



INSTRUCTION MANUAL  
FOR  
PRESSURE TRANSMITTER  
MODEL KH15 (R TYPE)

NAGANO KEIKI CO., LTD.

Nov. '04. REV.

# MANUAL FOR ACCURATE AND SAFE OPERATION

## SAFETY CHAPTER FOR PRESSURE TRANSMITTER PRESSURE TRANSDUCER AND ELECTRONIC PRESSURE SWITCH

To use these devices accurately and safely, carefully read this manual and the operation manual. Incorrect usage may cause malfunction and result in human injury, accidents, etc.

Be sure to keep this manual for reference after reading.

### WARNING

1. Do not apply more than the maximum allowable pressure.  
Human injury or damage to surroundings may result due to explosion or breakdown of the pressure elements.
2. Do not use these devices on measured objects which are corrosive to fluid or gas contacting areas.  
Human injury or damage to surroundings may result due to explosion or breakdown of the pressure elements and exposure of dangerous measured objects.
3. Do not apply excessive weight, vibration or shock.  
Human injury or damage to surroundings may result due to explosion or breakdown of these devices and exposure of dangerous measured objects.
4. Use with the unspecified power supply may cause fire hazard or electric shock.
5. Use with the instrument temperature range.  
Use outside the instrument temperature range may cause human injury or damage to surroundings due to explosion or breakdown of the devices.
6. Connect wiring accurately according to the wiring drawings or instructions in the operation manual.  
Incorrect wiring may result in human injury or fire hazard.
7. Use devices with an explosion-proof construction when operating in places liable to have explosive gas.  
Danger of ignition and explosion.
8. If the measured object is oxygen, use devices with anti-oil treatment.  
Standard devices may possibly contain remaining oil, and there is danger of combustion and explosion if oil acts on oxygen.
9. Accurately install these devices according to the installation instructions in the operation manual.
10. Never attempt to reconstruct the main body of devices nor add any new function to the devices, etc. Contact us for repairs.

**Note :** Inform us in advance when using these devices in a way that may result in fatal or serious injury due to malfunction or incorrect operation.

NAGANO KEIKI CO., LTD.

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## 1. Preface

First, please confirm the specification of the model delivered to you. If its range or electric power source or output is wrong it becomes a cause of accident.

Please make sure to use and install a model of proper specification at right place.

## 2. Product Outline

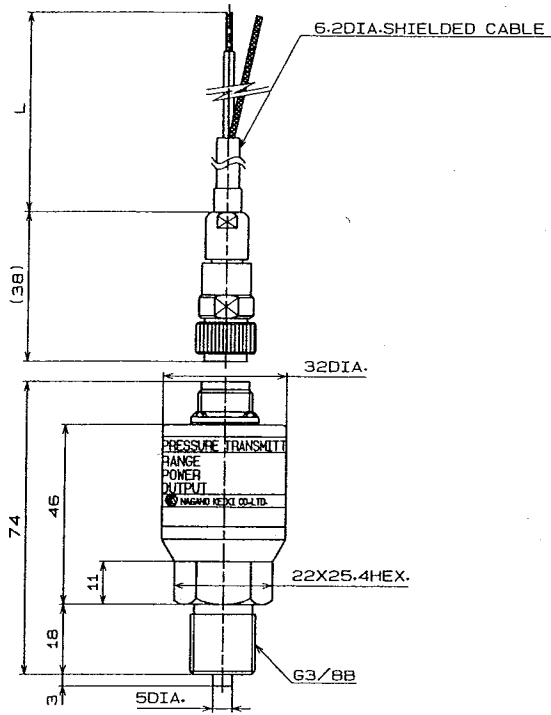
KH15 type pressure transmitter (R TYPE) is a small but rugged pressure transmitter which was a semi-conductor strain gauge at pressure pick up part. Its standard output is 4 to 20 mA DC, 0 to 5 V DC or 1 to 5 V DC.

## 3. Specifications

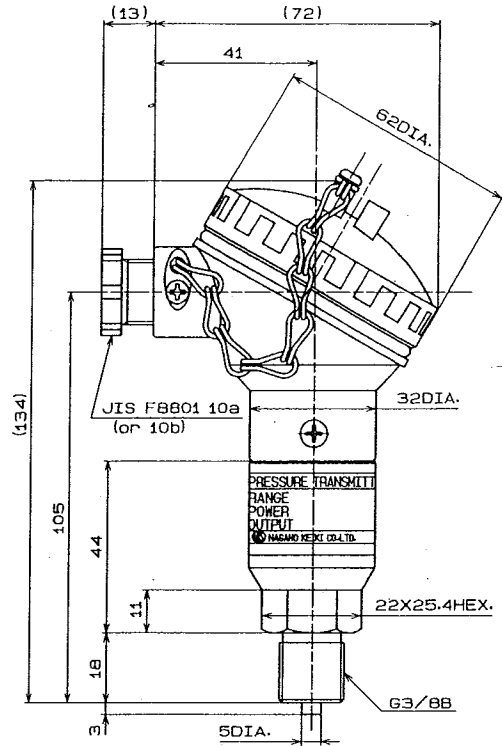
- 1) Pressure range : 0 to 30 kPa ~ 0 100 MPa  
Less than 2 MPa : Compound gauge is also available  
Less than 0.1 MPa : non-corrosive air fluids
- 2) Maximum allowable pressure : 200 % of rated pressure  
(150 % for 35 MPa and 50MPa)  
(120 % for 70 MPa and 100MPa)
- 3) Power source : 24 V DC  $\pm$  10 %
- 4) Output : 4 to 20 mA DC (Load resistance : 500  $\Omega$  max.)  
1 to 5 V DC (Load resistance : 10 k $\Omega$  min.)  
0 to 5 V DC (Load resistance : 10 k $\Omega$  min.)

- 5) Accuracy :  $\pm 0.25$  % F.S. (for the range of 3.5 MPa to 20MPa)  
 $\pm 0.5$  % F.S. (for the range of 0.5 MPa to 50MPa)  
 $\pm 1.0$  % F.S.  
 (They includes linearity hysteresis and repeatability)
- 6) Applicable temperature range :  $-20$  to  $70$  °C (Provided that measured substances shall not get frozen and dew concentration shall not occur.)
- 7) Temperature characteristics :
- |                      |                      |                                   |
|----------------------|----------------------|-----------------------------------|
| Zero thermal drift ; | $\pm 0.025$ %F.S./°C | (at accuracy of $\pm 0.25$ %F.S.) |
|                      | $\pm 0.05$ %F.S./°C  | (at accuracy of $\pm 0.5$ %F.S.)  |
|                      | $\pm 0.1$ %F.S./°C   | (at accuracy of $\pm 1.0$ %F.S.)  |
| Span thermal drift ; | $\pm 0.025$ %F.S./°C | (at accuracy of $\pm 0.25$ %F.S.) |
|                      | $\pm 0.05$ %F.S./°C  | (at accuracy of $\pm 0.5$ %F.S.)  |
|                      | $\pm 0.1$ %F.S./°C   | (at accuracy of $\pm 1.0$ %F.S.)  |
- 8) Response time : Less than 1 ms
- 9) Connecting part material : Element SUS630 or equivalent  
 Silicon (pressure range 30 kPa to 0.1 MPa for non-corrosive air fluids)  
 Joint SUS316  
 NBR (with O ring for the pressure range less than 10 MPa)
- 10) Connecting screw : PF3/8  
 PT1/4 (for the pressure range less than 50 MPa)
- 11) Case : Drip-proof constructive (Except external adjustment type and internal connector type that are general type of indoor installment.)

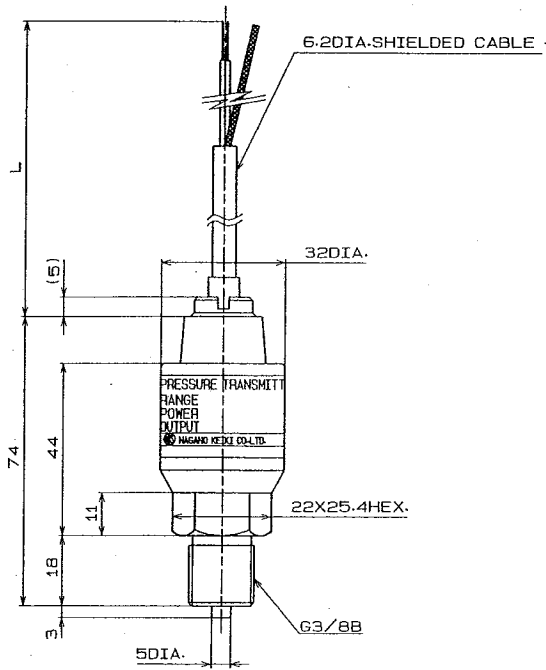
4. External Shape Drawing



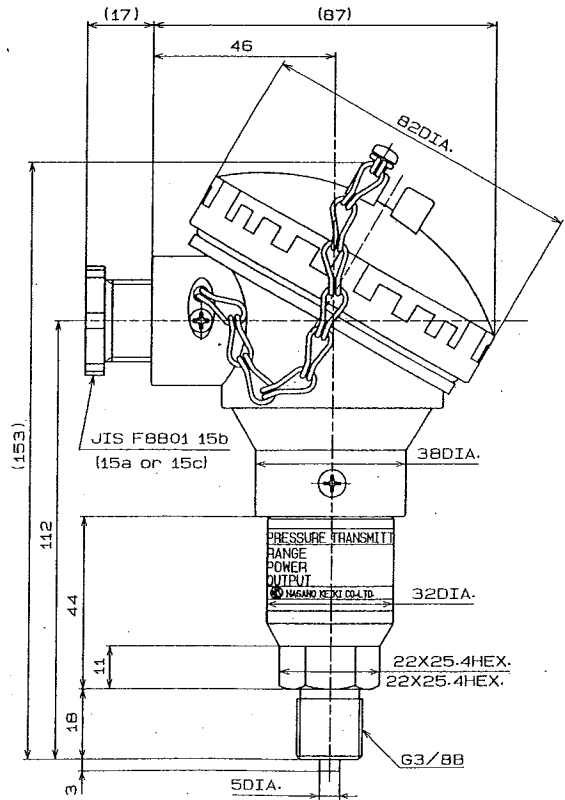
Internal Adjustment with Connector Type



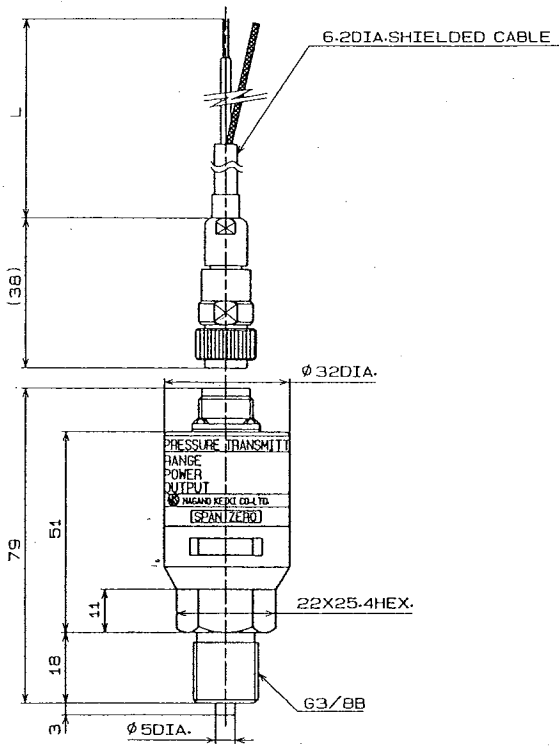
Terminal Box (Small) Type



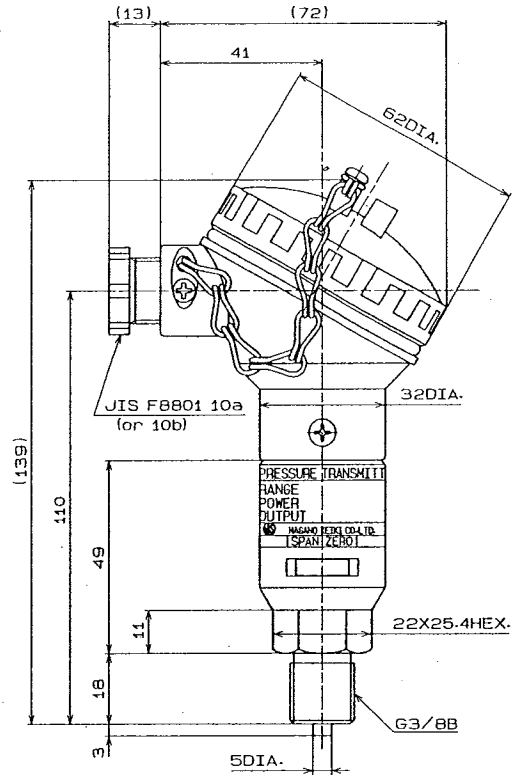
Cable Type



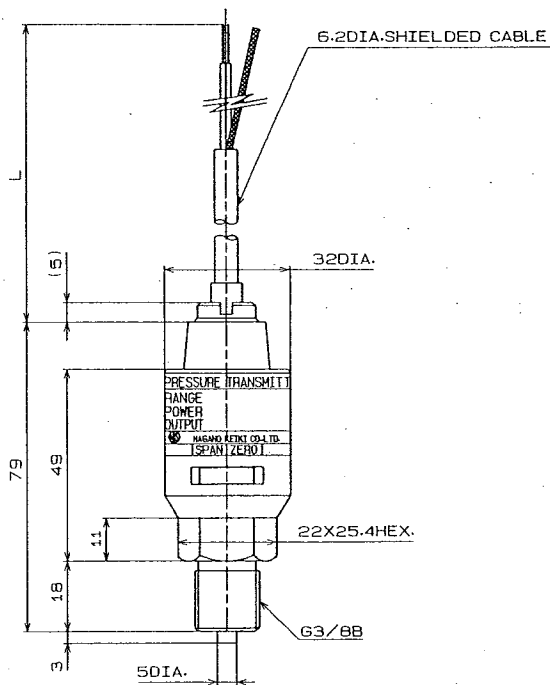
Internal Adjustment with Terminal Box (Large) Type



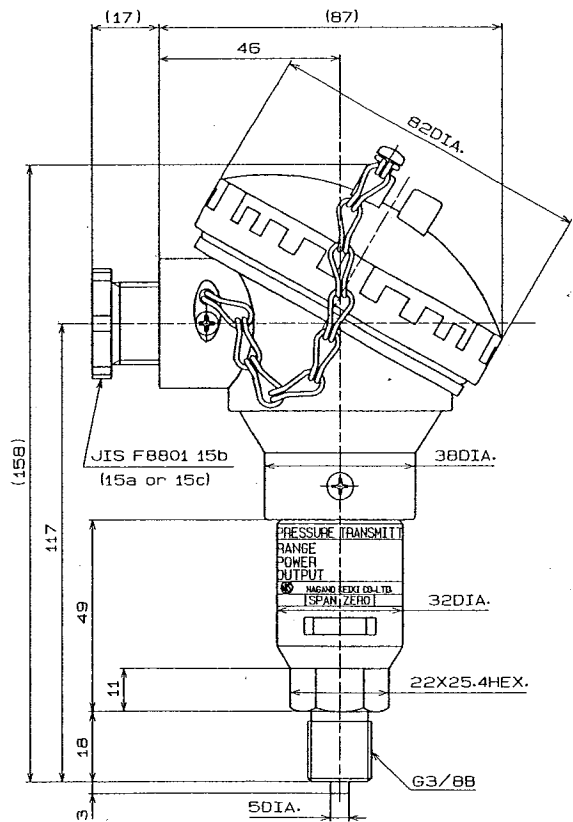
External Adjustment with Connector Type



External Adjustment with Terminal Box (Small) Type



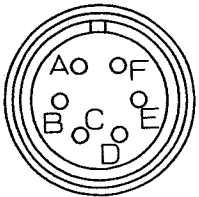
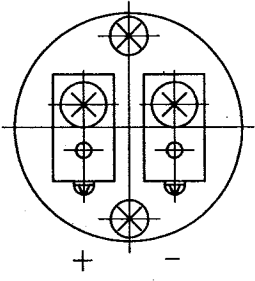
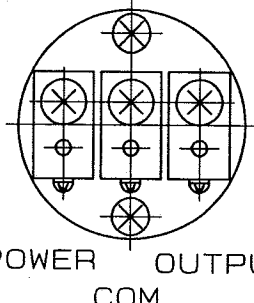
External Adjustment with Cable Type



External Adjustment with Terminal Box (Large) Type

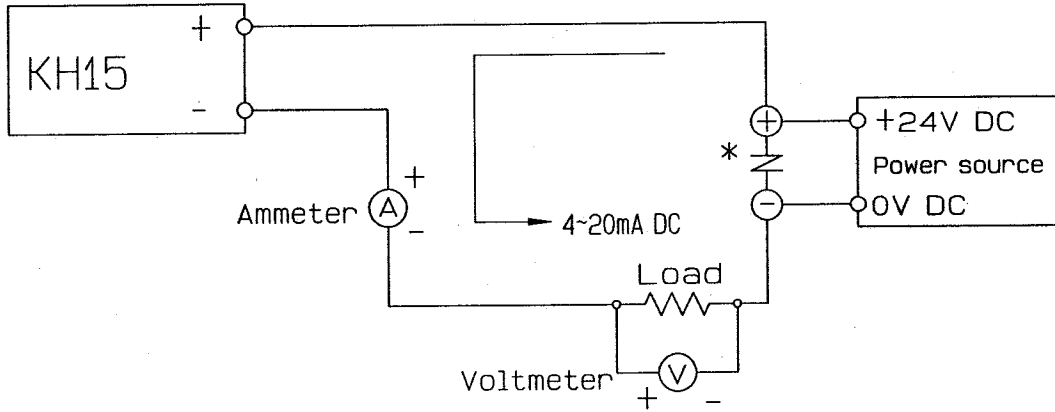
5. Wiring and External Connection Examples

5-1. Wiring Diagram

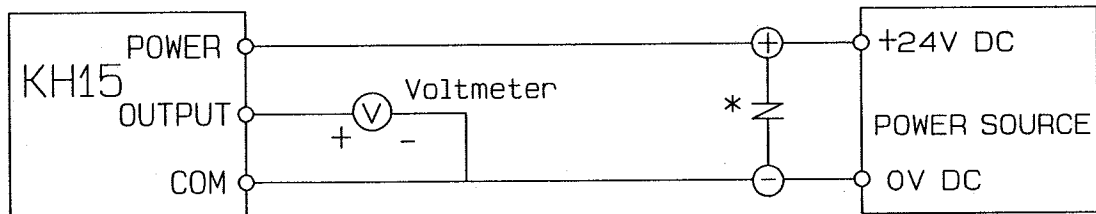
	Two wires	Three wires
<p>Connector Type</p> 	<p>Red (Connector : A) + White (Connector : C) -</p>	<p>Red (Connector : A) POWER White (Connector : C) COM Green (Connector : E) OUTPUT</p>
<p>Cable Type</p>	<p>Red + White -</p>	<p>Red POWER White COM Green OUTPUT</p>
<p>Terminal Box (Large) (Small) type</p>		

5-2. External Connection Examples

(Example 1.) Two wires 4 to 20 mA DC output



(Example 2.) Three wires 0 to 5 V DC 1 to 5 V DC output



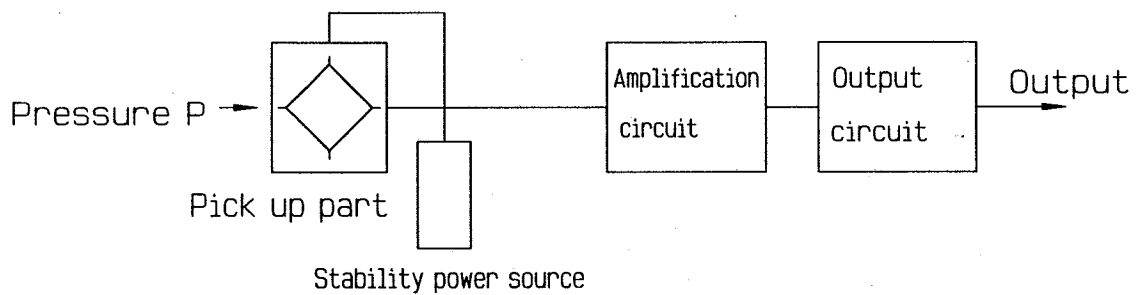
\* In case of connecting an equipment of surge currency from the same power source, please connect to a barrister, etc. for the protection purpose.

## 6. Function Principle

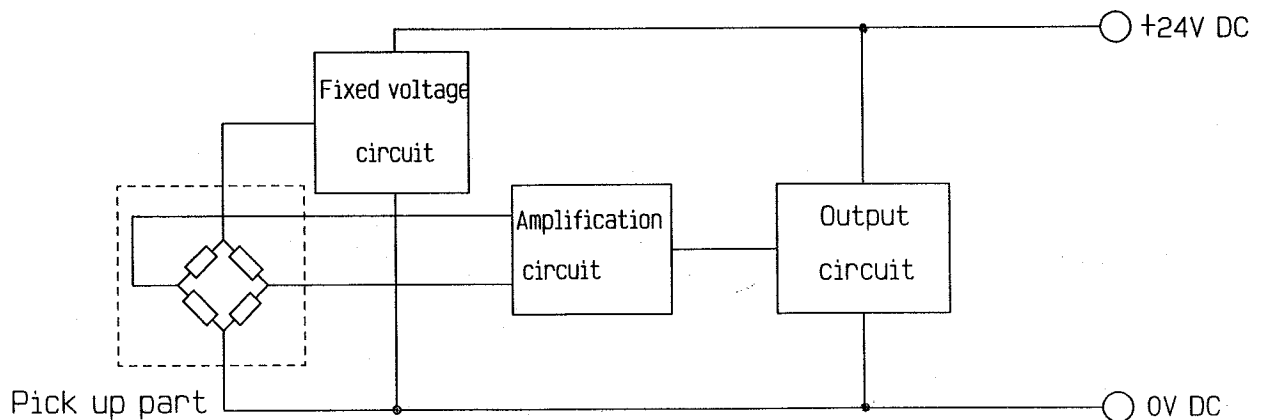
This transmitter has a receiving part of diaphragm which converts pressure to strain and picks up the mass of strain with semi-conductor strain gauge. Its pick up circuit is full bridge system which consists of semi-conductor strain gauge at four sides of the bridge.

From the bridge circuit, an electrical signal is obtained in proportion to the strain and transmitter as a direct current output or direct voltage output by signal conversion at the next stage.

### 6-1. Block Diagram



### 6-2. Composition Example for the above (4 to 20 mA DC output)



## 7. Cautions for Installation, Transportation and Storage.

### 7-1. Cautions for Installation

- 1) What connecting it to a pressure line, do not tighten the case itself with pipe-wrench, etc.
- 2) Do not install the transmitter while liquid fills up the pressure line. If the socket screw is tighten up, high pressure will be generated because of its incompressibility. The pressure may be a cause of failure. To avoid this accident at installation, draw out the liquid in the pipe, keep aside air for 15 to 20 mm, and tighten up the socket.
- 3) This model has substantial vibration resistance, but, to play safe pay a good care not to give it severe vibration.

### 7-2. Cautions for Transportation

As it is minutely processed instrument, do not drop or give a shock, or it may become unusable. So, please transport it carefully

### 7-3. Cautions for Storage

Please store it at the place of less moisture, vibration and dust, etc.

## 8. Operation

- 1) Please confirm once again that there is no error in wiring before turning the power source on.
- 2) After putting the power source on, make a test running for about 5 minutes and start the operation.

## 9. Maintenance and Adjustment

### 9-1. Maintenance

KH15 pressure transmitter has no movable part in the pick up part from its constructional reason, so it almost does not need the maintenance work. Depending on the operating situation, an adequate maintenance is necessary and, generally speaking, periodical maintenance twice a year will be needed. At the periodical check up, please refer to the following items.

Periodical check up items list.

External appearance

Corrosion status of pressure incoming part.

Insulation (less than 50V) between each terminal and case.

Pe-tightening of connecting screws

Output check with standard pressure gauge.

### 9-2. Adjustment

As to internal adjustment with connector type, remove the connector and make adjustment. In case of internal adjustment with terminal box (large) type take off the base of box and adjust it. In case of external adjustment type, adjust it after taking the rubber plug off.

#### ○ Zero adjustment

It is made by turning the zero-adjustment trimmer (see the next page) with a minus driver.

#### ○ Span adjustment

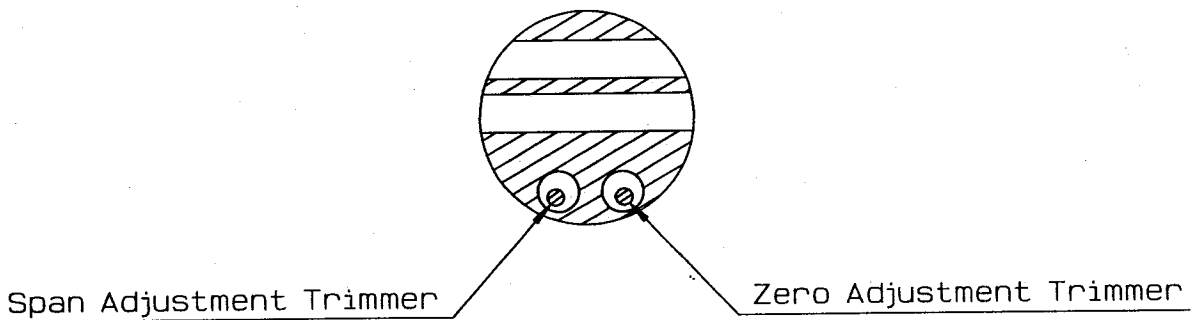
If a standard pressure gauge is not available, do not make span adjustment. The span adjustment procedure with a standard pressure gauge is as follows.

Note : When turning the span adjustment trimmer, zero point also changes. In case of adverse output and compound gauges the output value changes.

- (1) At no addition of pressure or Zero point, make the zero output 4 mA (in the case of current output) and 0V or 1V (in the case of voltage output).
- (2) By adding the upper limit of pressure, make the output 20mA (in the case of current output) and 5V or the value of span (in the case of voltage output) with the span adjustment trimmer.
- (3) Make span adjustment by repeating the procedures of (1) and (2).  
Note : Unless there is special reason. Let us the span adjustment.

- (4) Disposition Diagram of Zero and Span adjustment trimmers for internal adjustment type.

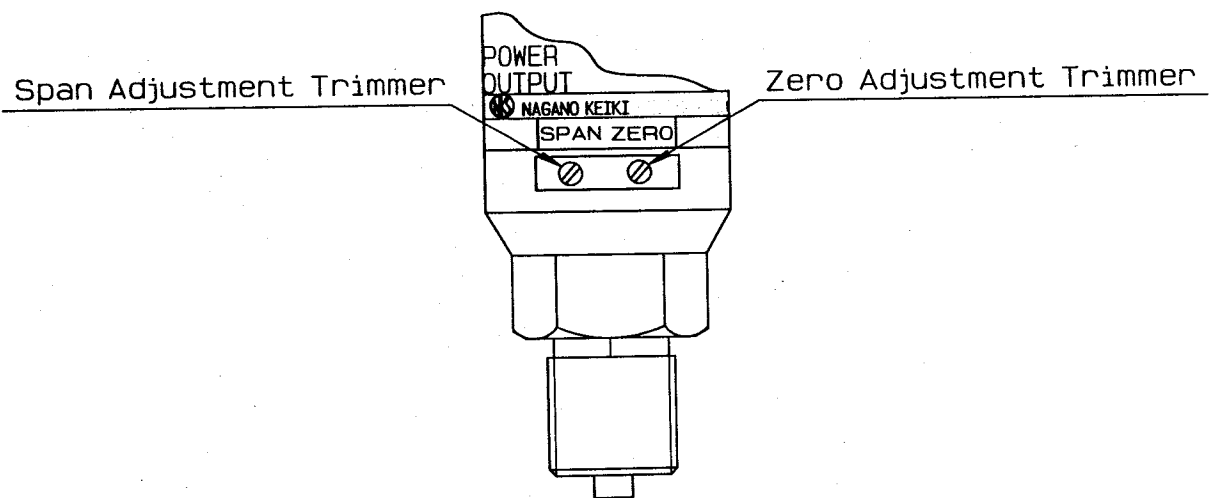
Top-view of the circuits part of connector and terminal box (large).



CIRCUIT TOP VIEW

- (5) Disposition Diagram of Zero and Span adjustment trimmers.

Side view of the case.



### 9-3. Countermeasures against noise

Noise trouble is so complicated and many trouble are not easily solvable theoretically, so there is no perfect and complete solution.

When measurement values sometimes change, vary or show very different ones, it may be caused by a noise effect.

When noises occur one over another in the electricity source line, it is a principle you should find out the source of noise and make a countermeasure against it.

If the noise occurs constantly, the countermeasure of noise filter insertion, etc. will be effective.

In addition, it is also important to get electricity supply from other different source line instead of noise overlapping one.

Also, a noise sometimes intrudes in the signal line by outside induction.

In this case, to keep the noise source remote, change the direction, apply magnetic shielding and static electricity shielding, etc will be required.

At the problems due to surge, same measures should be made.

### 10. Others

This manual cannot cover all details of the instrument or other model variation. This also cannot stipulate all details of installation, maintenance and other matters.

Therefore, if further detailed explanation becomes necessary or this manual does not meet your requirements fully, please feel free to contact us.