

# INSTRUCTION MANUAL

ITEM : DIFFERENTIAL PRESSURE SWITCH

MODEL : P991



**WISE<sup>®</sup>** WISE Control Inc.  
[www.wisecontrol.com](http://www.wisecontrol.com)

# Instructions for proper and safe operation

Please read instructions carefully prior to using the instrument for proper and safe operations.

Mishandling could cause device malfunctions and result in disastrous injuries or accidents.

## WARNING

1. Do not exceed the pressure range allowed.

2. Do not use it to measure the pressure of corrosive fluid.

Damage or rupture of pressure gauge may cause release of fluid which could lead to bodily injury or destroy surrounding area.

3. Do not apply excessive load, vibration or impact.

4. Please use within the specified temperature ranges.

Exceeding the temperature range may cause disruption in nearby area due to damage to the temperature indicator.

5. Make sure to turn off the valve to prevent the measuring fluid leak when dismantling the gauge.

6. Use a pressure gauge with no oil in an environment with hydrocarbon or oxygen.

Oil contained in the gauge may react with oxygen which may be flammable or explosive.

7. Please always follow the mounting instructions in the manual in cases of field installation.

8. Do not make any modifications to the product or to add more functions.

Please consult with us for any repair.

9. Please be sure to close a valve and cut off pressure in advance in opening the case of this product.

Please be sure to cut off power because there is a risk of electric shock if wiring work is carried out while electricity is applied.

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## 1. INTRODUCTION

Before using the P991, read through this manual carefully to use the product properly and efficiently. Items which may potentially invoke injury or serious harm to the human bodies are marked with "DANGER". Observe the given instruction strictly.

## 2. APPLICATION

On reaching a set differential pressure, this product can be used for process control, abnormality notice, or warning on the basis of the On/Off signal. In addition, due to the pressure resistant and explosionproof structure, it can be installed in explosionproof areas.

## 3. FEATURES

- 1) High reliability owing to a microswitch.
- 2) Maintenance is easy due to face to face operating.
- 3) A micro switch is useful for stable open or close due to its snap action.
- 4) It can be used for explosionproof or hazardous area.

## 4. SPECIFICATIONS

- 1) Available Differential Pressure Ranges

Differential pressure range Kpa	Contact Difference Kpa	Static pressure Kpa	Single-side withstand pressure Kpa
0 ~ 4	0.25	500	4.8
0 ~ 5	0.3		6
0 ~ 7	0.35		8.4
0 ~ 10	0.4		12
0 ~ 15	0.6		18,24
0 ~ 20	0.8		24
± 2	0.25		2.4
± 5	0.4		6

- 2) Repeatability :  $\pm 1.5\%$  of Full Range
- 3) Sewice temperature range : -20 to +60°C
- 4) Process fluid temperature : -20 to +60°C
- 5) Materials for wetted parts : Wetted Parts - 304SS, Bellows - 316LSS
- 6) Number of contacts : 1 SPDT
- 7) Connecting screws : Rc 1/4
- 8) Case protection class : Explosion Proof - Ex d IIc T6, IP65
- 9) Case materials : AC7A
- 10) Mass : approx 20Kg
- 11) Electrical properties

Power source	Voltage	Resistance load	Inductive load	Withstand voltage	Insulation resistance
	V	A	A		
AC	125	15	15	1500V AC,50/60Hz one minute between each terminal and case	100MΩ or more on 500VDC between each terminal and case
	250	15	15		
DC	30	2	1		
	125	0.5	0.05		

## 5. INSTRUCTIONS FOR TRANSPORTATION, STORAGE AND UNPACKING

### 1) Instrucion for Transportation

This product is a precision instrument. If it is dropped or a shock is applied to it,  
it maybe damaged. Carry the product with great care.

6. OUTSIDE DIMENTIONS

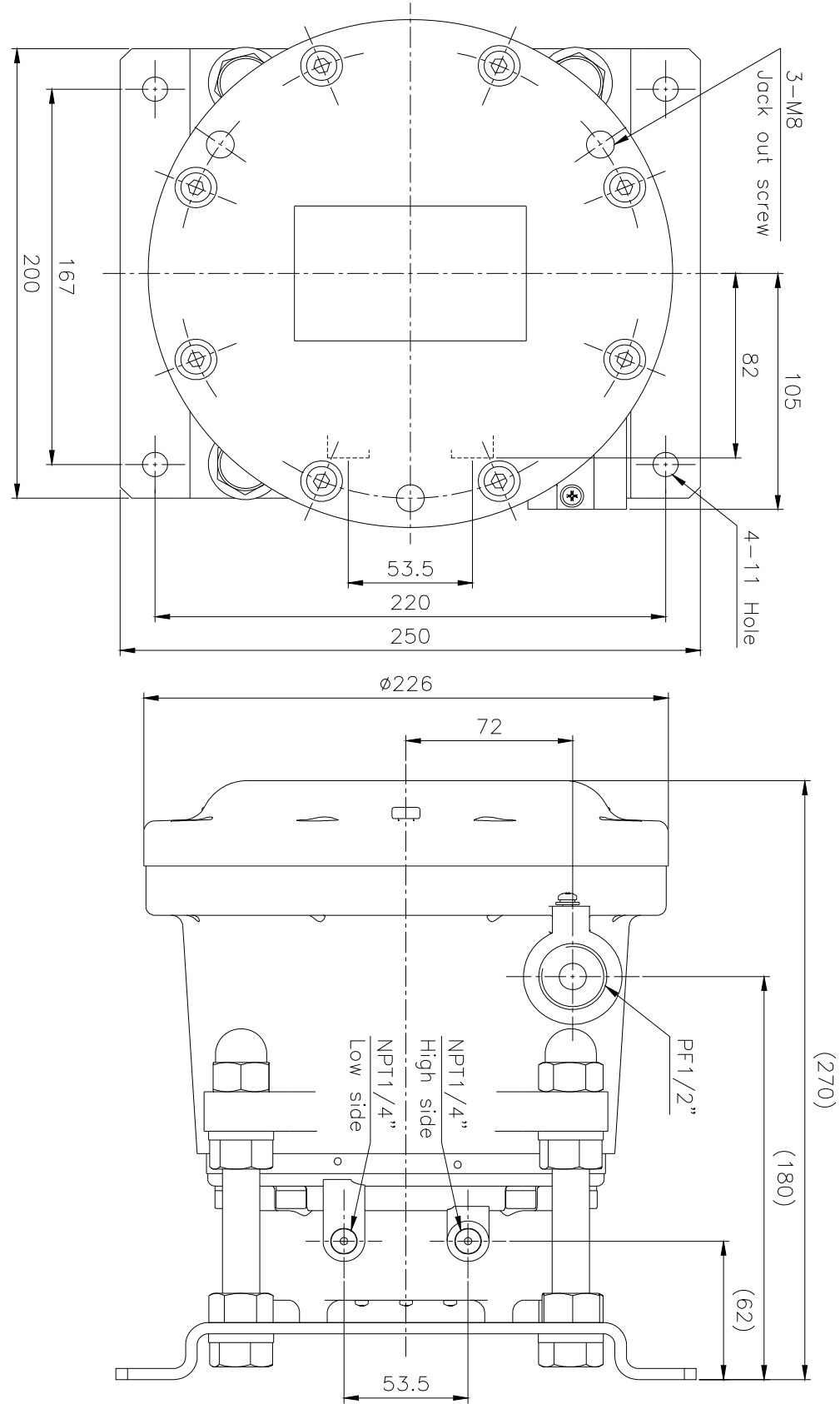


Fig. 6-1

## 7. STRUCTURE AND PRINCIPLE OF OPERATION

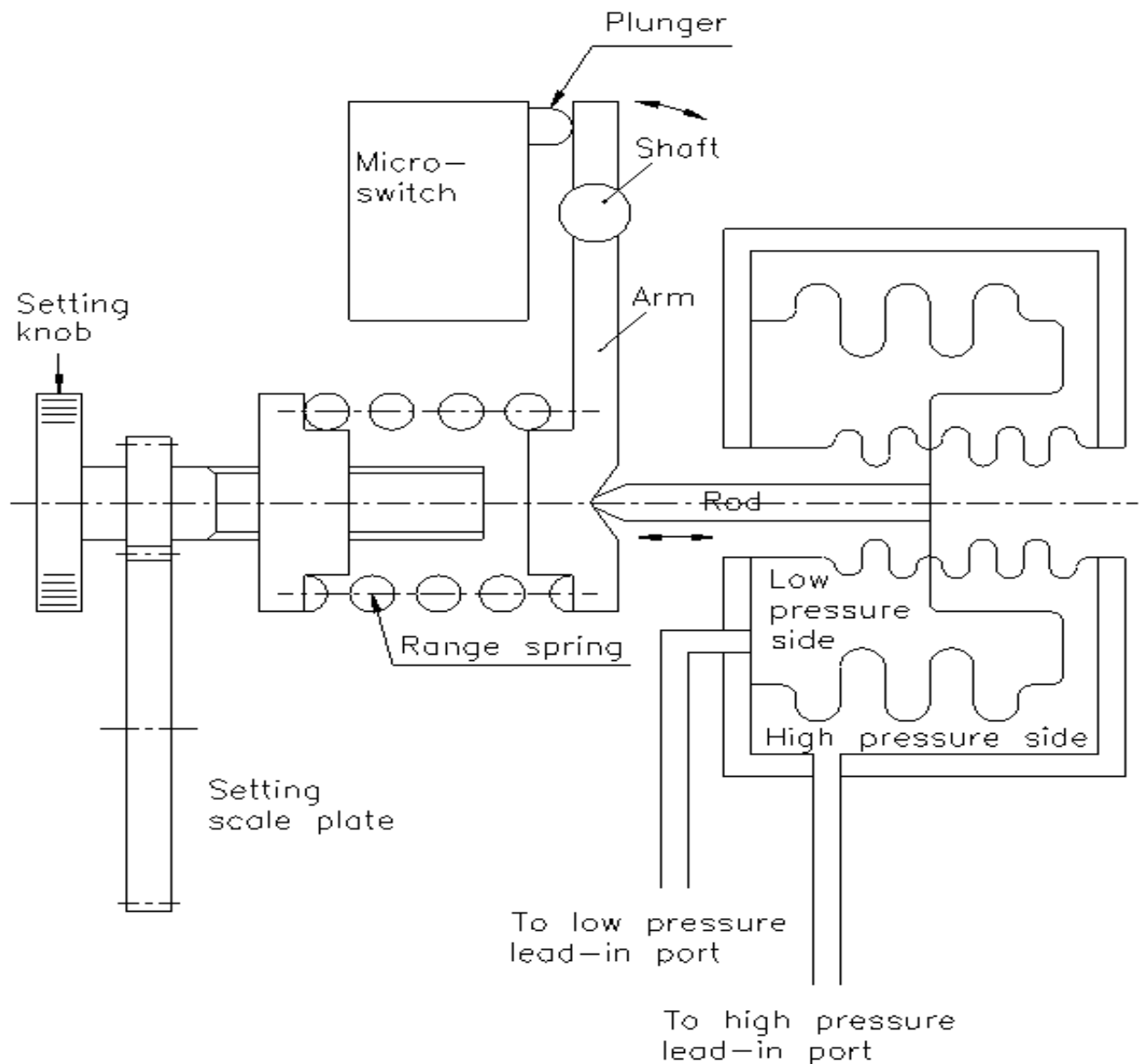


Fig. 7-1

If the differential pressure is less than the set value, the plunger of the microswitch is pressed by the range spring. As the differential pressure increases, the rod overwhelms the force of the range spring and moves to the left. Accordingly, arm with a pivot rotates clockwise around the shaft and drives the microswitch. Therefore, the differential pressure can be set by turning the setting knob to control the force of the range spring.

## 8. INSTALLATION

### 8-1. Instructions for Installation

Observe the operation range shown in Section 4 SPECIFICATIONS.

Other instructions are shown below.

### 8-2. Installation position

Follow the instructions shown below when selecting the installation position of the switch.

- 1) The switch should be installed in a place which allows easy operation and maintenance.
- 2) The switch should be installed in a place the from external vibrations or shocks.
- 3) The switch should be installed in a place not subject to the direct sunlight, rain or dews.
- 4) The switch should be exposed to the normal ambient tempera & and not so high humidity.
- 5) The switch should not be exposed to dust, corrosive gas, etc.

### 8-3. Installation Direction

See Section 6 OUTSIDE DIMENSIONS, and install the switch in the direction shown in the figure to allow it to function properly.

### 8-4. Installation Methods

Be sure to fix the switch securely to a mounting plate or panel. With four bolts, because it is heavy. Never support it with the pressure port (pipe) only.

### 8-5. Wiring

#### 1) Contact type

The switch incorporates one microswitch. The types of the microswitch contact available are upper limit (H), lower limit (L), reverse upper limit (HR), and reverse lower limit (RL).

When ordering, specify the type of the limit switch. The details of the microswitch contact are as follows.



Contact type name	Contact type symbol	Diagram	Terminal symbol on terminal block
Upper limit	H(NO)	<p>Differential pressure increases →</p> <p>← Differential pressure decreases</p> <p>0 ← Differential pressure → MAX. (H&gt;L)</p>	NO-COM
	H(NC)	<p>Differential pressure increases →</p> <p>← Differential pressure decreases</p> <p>0 ← Differential pressure → MAX. (H&gt;L)</p>	NC-COM
Lower limit	L(NO)	<p>Differential pressure increases →</p> <p>← Differential pressure decreases</p> <p>0 ← Differential pressure → MAX. (H&gt;L)</p>	NC-COM
	L(NC)	<p>Differential pressure increases →</p> <p>← Differential pressure decreases</p> <p>0 ← Differential pressure → MAX. (H&gt;L)</p>	NO-COM

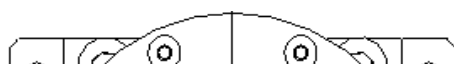
Table 8-1

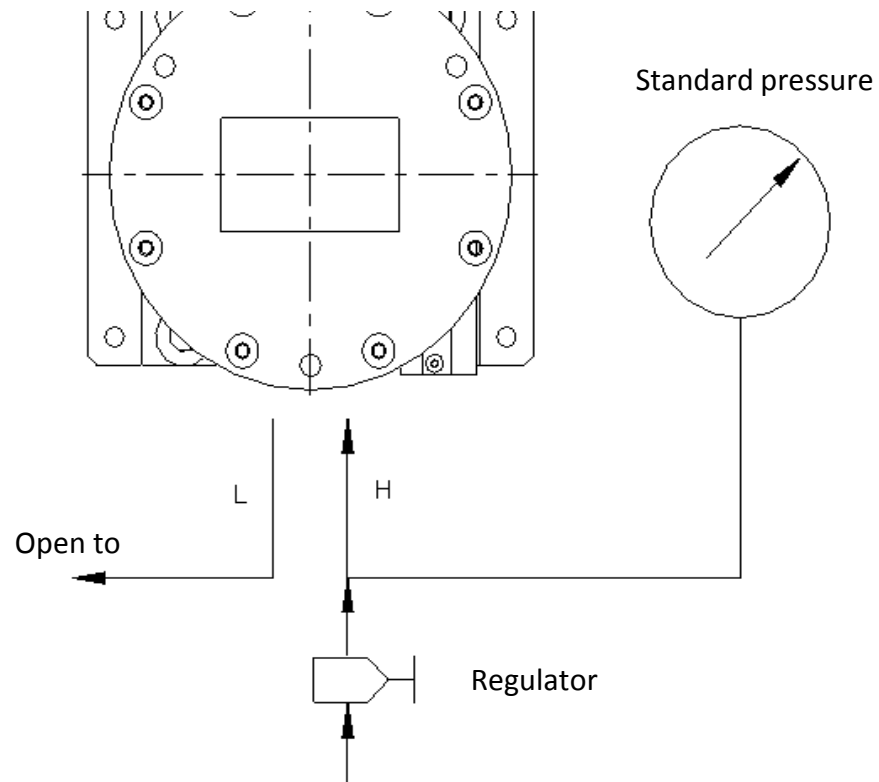
## 9. SETTING PROCEDURES

- 1) Fix the instrument in the proper direction firmly and stably.  
(For the proper direction, see Section 6 OUTSIDE DIMENSIONS.)
- 2) Connect a pipe between the standard pressure source and the high-pressure connection port of the instrument. Open the low-pressure connection port to the atmosphere. ( Fig. 9-1 )

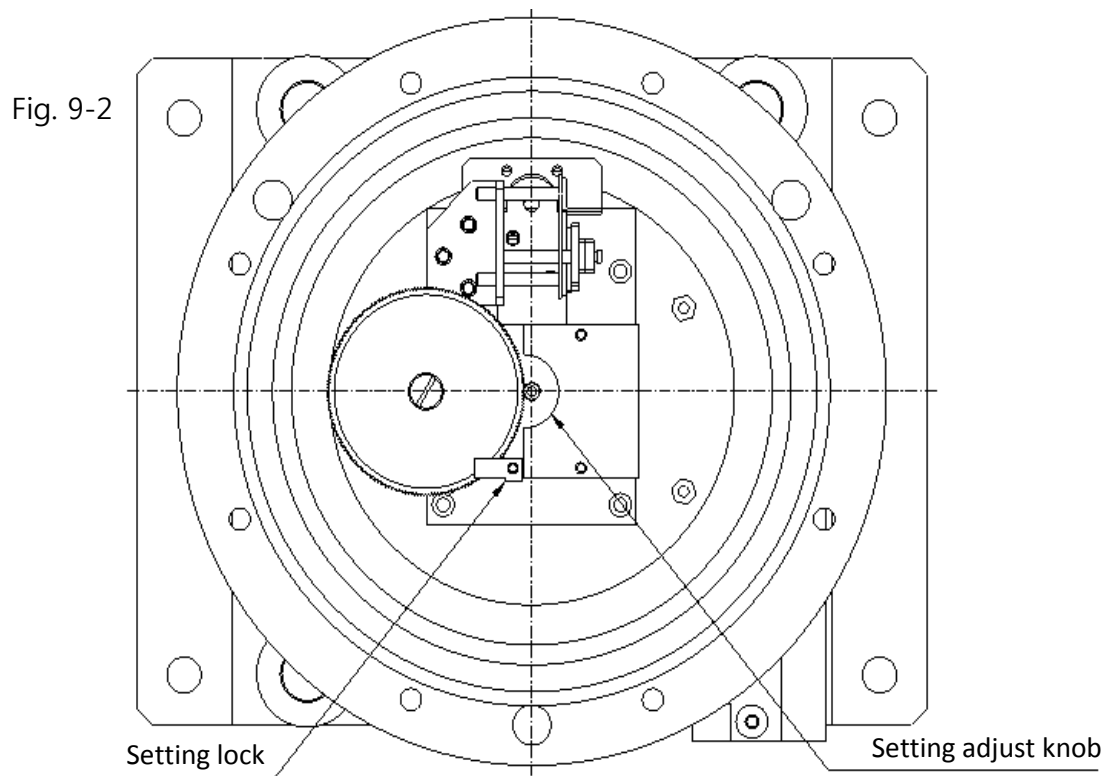
Use as accurate standard pressure gauge as possible in the proper range. If the standard pressure gauge is used in too high a range even though it is a precision instrument, the indication reading accuracy is deteriorated. Please note this.

Fig. 9-1





- 3) Detach the front cover. Refer to the terminal numbers shown in Table 8-1 and connect the buzzer, etc.
- 4) Fig 9-2 shows the internal mechanism with the front cover detached. Loosen the setting lock with flathead screwdriver, and turn the setting adjust hob to change the setting.



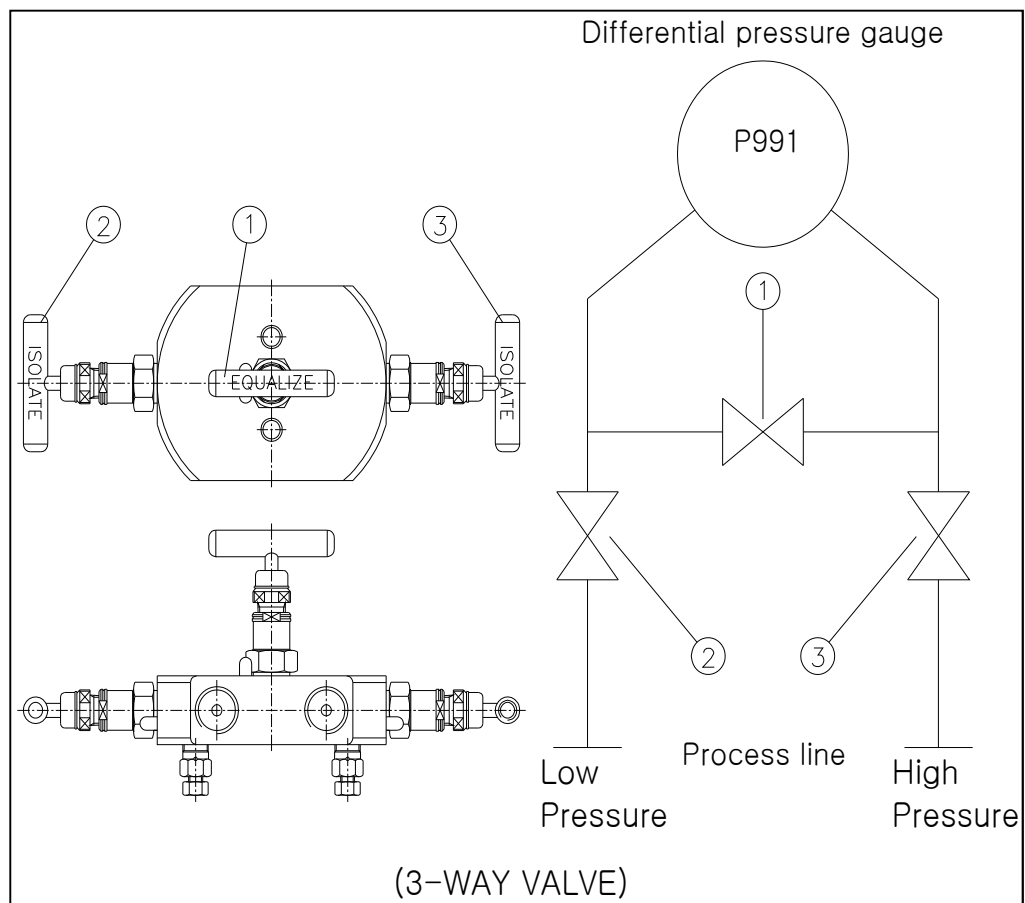
- 5) In the case of an upper limit or reverse upper limit type switch, decrease the set value gradually from a high differential pressure. In the case of a lower limit or reverse lower limit type switch, increase the set value gradually from a low differential pressure. Every time setting is changed, increase and decrease the pressure to check the operating pressure.
- 6) When the pressure is set properly, check the set pressure three times or more in that condition. If it is different from the intended value, set the pressure again and repeat the same operation Tighten the setting lock after the setting.
- 7) Attach the front cover, and secure the locking.

## 10. OPERATIONS

### 1) Operation of the three-way valve

- ① Equalizing Valve
- ② Low Pressure Valve (LP Valve)
- ③ High Pressure Valve (HP Valve)

Fig. 10-1



- (1) For initial setup, all the valves must be closed
  - (2) After complete installation, first release Equalizing valve, then release HP valve at this point check whether the pointer is pointing at "0", if there is an error, must perform zero adjustment.
  - (3) Before operating other valves, make sure all the air is out of the DP gauges by opening the air vent at the top of the housing. left over air could cause error in measuring DP.
  - (4) Then, open LP valve. after opening LP valve, close the Equalizing valve, Then make sure it is indicating correct value. now, it is ready to use.
- 2) In case of DP gauge is malfunctioning, release Equalizer valve,  
Then close LP valve. now, close HP valve, then close equalizer valve.  
Release all the air inside the DP gauge by opening up the air vent.  
Now take DP gauges to manufacturing for repair service.

## **11. MAINTENANCE AND INSPECTION**

- 1) Check the instrument once a year or more for the following points:

- Whether the appearance is conformable
- Set value
- Contact resistance measurement

We recommend to prepare a check list of the instruments and to make calibration and work records for effective instrument control. Do not record data-without an aim. Check long-term changes of the instrument such as the total errors with respect to the initial values, abnormal change of the contact difference etc. If abnormal change takes place, it is necessary to locate the cause, no matter how it can be eliminated by means of readjustment. Minor defects may not cause serious troubles. However, serious troubles may be hidden in some cases.

- 2) The contacts of a micro-switch are oxidized or chemically affected by the atmosphere. The contact resistance increases as time passes. If the load is relatively great, oxide film, etc. are blown out by electric arc energy when the contact function and poor contact rarely occurs. However, such a phenomenon does not occur with a minor load, resulting in poor contact in many cases.