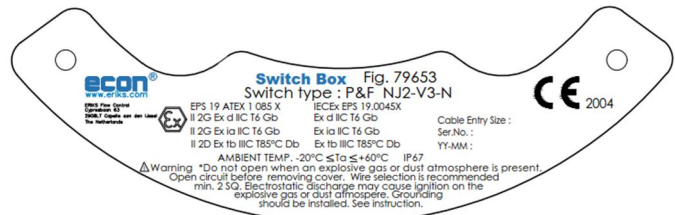
4 SWITCH BOX MARKING

- n ECON-logo
- n Figure number (Fig.)
- n CE ATEX mark and IECEx mark
- n Switch type specification
- n Switch type information
- n QR-code for I.O.M (Installation and Operation Manual)
- n Weather proof enclosure rating
- n Explosion proof enclosure rating
- n Ambient temperature rating
- n Serial number
- n Manufacturing year
- n Cable entry size
- n Warning information

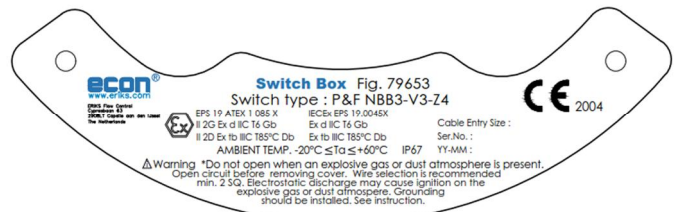
Mechanical switches



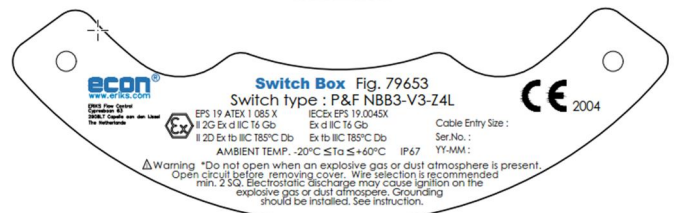
Pepperl & Fuchs NJ2-V3-N proximity sensors



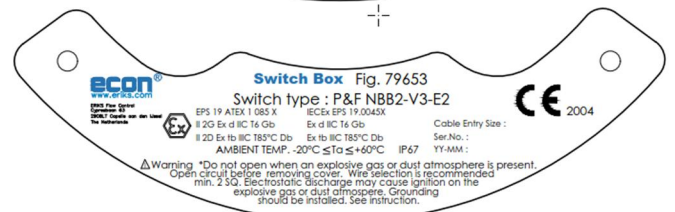
Pepperl & Fuchs NBB3-V3-Z4 proximity sensors



Pepperl & Fuchs NBB3-V3-Z4L proximity sensors



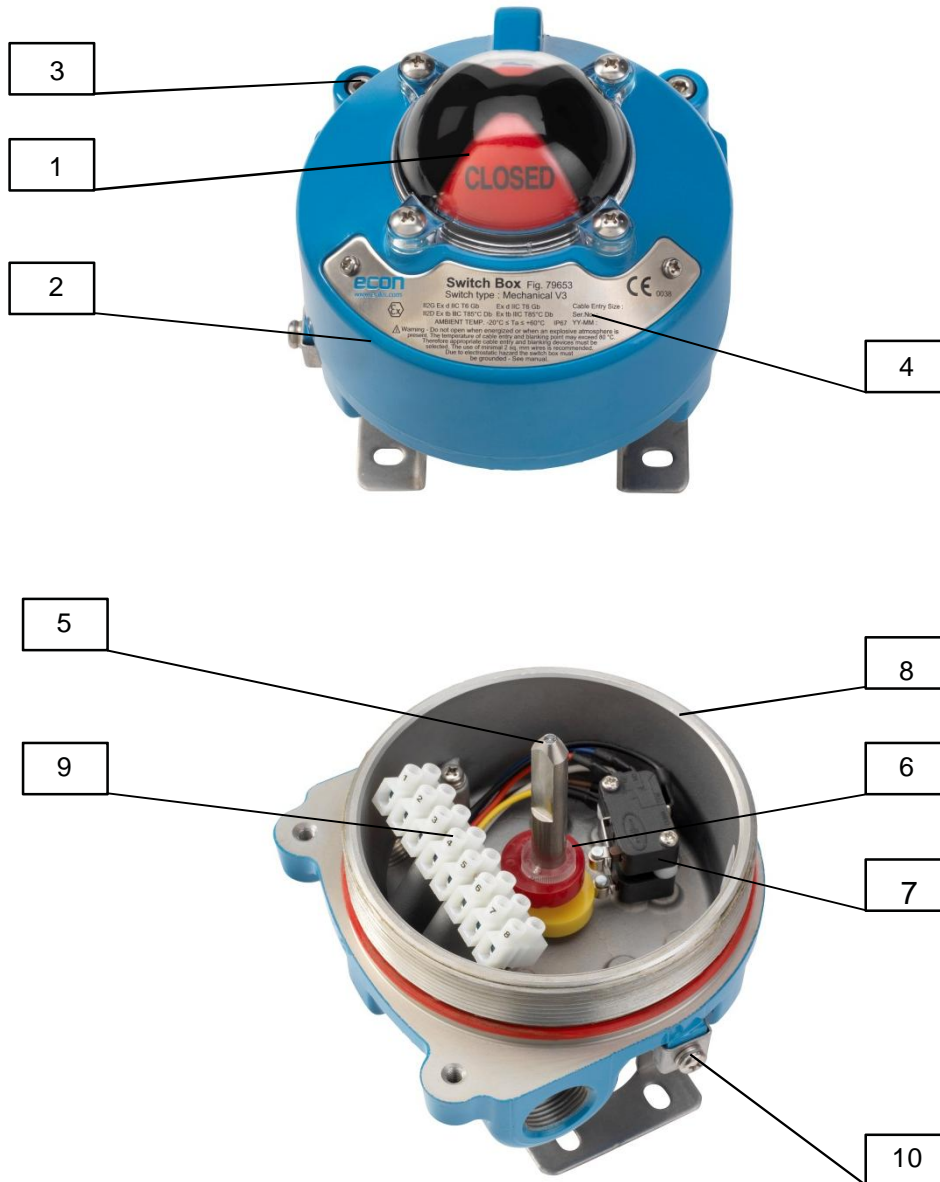
Pepperl & Fuchs NBB2-V3-E2 proximity sensors



Reed switches



5 STANDARD FEATURES



No.	Part Name	Q'ty	Description
1	Window / Indicator	1	PC / ABS
2	Cover	1	Aluminium Die Casting ADC12 / Stainless steel CF8M
3	Captive Cover Bolt	4	Stainless steel
4	Name Plate	1	Stainless steel (A240 T304)
5	Shaft	1	Stainless steel (G4303 SUS303)
6	Cam	2	PC
7	Switch	2	See switch type specification (chapter 3)
8	Body	1	Aluminium Die Casting ADC12 / Stainless steel CF8M
9	Terminal Strip	1	8 positions (9-14P available)
10	Grounding Lug	2	Stainless steel

6 PRE-INSTALLATION AND INITIAL INSPECTION

6.1 Pre-Installation for use in potentially explosive atmosphere

Installation, commissioning, maintenance, repairs and modification work must only be performed by qualified personnel with extensive knowledge on how to work on explosion-proof electrical equipment. Read this installation and maintenance manual carefully and completely before attempting to install, operate, or troubleshoot the switch box.

6.2 Cable Connections

- Sealing devices must be used and shall be fitted directly at enclosure wall when using conduit.
- Cable glands shall be suitable and certified for the environment.
- Cable glands must be installed with a minimum of 8 full thread lengths and the total length of the sealing thread must be at least 8mm.
- **“Warning”**: Please be sure that user must select appropriate cable glands and a cable of at least 2SQmm in order to prevent the cable entry and/or cable to exceed 70°C.
- When cable entries or conduit entries are not used, user or installer shall close them by using certified blanking elements (stopping plugs) in order to maintain the flameproof properties of the enclosure.

6.3 Groundings

- The limit switch box enclosure must always be grounded according to the local standards. The most effective enclosure grounding method is a direct earth connection. Methods for grounding the enclosure include:
 - ü Internal ground connection: The grounding point is located inside the switch box enclosure.
 - ü External ground connection: The grounding lug is located on the outside of the body.
 - ü At least a 2SQ mm wire is required

6.4 Special Condition for safe use (“X” marking)

- Electrostatic discharge from window (over 1GΩ) may cause the ignition of an explosive gas atmosphere. Adapting the conducting window bolts will reduce the risk of electrostatic discharge.
- Before installation or maintenance work will be started, shut-off power supplies and groundings must be connected.
- The window may only be cleaned with a damp cloth in order to avoid ignition hazards, caused by static electricity.

6.5. Initial inspection

Upon on the receipt of the switch box, the user should inspect the condition of the product and ensure that the product specification stated on the name plate matches with the order sheet.

- Remove the packing wrap or cardboard box carefully. Inspect the product for any physical damage that may have occurred during shipment.
- Check the product specification of the received product. If a wrong product has been supplied, please immediately report this to the distributing company.

7 STORAGE

Limit switch boxes must be stored in a clean, cool and dry area. The unit should be stored with the cover installed and the conduit openings sealed. Storage must be off the floor, covered with a sealed dust protector.

8 INSTALLATION

WARNING:



- *Inspection and maintenance work must be performed by qualified and trained personnel*
- *When working in potentially explosive areas, the standard EN 60079-14 “Electrical Installations in Hazardous Areas” must be observed.*
- *Work on an open limit switch box, which is under voltage, may only be performed if there is no explosion risk.*
- *The switch box must be grounded at all times.*
- *Observe local and national regulations and legislation.*
- *Flame proof enclosures may only be opened if there is no explosion risk.*

CAUTION: PREVENT INJURIES



Before installing the limit switch box on the actuator, air supply and power supply of the pilot valve must be shut off.

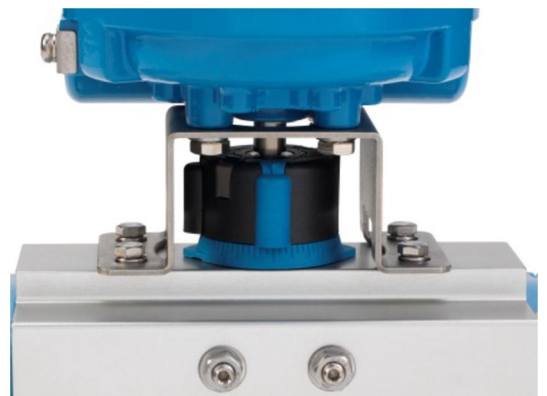
Before installing the limit switch box on the actuator, air supply and power supply of the pilot valve must be shut off.

8.1 Mounting of the limit switch box

ECON limit switch boxes are supplied with a mounting bracket according to the VDI/VDE 3845 (NAMUR) standard. This standard bracket is selected for actuators with a VDI/VDE connection 30x80 mm and an actuator shaft height of 30mm. Brackets for other VDI/VDE dimensions are available upon request and are mentioned in the table below.

Available bracket sizes	ECON code
30x80mm, Height: 30 mm (standard)	EC7965X0BR80X30
30x80mm, Height: 20 mm	EC7965X0BR80X20
30x130mm, Height: 30 mm	EC7965X0BR130X30

- Put the actuator in the fully open or closed position.
- Mount the bracket on the switch box.
- Put the switch box with bracket on the actuator and do not tighten the bolts yet (4 pieces).
- Check the actuator shaft and switch box shaft alignment
- Check if the position of the open and closed switches/sensors and also the visual position indicator corresponds with the valve position.
- Tighten the bolts in order to secure the bracket to the actuator (4 pieces).
- Check again if the position of the open and closed switches/sensors and also the visual position indicator corresponds with the valve position.

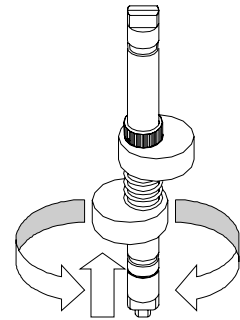


8.2 Setting of switch/sensor cams

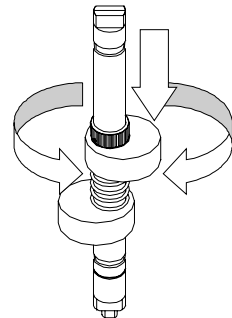
The colour of the cams corresponds with the visual position indicator. Cams can be easily set without using any tools. ECON cams have a spline connection and can be set by lifting or pushing down the cams over the shaft. The cams are spring loaded and therefore self-locking.

Note : *Cams are pre-set by the factory for most standard applications. This setting however must always be checked before commissioning.*

- Loosen the switch box cover bolts.
- Remove the cover carefully.
- Setting of the open-cam setting:
 - Put the actuator in the fully open position.
 - Lift the yellow (lower) cam and rotate it until the switch is activated.
 - Release the cam and it will lock itself to the shaft.



- Close cam setting
 - Put the actuator in the fully closed position.
 - Push the red (upper) cam down and rotate it until the switch is activated.
 - Release the cam and it will lock itself to the shaft.



8.3 Cam types

Cams for mechanical switches	Cams with metal insert for proximity sensors	Splined cam

8.4 Wiring of the limit switch box



DANGER:

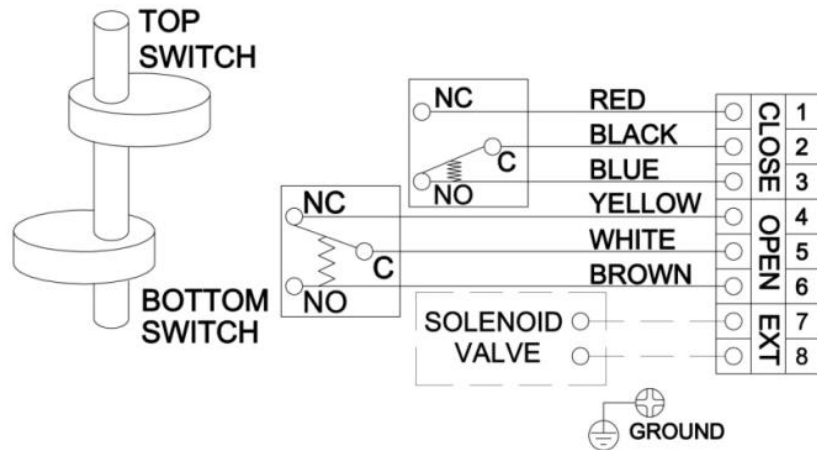
HAZARDOUS VOLTAGE. *Electrical power must not be connected until all wiring and limit switch adjustments have been completed. Once the power is supplied to the actuator, precautions must be taken if the cover is not mounted.*

ECON limit switch boxes have prewired switches. All user connections must be made on the numbered terminal strip. A wiring diagram, located inside the cover, indicates which terminal numbers correspond with switch contacts. Follow the wiring diagram in order to make a correct connection to your system.

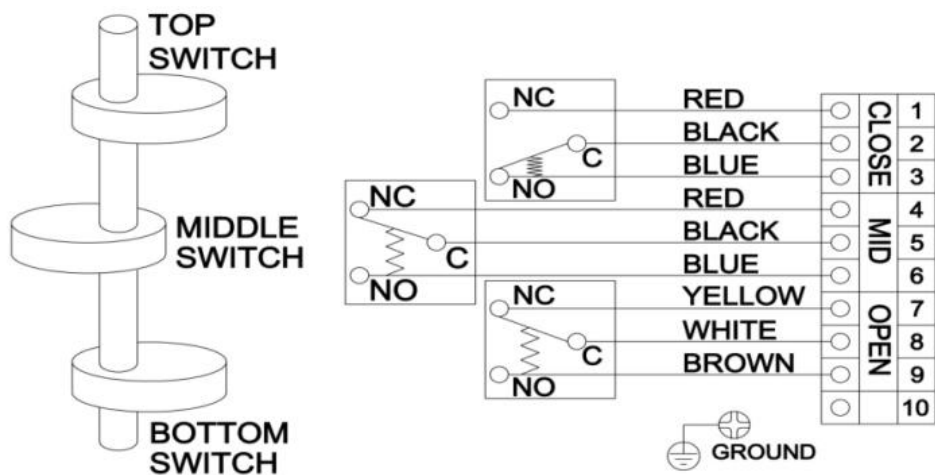
A solenoid valve may also be wired through the ECON limit switch box. Two auxiliary terminals (EXT) are included as a standard.

ECON limit switch boxes have two cable entries and are being supplied with a blanking cap/plug. A cable gland must be selected by the user or installer and must meet the applicable enclosure rating

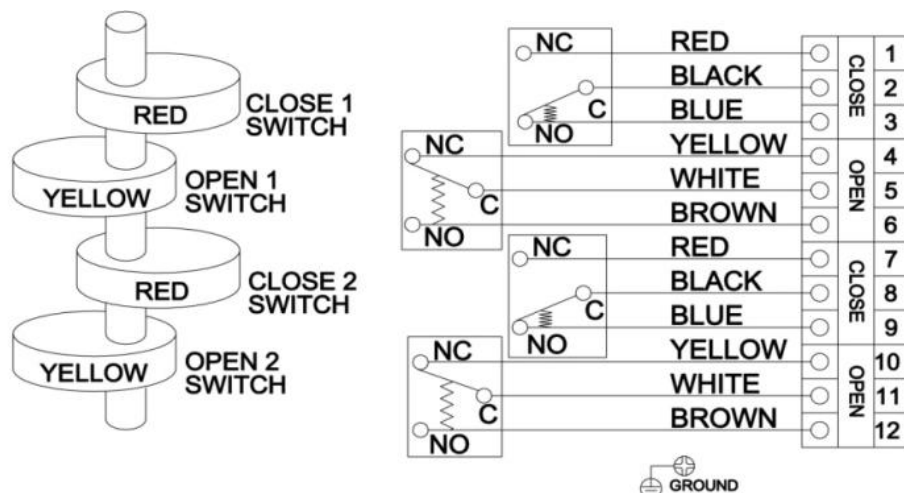
8.4.1 Mechanical switch - 2 SPDT



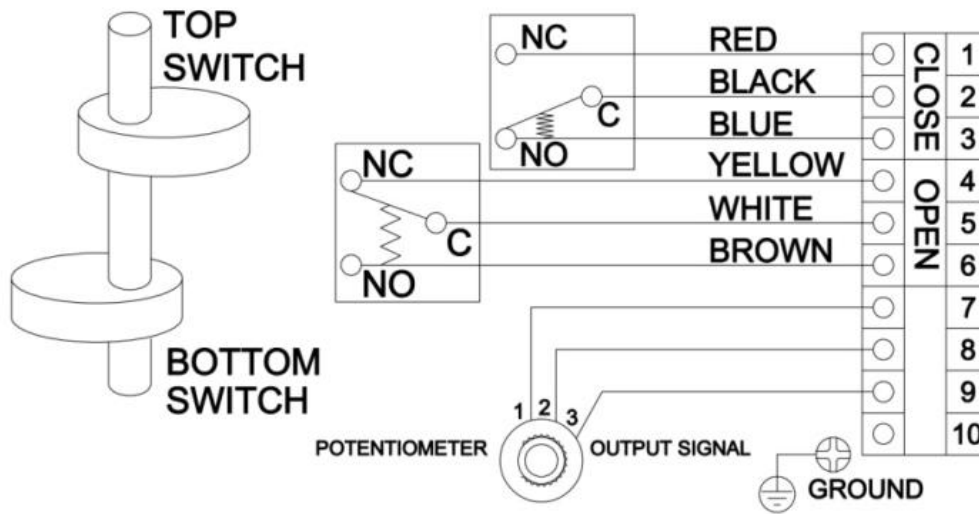
8.4.2 Mechanical switch - 3 SPDT



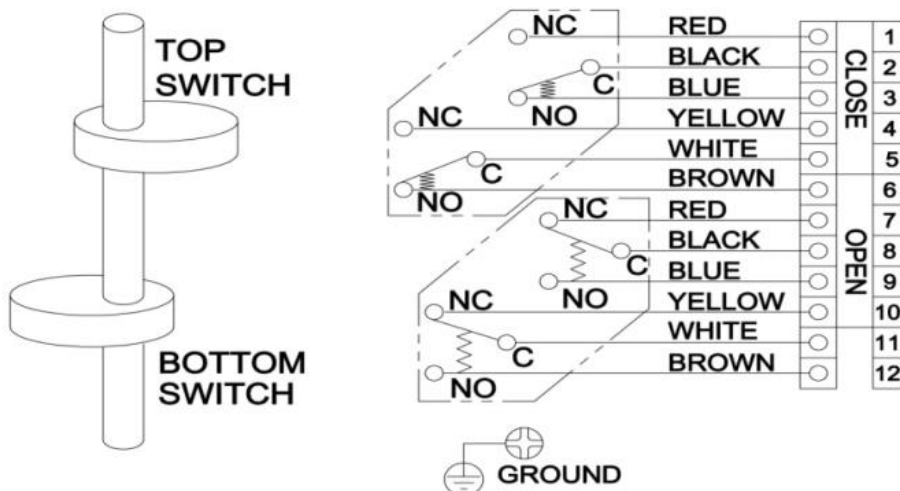
8.4.3 Mechanical switch - 4 SPDT



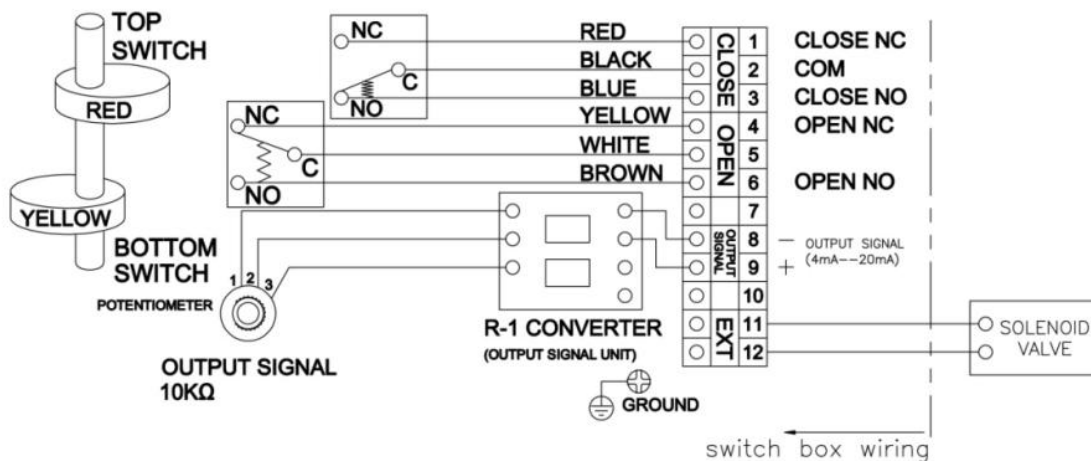
8.4.4 Mechanical switch - 2 DPDT



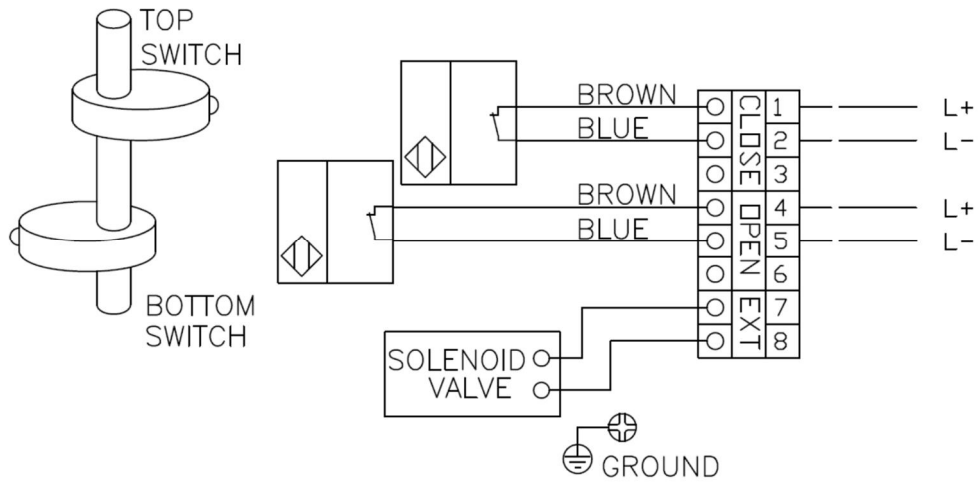
8.4.5 Mechanical switch – 2 SPDT with potentiometer



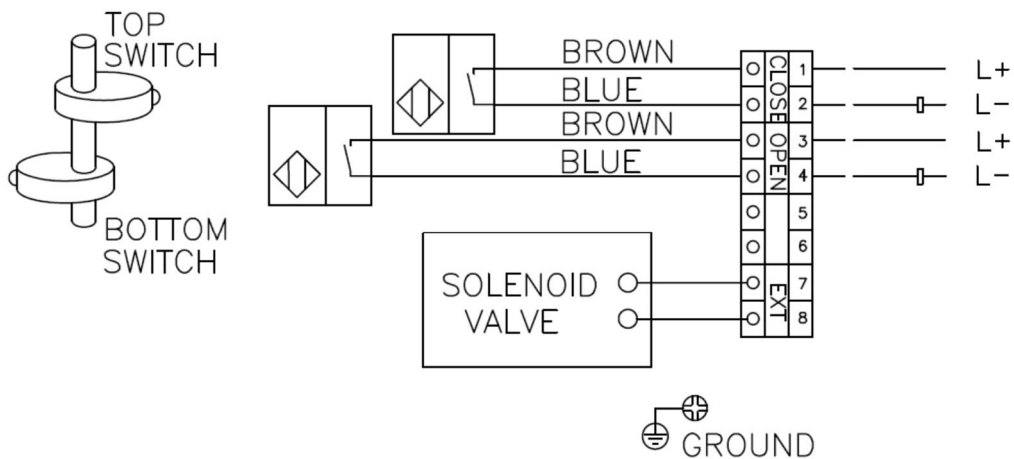
8.4.6 Mechanical switch – 2 SPDT with Current Position Transmitter (CPT)



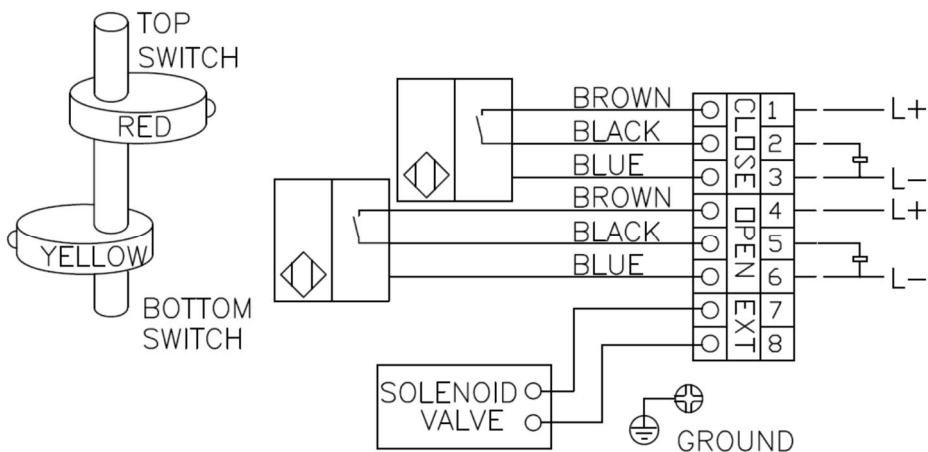
8.4.7 Proximity switch – P&F NJ2-V3-N



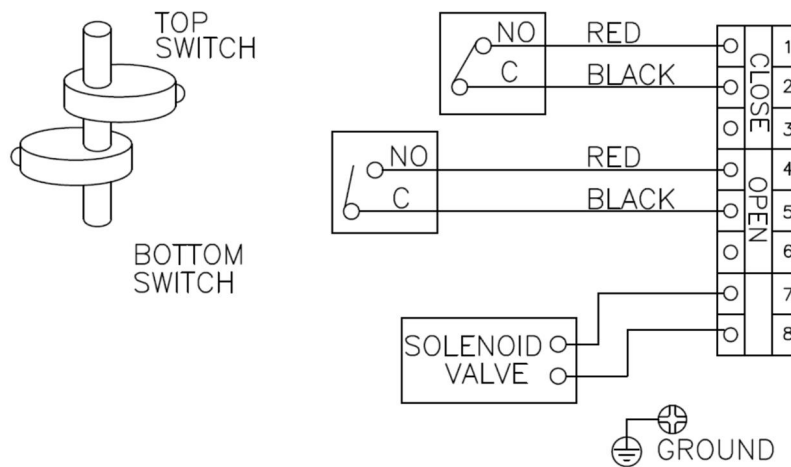
8.4.8 Proximity switch - P&F NBB3-V3-Z4 and NBB3-V3-Z4L



8.4.9 Proximity switch - P&F NBB2-V3-E2



8.4.10 REED switch, MS-B301



Note:

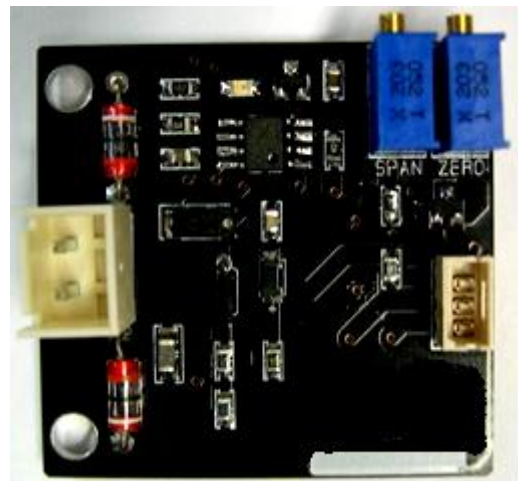
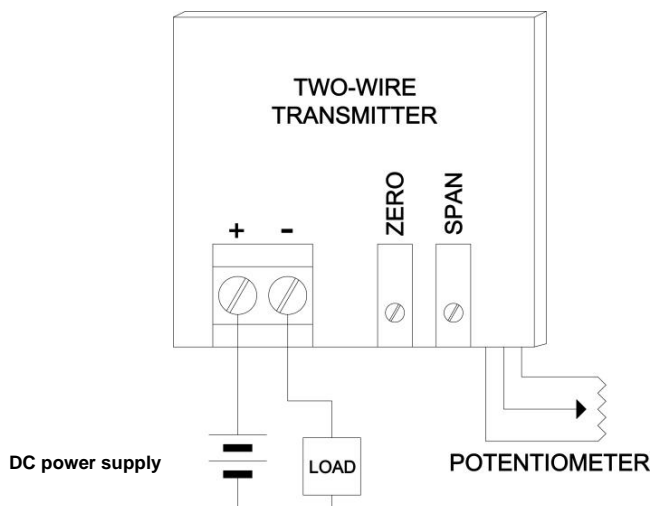
- § **The limit switch box must be grounded at all times.**
- § **At least a 2SQ mm wire is recommended for grounding.**

8.5 Setting of the Current Position Transmitter unit - CPT (Optional)

A potentiometer reads the current position of the actuator (valve) and transmits a resistance value to the position transmitter PCB. The transmitter indicates the actuator (valve) position throughout the complete stroke and converts resistance value it into a 4 to 20mA output signal.

Technical features

Power supply range:	12.5 to 37VDC (25V typical)
Current signal output:	4 to 20mA
Max. load resistance:	Max. resistance (Ohm) = (Supply voltage – 12.5) / 0.02
Potentiometer:	0 to 500Ω / 10kΩ
Operation temperature:	-20°C to 60°C (-4°F to 140°F)
Dimension:	40 x 60 x 15mm



8.5.1 Calibration of the potentiometer

- Operate the actuator into the closed position.
- Connect an Ohm-meter to the P1 and P3 resistor. The value shall be approximately 1kΩ.
- Loosen the potentiometer gear wheel from the shaft and connect the Ohm-meter to P1 and P3 and rotate the gear wheel gently until a value between 80 to 120Ω is achieved (100Ω preferred!) While maintaining the value, tighten and lock the gear wheel to shaft.

8.5.2 Calibration of the zero span

The zero span setting has been calibrated by manufacturer. However, if re-calibration is required, please follow the hereunder mentioned instruction:

- Operate the actuator to the middle position and thereafter to the fully closed position.
- As soon as the actuator reaches the fully closed position, adjust the “zero” rotary switch on the P CB until a value of 20mA is achieved.

9 MAINTENANCE

The ECON Fig. 79653 limit switch box is designed to provide accurate and reliable valve position signalling and indicating of most automated valves.

WARNING:



- **Inspection and maintenance work must be performed by qualified and trained personnel**
- **When working in potentially explosive areas, the standard EN 60079-14 “Electrical Installations in Hazardous Areas” must be observed.**
- **Work on an open limit switch box, which is under voltage, may only be performed if there is no explosion risk.**
- **The switch box must be grounded at all times.**
- **Observe local and national regulations and legislation.**
- **Flame proof enclosures may only be opened if there is no explosion risk.**

CAUTION:



- **Shut-off all incoming power or air supply on the valve actuator before starting maintenance work on the limit switch box.**
- **Be sure that the working area is clean before disassembling the limit switch box. Clean all parts and seals before re-assembling.**
- **Use only genuine spare parts, which can be purchased from your local ECON distributor.**

Maintenance should be performed every six month or after every 10,000 operation cycles. In severe operation conditions inspections must be performed more frequently. During maintenance the following parts of the limit switch box must be inspected:

- Check the alignment of the valve, actuator and limit switch box.
- Check the wiring insulation and the terminal strip connections.
- Check the adjustment of the cams.
- Check the cams on wear and replace them if necessary.
- Check if all screws are present and tightened.
- Check if the cable connections are installed properly and not leaking.
- Check internal devices for condensation.
- Check the enclosure for damages, especially on the sealing surfaces.
- Check the enclosure O-ring seals and also check if the O-ring is in the correct position.
- Visually inspect the limit switch box during operation.
- Inspect the type plate of the limit switch box and replace it if necessary.

10 TROUBLESHOOTING

The following instructions are offered for the most common difficulties that could be encountered during installation and start-up.

Signal errors to main control room.

- Check if the wiring of the limit switches/sensors is in accordance to the wiring diagram.
- Check if the cams or switches/sensors are damaged or broken.
- Check the connections on the terminal strip.
- Re-set the limit switch box
- Check the potentiometer gear for jamming (if present)
- Check the zero and span calibration if a CPT has been installed.
- Check the PCB for damages if a CPT has been installed.

11 TOOLS

For installation or maintenance the below tools may be necessary:

- 1 Set of metric Allen keys
- 1 Set of screw drivers
- 1 Set of metric spanners
- 1 Wire stripper with long nose
- 1 Needle nose plier
- 1 Multi meter (AC, DC, Resistance)

12 GENERAL INSTALLATION AND MAINTENANCE TIPS

CAUTION:



- *Regular inspection and maintenance by qualified and trained personnel needs to be planned.*
 - *Be sure the working area is clean before disassembling the limit switch box. Clean all parts and seals before re-assembling.*
 - *Use only genuine spare parts, which can be purchased from your local ECON distributor.*
-

For any installation and maintenance work, the following should be observed:

- Check the limit switch box visually. Ensure that no outside damages or changes are visible. The electric connecting cables must be without damage and wired correctly.
- Cable entries, cable glands, plugs etc. have to be checked for tightness.
- Check whether Ex-connections are fastened correctly.
- Take care of possible discolorations of the terminals and wires.
- Check the flame path gaps of flameproof enclosures for dirt and corrosion. Since the dimensions of all Ex gaps are strictly defined and inspected, no mechanical work shall be performed on them.
- Ensure that all enclosure seals are handled carefully and are being checked for damages. All cables and cable entry seals have to be checked.
- If defects are found during maintenance, repair measures must be taken immediately.
- Sealing surfaces must not be coated.
- Parts may only be exchanged by genuine parts.

**If you have questions about this product,
Please contact the nearest ECON distributor.
You can find them on www.eriks.com**

ERIKS**ERIKS Flow Control**

Cypresbaan 63,
2908 LT Capelle aan den IJssel,
The Netherlands

Phone: +31 (0)10 284 1100