APL-7 Series Valve Position Monitor

Installation, Operation & Maintenance Manual

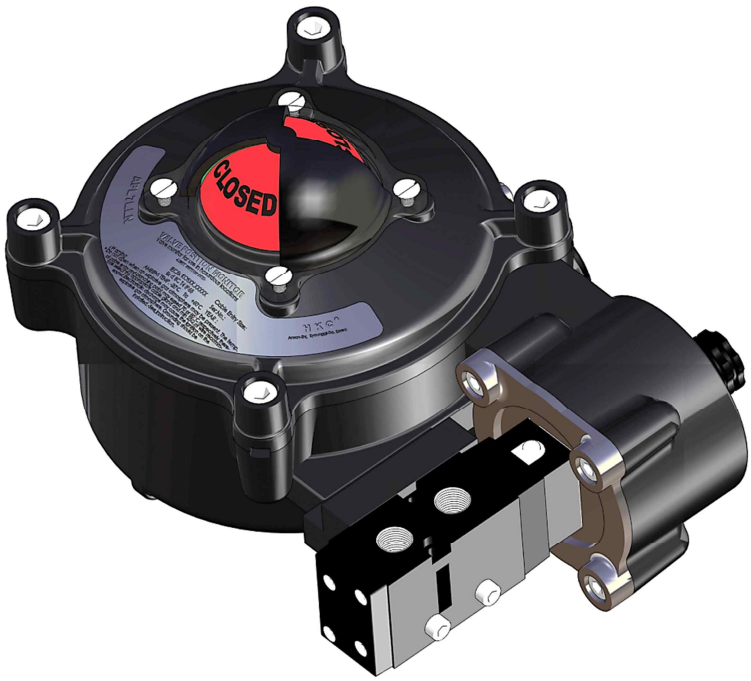

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Table of Contents

1 General

HKC APL series limit switch box is designed to provide accurate and reliable valve position signaling and indicating of most valves or actuators manufactured.
APL limit switch box consists of a visual position indicator, quick-set cam ass'y, terminal strip, switch ass'y and easy mounting bracket. Quick-set cam allows for a quick and simple hand operation in the setting of switches.

2 Ordering Information

APL - 7 10 N 0 1 2
① ② ③ ④ ⑤ ⑥

① Enclosure type
7 : Explosion proof & Coil, IECEx Ex d IIC T5 Gb, ATEX II 2 G Ex d IIC T5 Gb, KCs Ex d IIC T6 Gb

② Switch type
10 : 2-SPDT (Wonwoo : SZM-V16-5FA-61)
11 : 3-SPDT (Wonwoo : SZM-V16-5FA-61)
12 : 4-SPDT (Wonwoo : SZM-V16-5FA-61)
13 : 2-SPST (Wonwoo : SZM-V16-5FA-61)
14 : 2-DPDT (DZ-10GW-1B)
15 : 2-SPDT + Potentiometer (Wonwoo : SZM-V16-5FA-61)
16 : 2-SPDT + Signal Unit(4~20mA) (Wonwoo : SZM-V16-5FA-61)
20 : Proximity Sensor (P&F : NJ2-V3-N)
21 : Proximity Sensor (Autonics : PS17-5DNU)
23 : Proximity Sensor (P&F : NBB2-V3)
30 : Reed type Proximity Sensor

③ Beacon
N : Standard
T : 3 way T port type
L : 3 way L port type

④ Enclosure material (Body material)
0 : Aluminum
1 : Stainless steel Gr CF8 (SCS13A)
2 : Stainless steel Gr CF8M (SCS14A)
3 : Stainless steel Gr CF3M (SCS16A)

⑤ Coil voltage
0 : 24 Vdc (±10%)
1 : 110 Vac (±10%)
2 : 220 Vac (±10%)

⑥ Solenoid valve
0 : 3-way, 760 L/min (5 bar), Cv 0.6, NPT 1/8" or G 1/8"
1 : 3-way, 1000 L/min (5 bar), Cv 1.0, NPT 1/4" or G 1/4"
2 : 3-way, 2000 L/min (5 bar), Cv 1.6, NPT 3/8" or G 3/8"
3 : 5-way, 760 L/min (5 bar), Cv 0.6, NPT 1/8" or G 1/8"
4 : 5-way, 1000 L/min (5 bar), Cv 1.0, NPT 1/4" or G 1/4"
5 : 5-way, 2000 L/min (5 bar), Cv 1.6, NPT 3/8" or G 3/8"

3 Standard specification

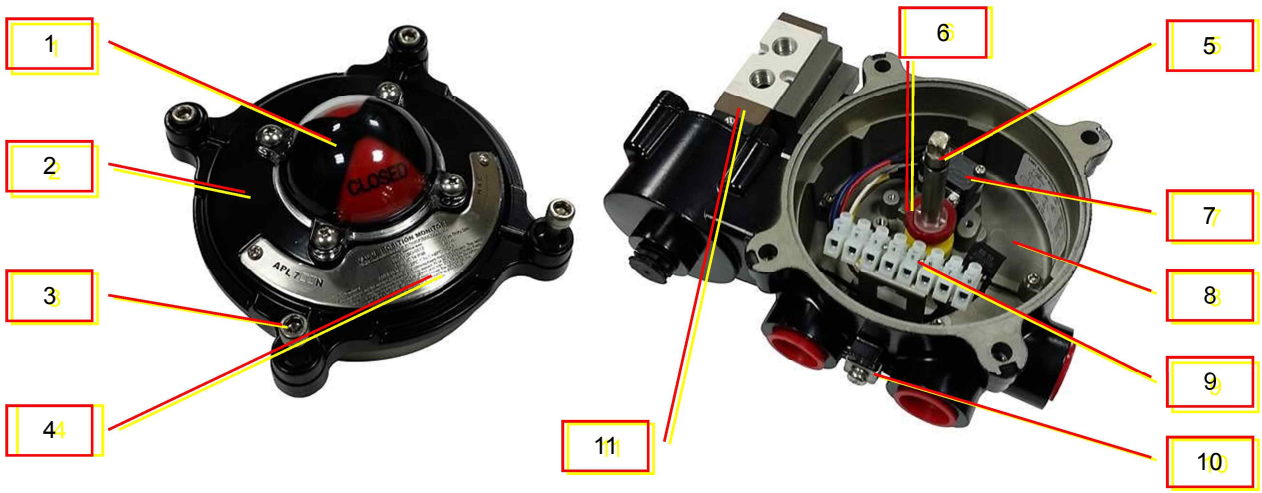
Model	APL-7..N,
Enclosure Rated	Weatherproof IP67 (Standard), IP68 (Option)
Enclosure	Aluminum alloy ADC12
Ambient Temperature	-20 ℃ ~ + 60 ℃
Cable Entries	3 x 3/4 NPT (Standard) M20, M25, PF3/4", PT3/4" (Option)
Travel Angle	90 degree +/- 10%
Position Indicator	Open : Yellow, Close : Red Language : English (option : French, German)
Switch	Mechanical switch : Wonwoo Starion, Omron

	Proximity sensor : Autonics, P&F Reed type proximity sensor
Potentiometer	1kΩ (option : 0~5kΩ , 0~10kΩ)
Current Output Signal Unit	4~20mA, 20~4mA
Terminal Strip	8 point (option : 9~14P)
External Coating	Thermally hardened dry powder polyester coating

4 Marking

- HKC Logo
- Trade mark
- Model
- Mechanical switches type
- Certification No.
- Ambient temperature
- Serial No.
- Manufacturred year & month (YY-MM)
- Cable entry size
- Warning
- Address
- Coil power rated voltage

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	Refer to the clause "2. Ordering Information ② Switch type"
8	Body	1	Aluminium die-casting(ADC12), Stainless steel(CF8M)
9	Terminal Strip	1	8P (9~14P available)
10	Earth Lug	2	Stainless steel
11	Solenoid Valve	1	Built-in

6 Pre-Installation for

- **use in general service**
  Verify the nameplate to insure correct model number, switch type, voltage before installation or use.

7 Installation

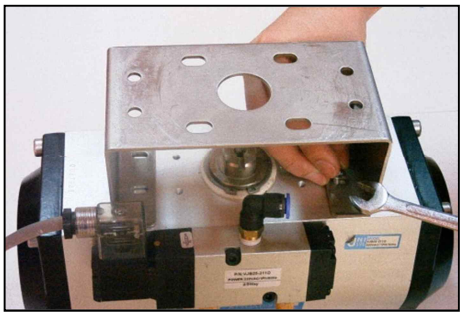
7.1 Mounting bracket

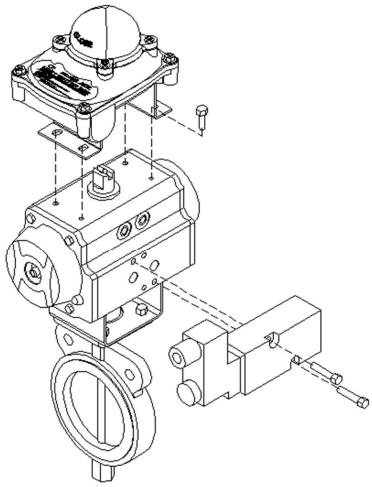
Caution ;

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

HKC shall supply a NAMUR VDI/VDE standards' bracket and a fixing stuff for mounting on actuator. Bracket shall be applicable to any type of valves ; manual valve, linear valve, pneumatic rotary valve.

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





7.2 Mounting limit switch box

Note :

- **Prior to mounting the limit switch box must be checked for any damage.**
- **Damaged parts must be replaced by original spare parts.**

Caution ;

⚠ *Do not attempt to work on limit switch box without first shutting off incoming power*

Limit switch boxes are available with a NAMUR shaft that enables direct attachment to actuator pinion without a coupler. These shaft feature a 4mm wide tang that engages the 4mm slot in NAMUR actuators.

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

7.3 Setting cam

The color of cams harmonized with position indicator help us to set the cams easily without wiring diagram. Cams shall be easily set without tool. APL series cams are splined and can be setting lift up or push down the cam from gear by hand in a seconds without setting tools. Self-locking, spring loading make never slip out of adjustment.

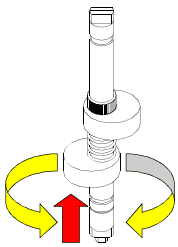
Note :

- **Basically, cams shall be set by manufacturer before shipment.**

- Un-tighten the captive cover bolts with a applicable tool. (L-Hex. Wrench recommended)

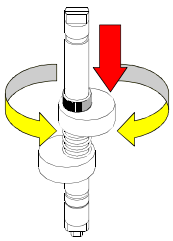
- Remove the cover carefully.

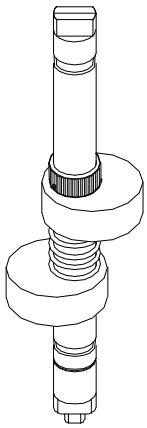
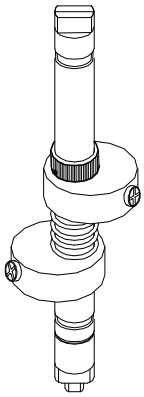
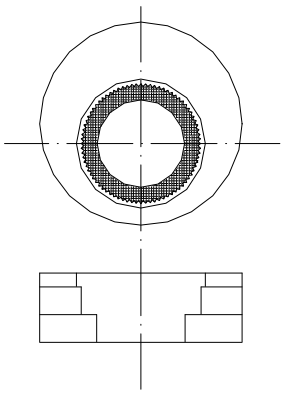
- Open cam setting
  - Electric power or air supply of valve actuator on to operate the actuator fully open
  - Lift the bottom yellow cam up and rotate it until the switch is activated.
  - And then release it. Cam shall be back into a stable position by itself.



- Close cam setting

  - Electric power or air supply of valve actuator off to operate the actuator fully close
  - Push the upper cam down and rotate it until the switch is activated.
  - And then release it. Cam shall be back into a stable position by itself.



Mechanical switches	Proximity sensors	Splined cam
		

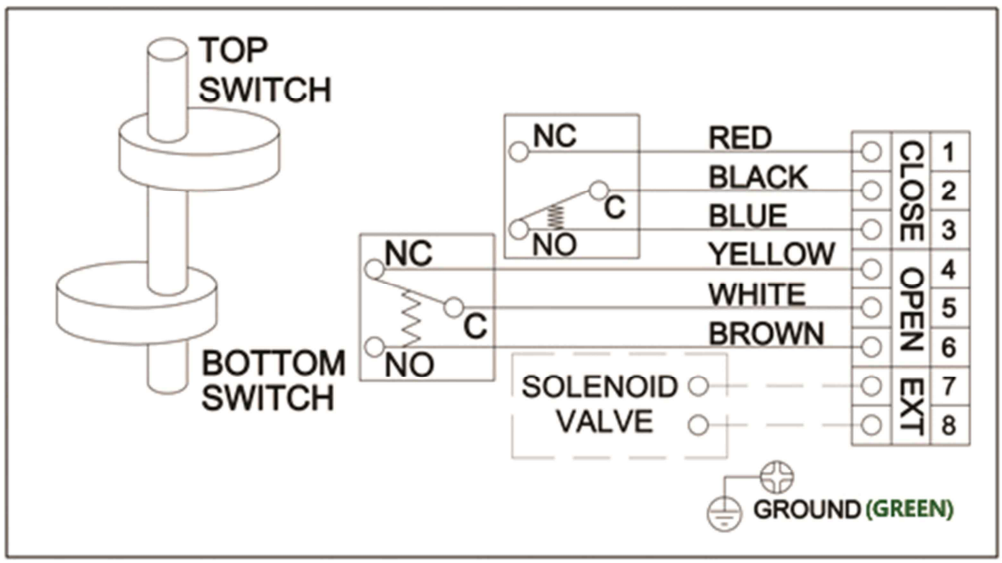
7.4 Wiring

Danger ;

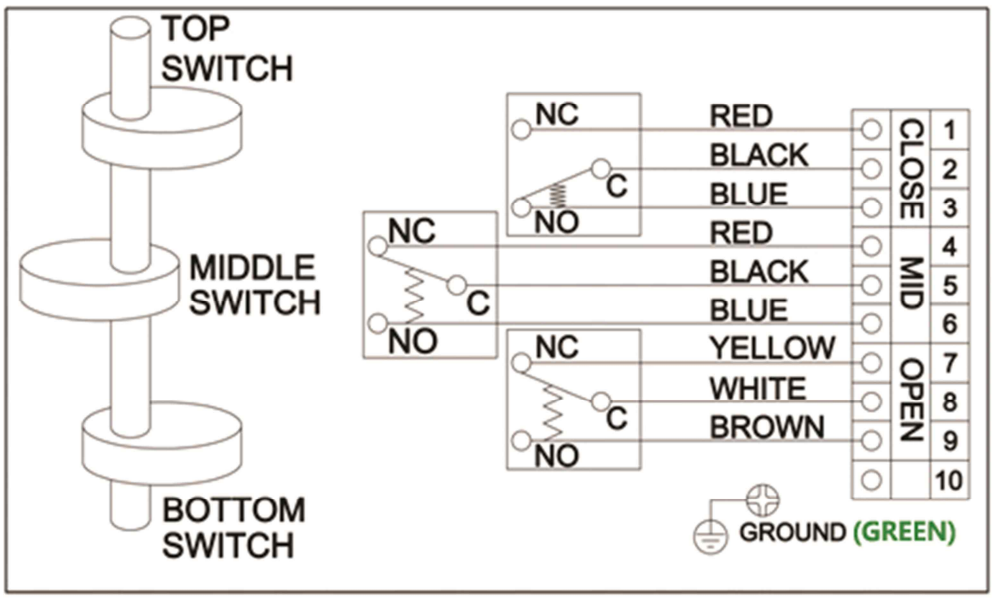
⚠ ***HAZARDOUS VOLTAGE. No electrical power should be connected until all wiring and limit switch adjustments have been completely.***

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.
Solenoid valve may also be wired through the APL enclosure. Two auxiliary terminals are included as standard.
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.

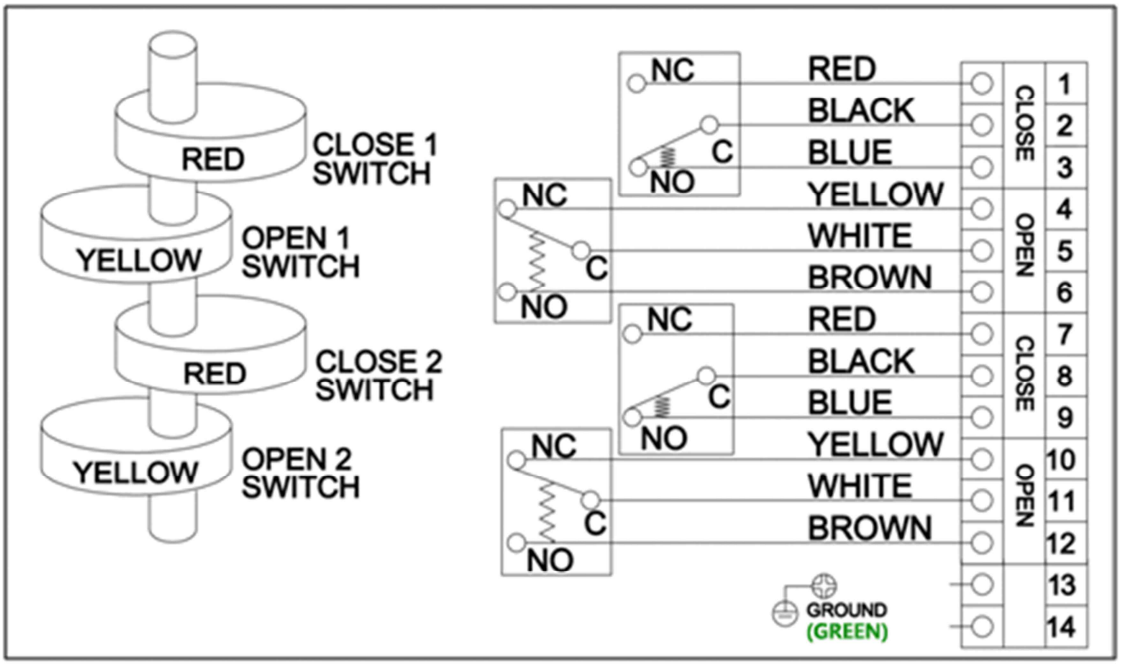
➢ MECHANICAL SWITCH (2 SPDT)



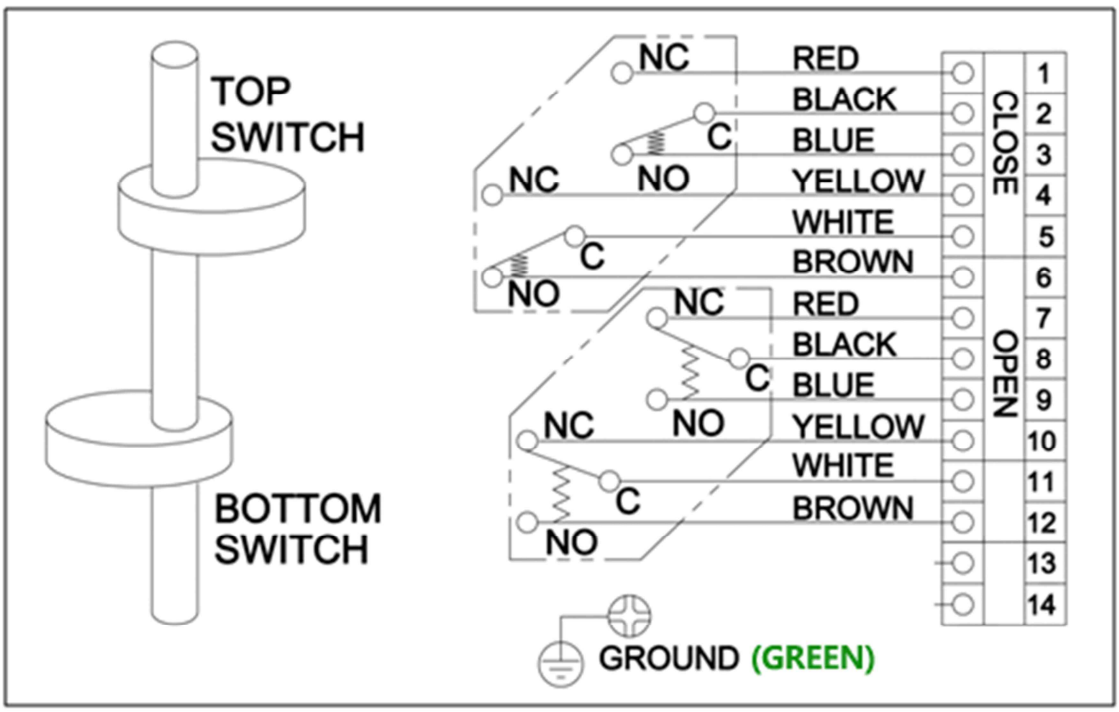
➢ MECHANICAL SWITCH (3 SPDT)



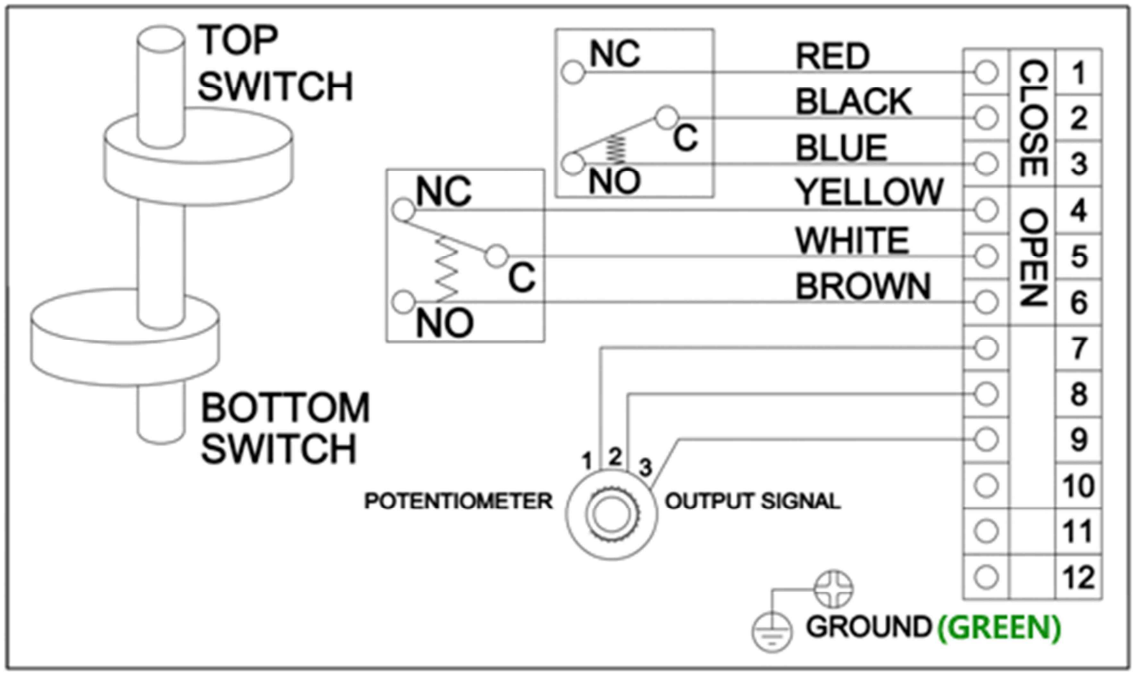
➢ MECHANICAL SWITCH(4 SPDT)



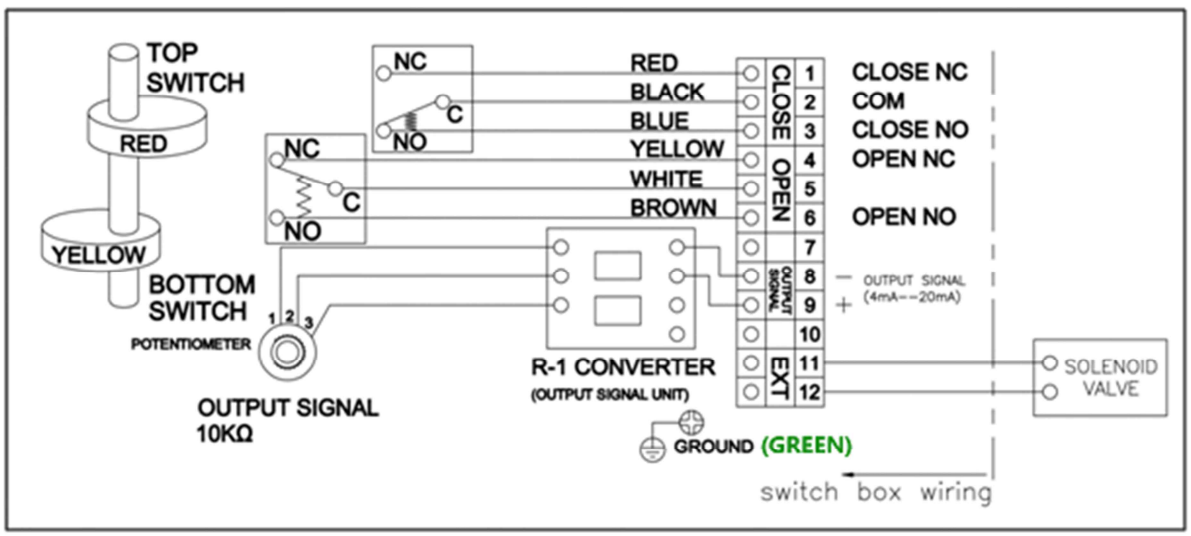
➢ MECHANICAL SWITCH(2 DPDT)



➢ MECHANICAL SWITCH(2 SPDT) WITH OUTPUT POTENTIOMETER



➢ MECHANICAL SWITCH(2 SPDT) WITH CURRENT OUTPUT SIGNAL



Note ;

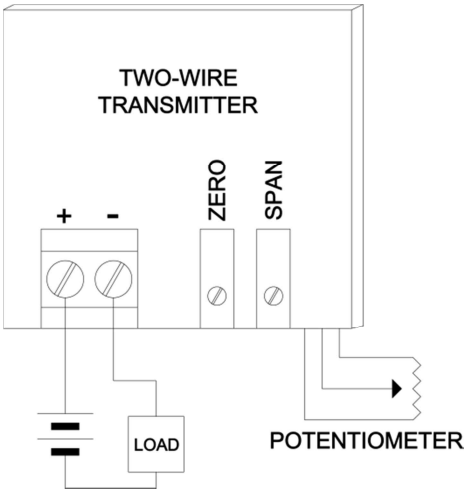
- Grounding should be connected until all wiring have been completely.
- Internal grounding wire square shall be min.2SQ. recommended.
- External grounding wire square shall be min.4SQ. recommended.

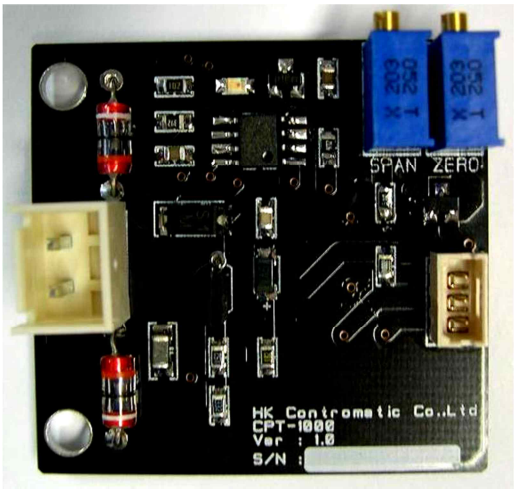
7.5 Setting Position Transmitter Unit (APL- . . 6)

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 a 4~20mA output signal.

Technical features

Power Supply Range	12.5 ~ 37VDC (25V typical)
Current Signal Output	4~20mA
Max. Load Resistance	Max. Resistance (ohm) = (Supply voltage - 12.5) / 0.02
Potentiometer	0~500 ohm / 10k ohm
Operation Temperature	-20 ~ 60℃
Dimension	40 * 60 * 15





a) Calibrating potentiometer

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

b) Zero and Span Calibration

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

- Operate an actuator to 50% position and then fully closed position.
- When the actuator is in the fully closed position, adjust the "zero" button on the card until a value of 20 mA is achieved.

8 Maintenance

HKC APL 7.. Series limit switch box is designed to provide accurate and reliable valve position signaling and indicating of most valves or actuators manufactured

Caution :

- ⚠ *Shut off incoming power or air supply on the valve actuator before maintenance limit switch box.*
- ⚠ *Be sure that the area is clean before disassemble and maintenance limit switch box. Clean all parts and housing before re-assemble.*
- ⚠ *Refers to the part list when ordering replacement or spare parts.*

Maintenance, under normal conditions at six month intervals or 100,000 cycle operation. But when conditions are more severe, more frequent inspections may be required.

- Insure valve actuator alignment
- Insure wiring is insulated, connected and terminated properly
- Insure all screws are present and tight
- Insure conduit connections are installed properly and are dry
- Check internal devices for condensation
- Check enclosure O rings seals and verify that the O ring is not pinched between housing
- Visually inspect during open/close cycle
- Inspect identification labels for ware and replace if necessary

Warning :

⚠ *Treat cover with care. Gap surface must not be damaged or dirtied in any way*

9 Inspection

- Check the item and quantity of products with packing list or related documents.
- Check the limit switch box o-ring. Where a damage on it. It caused the corrosion of internal parts.
- Check the adjustment of cams. Cams shall be released when those have been used for a long period of operating. If do so, they don't work correctly with switches.

10 Storage

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

11 Trouble Shooting

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

Signal fails to main control room.

- Check the wiring of limit switch box in accordance with wiring diagram.
- Check whether the cams or switches are damaged or broken.
- Check the main signal wire from the terminal strip.
- Re-set the limit switch box
- Check potentiometer gear jamming
- Check the zero and span calibration
- Check whether the card is damaged or not.

12 Tools

- 1 Set Metric Allen key (Hex Wrench)
- 1 Set Screw driver
- 1 Set Metric spanner
- 1 Wire Stripper long nose
- 1 Needle nose pliers
- 1 Multi Meter (AC, DC, Resistance)
- 1 Ohm Meter (0~25mA) : IF APL - . 16 adapted

13 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.*

- 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.
- Cable entries, cable glands, plugs etc. have to be checked for correct tightness and sealing.
- Check all of the connections are fastened correctly.
- Take care of possible discolorations of the terminals and wires.
- Ensure that all housing covers are handled carefully and that the seals are checked.
- All cables have to be checked.
- If defects which affect the safety are detected during maintenance, repair measures have to be taken immediately.
- Any kind of coating for the gap surface shall not be permitted.
- When exchanging parts, seals etc. only original spare parts shall be used.

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