

APL-5 Series Valve Position Monitor Installation, Operation & Maintenance Manual



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1. General

- 1.1. TRIAC APL-5... series limit switch boxes are designed to provide accurate and reliable valve position signaling and indicating of most valves or actuators manufactured.
- 1.2. APL-5... limit switch boxes consists of a visual position indicator, quick-set cam assembly, terminal strip, switch assembly and easy mounting bracket. Quick-set cam allows for a quick and simple hand operation in the setting of switches.

2. Standard specification

Model	APL-5** *																				
Electrical Ratings	CSA approved Class I, Division 1, Groups B, C & D T6 Class I, Zone 1, AEx d IIC, T6 / Ex d IIC, T6 Type 4x / 6, IP66 / 67 4A, 250VAC Maximum																				
Enclosure Material	High grade aluminum alloy or stainless steel																				
Ambient Temperature	-20°C ≤ Ta ≤ +60°C																				
Conduit Entries	Two NPT 3/4"																				
Travel Angle	90 degree +/- 10%																				
Position Indicator	Open: Green Close: Red Language: English																				
Mechanical Switch	SPDT (10, 12, 15, 16): 16A 1/2HP 125/250Vac, 0.6A 125Vdc, 5A 125Vac SPDT Gold Plated (18): 0.1A 125Vac/30Vdc DPDT (14): 20A@125/250Vac, 1A@125Vdc, 1HP@125Vac																				
Proximity sensor	NAMUR P&F NJ2-V3-N (20): Uo = 8.2V nominal @ Ri = 1kΩ.																				
	<table border="1"> <tr> <td>Ui</td> <td>16 V</td> <td>16 V</td> <td>16 V</td> <td>16 V</td> </tr> <tr> <td>Ii</td> <td>25 mA</td> <td>25 mA</td> <td>52 mA</td> <td>76 mA</td> </tr> <tr> <td>Pi</td> <td>34 mW</td> <td>64 mW</td> <td>169 mW</td> <td>242 mW</td> </tr> <tr> <td>Ta max</td> <td>60°C</td> <td>60°C</td> <td>45°C</td> <td>30°C</td> </tr> </table>	Ui	16 V	16 V	16 V	16 V	Ii	25 mA	25 mA	52 mA	76 mA	Pi	34 mW	64 mW	169 mW	242 mW	Ta max	60°C	60°C	45°C	30°C
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	PNP Sourcing 3-wire P&F NBB2-V3-E2 (23): 10-30Vdc, 100mA@30Vdc SPST Reed Switch (30): 50W Max, 250Vdc 3.0A max.																				
Potentiometer	5kΩ																				
4-20mA Transmitter	12.5Vdc to 37Vdc																				
Terminal Strip	8 position																				
External Coating	Polyester powder coating																				

3. Preparing for Installation

3.1. 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.



Warning: Read this installation and maintenance manual carefully and completely before attempting to install, operate, or troubleshoot the TRIAC product

3.1.1. Cable Connection

- ① Sealing devices must be used and shall be fitted directly at enclosure wall when using conduit.
- ② Cable glands shall be suitable for the environment and shall be certified as flameproof if used in Division 1 application in order to connect outside electric wire.
- ③ NPT cable glands and conduit to be installed minimum 5 full.
- ④ Select the appropriate cable glands for number of 18AWG (minimum) conductors.
- ⑤ When cable entries or conduit entries are not used, user or installer shall close by certified blanking elements (stopping plugs) so that the flameproof properties of the enclosure are maintained.

3.1.2. Groundings

- ① Always ground the enclosure in accordance with local electric codes. The most effective enclosure grounding method is a direct connection to earth ground with minimal impedance. Methods for grounding the enclosure include:
 - Internal ground connection: The internal ground is located inside the body.
 - External ground connection: The ground bracket is located on the side of body.
(Min 18AWG wire required)

3.1.3. Special Condition for safe use ("X" marking)

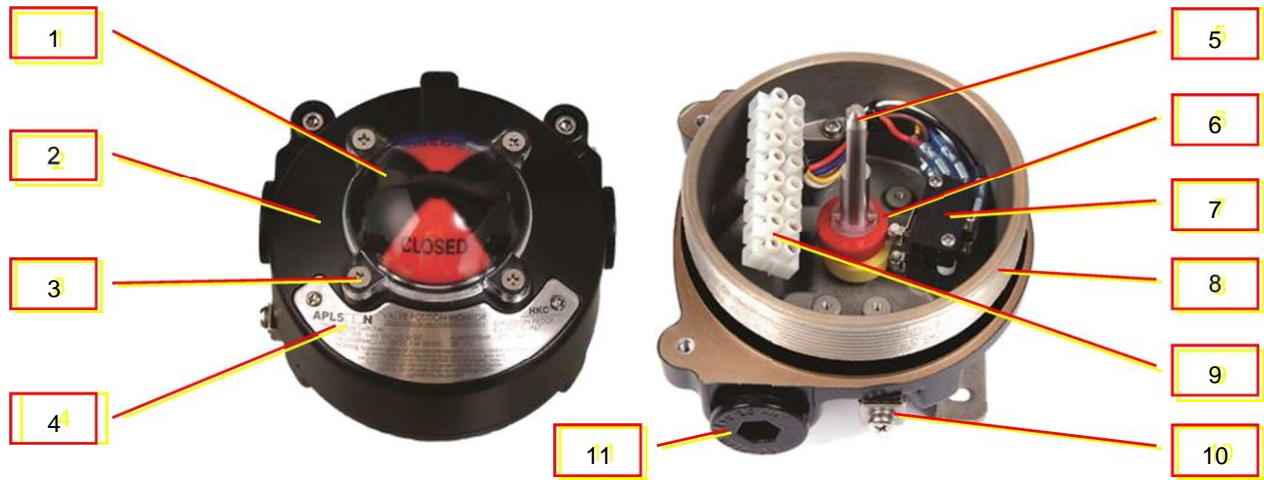
- ① Electrostatic discharge from window (over 1GΩ) may cause the ignition on the explosive gas atmosphere. By adapting the conducting window bolts make reduce the risk from electrostatic discharge.
- ② Before installation or maintenance of products, shut off incoming power and verify grounding is properly connected.
- ③ The window must only be cleaned with a damp cloth in order to avoid ignition hazard caused by static electricity.

3.2. Initial inspection

When the user receives the product, inspect the condition of the product and ensure the name plate matches the order sheet.

- 3.2.1. Remove packing wrap or wooden box carefully. Inspect the product for any physical damage that may have occurred during shipment.
- 3.2.2. Check the product specification with product ordered. If a wrong product has been shipped, immediately report to our coordinator.

4. Standard Features



No.	Part Name	Q'ty	Description
1	Window / Indicator	1	PC / ABS
2	Cover	1	Aluminum die casting, Stainless steel
3	Captive Cover Bolt	4	Stainless steel
4	Name Plate	1	Stainless steel
5	Shaft	1	Stainless steel
6	Cam	2	PC
7	Switch	2	Refer to specifications
8	Body	1	Aluminum die-casting, Stainless steel
9	Terminal Strip	1	8P
10	Earth Lug	2	Stainless steel
11	Blanking Element	2	Aluminum plug

5. Installation

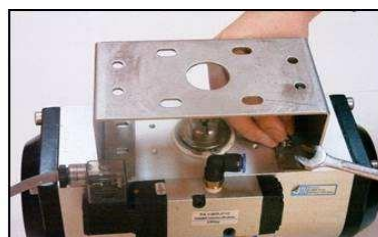
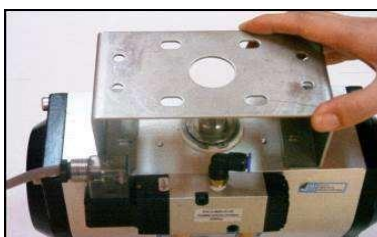
5.1. Mounting bracket



Caution; Where limit switch box or one of parts are to be moved, installed, disassembled, reassembled by a hand, care must not be taken to cause injury by the harmful sharp edges of corners or rough surfaces or residual electricity.

5.1.1. TRIAC can supply a NAMUR VDI/VDE standards bracket and hardware for mounting on actuator. Brackets can be applied to any type of valve; manual valve, linear valve, pneumatic rotary valve.

- ① Insure valve actuator alignment (fully open or closed).
- ② Place the mounting bracket on a horizontal plane of actuator
- ③ Tighten the bolts enclosed in a box using a proper tool.



5.2. Mounting limit switch box



Caution: Do not attempt to work on limit switch box without first shutting off incoming power

- 5.2.1. Prior to mounting the limit switch, enclosure must be checked for any damage.
- 5.2.2. Damaged parts must be replaced by original spare parts.
- 5.2.3. Limit switch boxes are available with a NAMUR shaft that enables direct attachment to actuator pinion without a coupler. These shafts feature a 4mm wide tang that engages the 4mm slot in NAMUR actuators.

- ① Check to be sure the drive slot on the top of the actuator and the shaft of switch box are the same direction.
- ② Insert the shaft of switch box carefully into the mounting bracket.
- ③ Tighten the bolts enclosed in a box using a proper tool.
- ④ Check the connection of shaft being assembled correctly.



5.3. Cam setting

5.3.1. The color of cams matches the position indicator to help set the cams easily without wiring diagram. Cams can be easily set without tools. APL series cams are splined and can be set by lifting up or pushing down on the cam to be set.

Self-locking, spring loading ensures cams never slip out of adjustment.

5.3.2. Loosen the captive cover bolts with an applicable tool. (L-Hex. Wrench recommended)

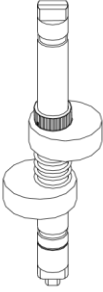
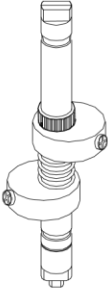
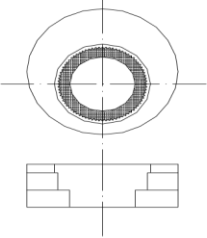
5.3.3. Turn the cover counter clockwise to open carefully.

5.3.4. Open cam setting

- ① Operate the actuator to fully open position
- ② Lift the bottom green cam up and rotate it until the switch is activated.
- ③ Release the cam so it fits back over the cam gear.

5.3.5. Close cam setting

- ① Operate the actuator to fully closed position
- ② Push the upper red cam down and rotate it until the switch is activated.
- ③ Release the cam so it fits back over the cam gear.

Mechanical switches	Proximity sensors	Splined cam
		

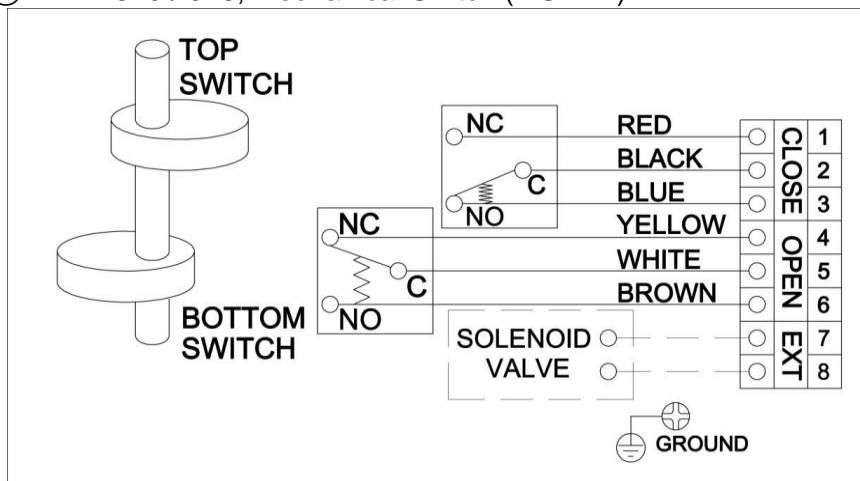
5.4. Wiring



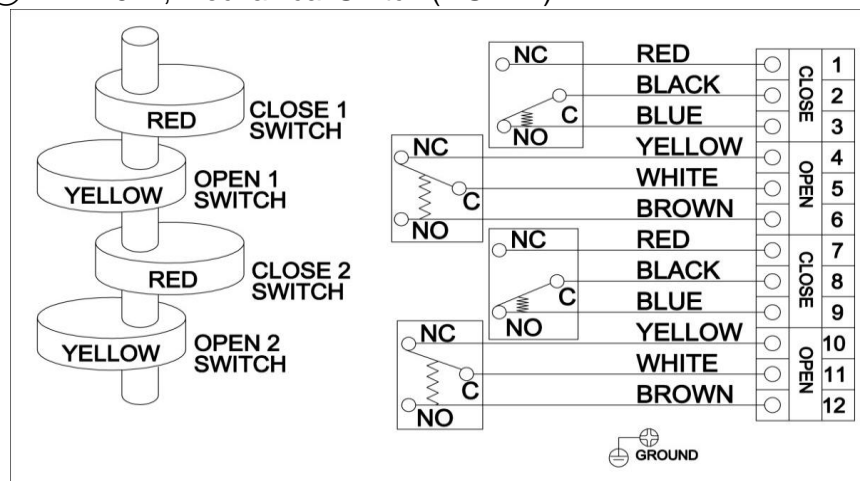
Danger: HAZARDOUS VOLTAGE. No electrical power should be connected until all wiring and limit switch adjustments have been completed.

- 5.4.1. APL limit switch box enclosure feature prewired switches. All user connections are made at a numbered terminal strip. A wiring diagram, located inside the cover, indicates which terminal numbers correspond to switch contacts, such as normally open (NO), normally closed (NC), etc. Follow the wiring diagram and electrical code to connect the switches to your system.
- 5.4.2. Solenoid valve may also can be wired through the APL enclosure. Two auxiliary terminals are typically included as standard.
- 5.4.3. APL limit switch box has two cable entries on the body and supply a blanking plug not a cable gland which meet the type of protection. Cable gland shall be applied by installer or user.

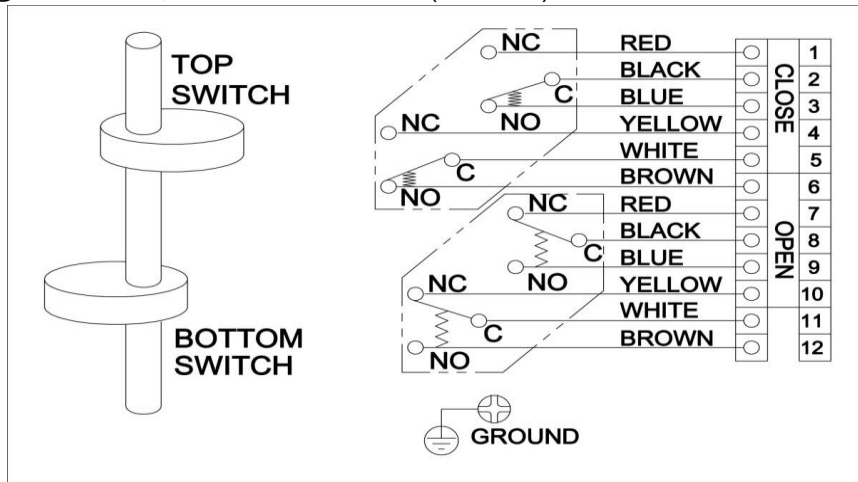
① APL-510 / 518, Mechanical Switch (2 SPDT)



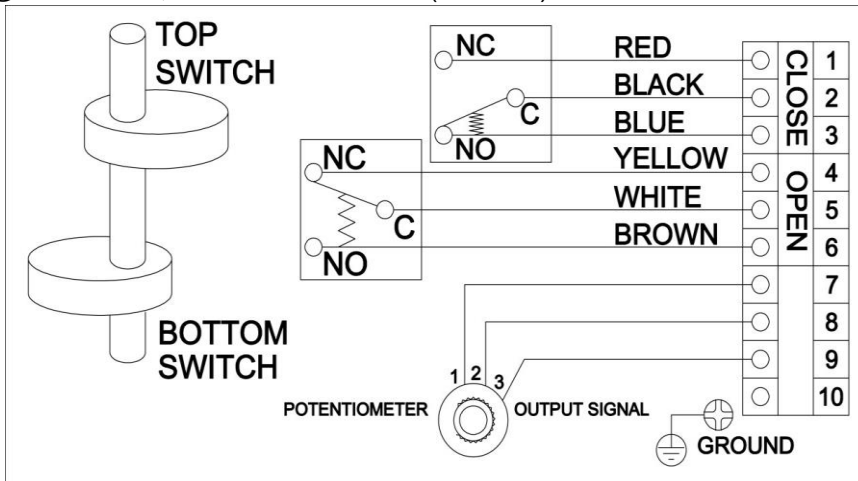
② APL-512, Mechanical Switch (4 SPDT)



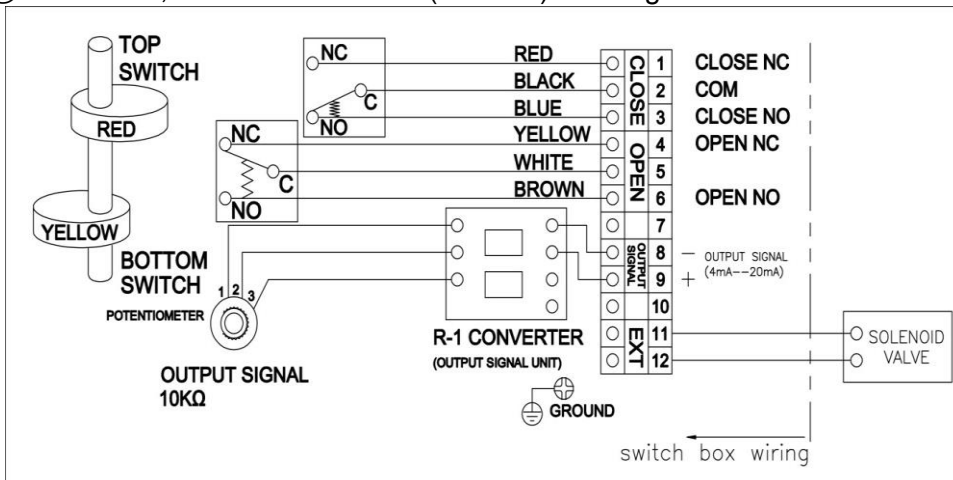
③ APL-514, Mechanical Switch (2 DPDT)



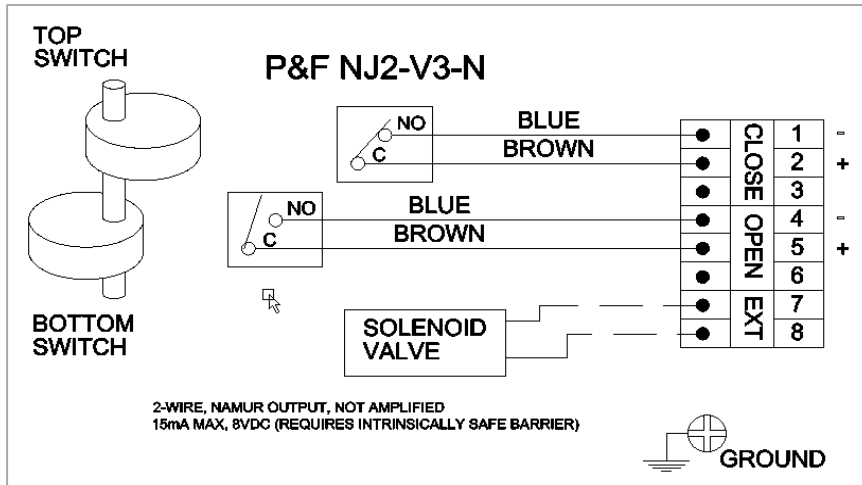
④ APL-515, Mechanical Switch (2 SPDT) with Potentiometer



⑤ APL-516, Mechanical Switch (2 SPDT) with Signal Unit



⑥ APL-520, Inductive Proximity Switch (2 NAMUR Output P&F NJ2-V3-N)



Note;

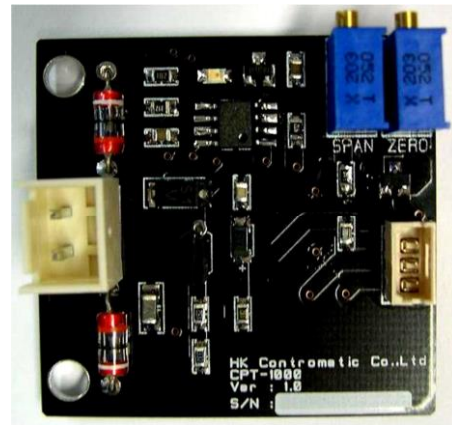
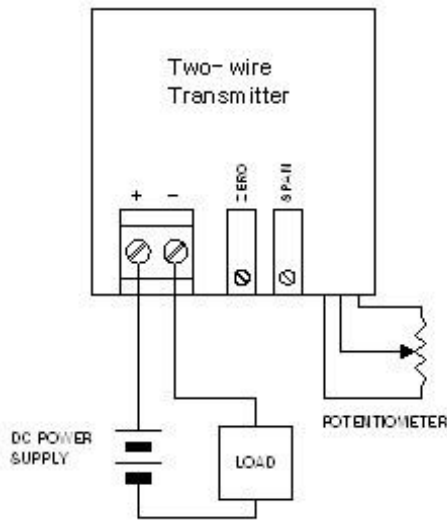
Grounding should be connected once all wiring had been completed.
Internal/External grounding wire square shall be min. 18AWG.

5.5. Setting for Position Transmitter Unit (APL- 516)

5.5.1. Potentiometer reads the current position of actuator and transfers a resistance value to a current position transmitter card. Transmitter indicates the actuator position throughout the stroke by a 4~20mA output signal.

5.5.2. Technical Features

- | | |
|-------------------------|--|
| ① Power Supply Range | 12.5 ~ 37VDC (24V typical) |
| ② Current Signal Output | 4~20mA |
| ③ Max. Load Resistance | Max. Resistance (ohm) = (Supply voltage – 12.5) / 0.02 |
| ④ Potentiometer | 0~500 ohm / 10k ohm |
| ⑤ Operating Temperature | -20 ~ 60 °C |
| ⑥ Dimension | 40 * 60 * 15 |



5.5.3. Calibration Potentiometer

- ① Apply power or air to the actuator to operate fully closed position
- ② Connect an ohm meter to potentiometer P1 and P3. The value shall be approximately 1kΩ.
- ③ Loosen the shaft gear and connect the ohm meter to P1 and P3 and gently rotate until 80 ~ 120 ohm is achieved (100ohm preferred). While maintaining the value, tighten the gear lock screw with a hex wrench.

5.5.4. Calibration Zero Span

Zero span setting has been calibrated by manufacturer. However, if re-calibration is required

- ① Operate actuator to 50% position and then fully closed position.
- ② When the actuator is in the fully closed position, adjust the “zero” multi-turn potentiometer on the card until a value of 20mA is achieved.

6. Maintenance



Caution: Shut off incoming power or air supply on the valve actuator before maintenance of limit switch box.



Be sure that the area is clean before disassembly and maintenance of limit switch box.

Clean all parts and housing before reassembly.

- Refer to the part list when ordering replacement or spare parts.

6.1. Maintenance, under normal conditions at six month intervals or 10,000 cycle operation.

When conditions are more severe, more frequent inspections may be required.

- 6.1.1. Insure valve actuator alignment
- 6.1.2. Insure wiring is insulated, connected and terminated properly
- 6.1.3. Insure all screws are present and tight
- 6.1.4. Insure cleanliness of internal electrical devices
- 6.1.5. Insure conduit connections are installed properly and are dry
- 6.1.6. Check internal devices for condensation
- 6.1.7. Check enclosure O rings seals and verify that the O ring is not pinched between housing
- 6.1.8. Visually inspect during open/close cycle
- 6.1.9. Inspect identification labels for wear and replace if necessary



Warning:

Flameproof enclosure! Before opening, ensure the absence of gas, dust and voltage.

Treat cover with care. Gap surfaces must not be damaged or dirtied in any way.

7. Inspection

- 7.1. The limit switch box should be inspected upon receipt to ensure that no damage has been sustained on transit.
- 7.2. Check the item and quantity of products with packing list or related documents.
- 7.3. Check the limit switch box o-ring. Damage to it can cause the corrosion of internal parts.
- 7.4. Check the adjustment of cams and make sure they are securely held on the shaft gear.

8. Storage

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

9. Trouble shooting

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

Signal fails to main control room.

- ① Check the wiring of limit switch box in accordance with wiring diagram.
- ② Check where the cams or switches are damaged or broken.
- ③ Check the main signal wire from the terminal strip.
- ④ Re-set the limit switch box.
- ⑤ Verify the current position transmitter resistance value.
- ⑥ Check potentiometer gear jamming.
- ⑦ Check the zero and span calibration.
- ⑧ Check the card damaged or not.

10. Tools

- ① 1 Set Metric Allen Key (Hex Wrench)
- ② Set Screw Drivers
- ③ 1 Set Metric Spanner
- ④ 1 Wire Stripper long Nose
- ⑤ 1 Needle nose plier
- ⑥ 1 Multi Meter (AC, DC, Resistance)
- ⑦ 1 4-20mA Loop Calibrator (if applicable 16 adapted)

11. Installation and Maintenance Tips

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



Caution:

A regular inspection and maintenance performed by qualified and trained personnel. When working in potentially explosive areas, observe the standard EN 60079-14 "Electrical Installations in Hazardous Areas".

Work at the open actuator under voltage must only be performed if it is assured that for the duration of the work there is no danger of explosion.

Observe additional national regulations.

- 11.1. Check the limit switch box visually. Ensure that no outside damage or changes are visible. The electric connecting cables must be without damage and wired correctly.
- 11.2. Cable entries, cable glands, plugs etc. have to be checked for correct tightness and sealing.
- 11.3. Check whether Ex-connections are fastened correctly.
- 11.4. Take care of possible discoloration of the terminals and wires.
- 11.5. 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.
- 11.6. Ensure that all housing covers are handled carefully and that the seals are checked.
- 11.7. All cables have to be checked.
- 11.8. If defects which affect the safety are detected during maintenance, repair measures have to be taken immediately.
- 11.9. Any kind of surface coating for the gap surface is not permitted.
- 11.10. When exchanging parts, seals etc. only original spare parts shall be used.



Warning: *Flameproof enclosure! Before opening, ensure the absence of gas, dust and voltage.*

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For product specifications go to <http://download.a-tcontrols.com/>

A-T Controls, Inc. • 9955 International Boulevard, Cincinnati, OH 45246 • Phone: (513) 530-5175 • Fax: (513) 247-5462 • www.atcontrols.com