# TE100, 200
# I/P CONVERTER

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# INSTRUCTION MANUAL

3S Co., Ltd.

(E)IM-TE100/00-R6

# Safety Precautions

Always read these instructions before using the I/P converter .

⚠ WARNING : Indicates instructions that, if not followed correctly, “may lead to death or serious injury”.

⚠ Warnings

■Install the flame-proof version in compliance with the “New Guidelines for Industrial Electrical Equipment Explosion-Proofing 1979” issued by the Industrial Safety Institute of the Ministry of Labor and in accordance with “technical procedures that comply with international standards”.

■The flame-proof version and Intrinsically Safe version and Nonincendive may not be installed or used for hazardous applications using gases other than those applicable to the explosion-proofing grade of the I/P converter.

■Perform adjustment (zero and span adjustment) of the flame-proof version in a non-hazardous environment or after making the environment non-hazardous.

■Always turn off the power before removing the terminal box cover or main cover.

■If intending to remove or disassemble the pressure gauge for maintenance or other purposes, always turn off the supply pressure and wait for the pressure in the pneumatic circuit to drop to zero before undoing any screws or other fittings used to attach parts.

■Always turn off the supply pressure before replacing the pilot relay unit.

⚠ CAUTION : Indicates instructions that, if not followed correctly, “may cause a fault or other physical damage”.

⚠ Cautions

■Fit the I/P converter in the orientation shown in section 3.2

■As drain fluid or dirt in the supply pressure line may block the fixed orifice or cause misoperation, fit a 5[micro]m or finer air filter (such as an SSS Mini-Set filter) and use a dryer or similar to ensure a clean air supply.

■Using a lubricator on the supply side may cause a blockage in the fixed orifice or nozzle. Never use a lubricator with this I/P converter.

# — Table of Contents —

# 1.Usage

## 1-1 Check the I/P converter Specifications

On receiving the I/P converter , check that the information on the nameplate on the front of the I/P converter matches what you ordered and confirm that the model code is correct.

## 1-2 Transport

To prevent damage during transport, leave the I/P converter in its packing until ready to install and use.

## 1-3 Storage Precautions

Store the I/P converter in a location that satisfies the following criteria.

- ●Not subject to rain or moisture
- ●Not subject to shock or other impact
- ●Normal room temperature and humidity

## 1-4 Install Location

To maintain the working life and performance of the transducer, observe the following precautions when using the I/P converter.

(1) Ambient temperature

If using in a location subject to heat radiation or large variations in temperature, consider fitting thermal insulation.

(2) Atmosphere

Try to select a well-ventilated location and avoid corrosive atmospheres.

## 2.Overview

The TE100 and TE200 I/P converters convert an electrical signal (4 to 20mA DC) output from a controller or similar to a pneumatic pressure. The I/P converters feature a compact design and high accuracy, making them suitable for adjuster valve and similar instrumentation applications.

### 2-1 Features

◆Features

Ultra light-weight, compact design at 1.6 kg (1.8 kg with reducing valve fitted), the I/P Converters are significantly lighter than previous models. This makes them easy to use.

◆High accuracy

The I/P Converters use a high-accuracy sensor and the latest technology to achieve a high level of conversion accuracy.

◆Built-in reducing valve

A model is available that incorporates a small dedicated reducing value (Mini-Set XR100). This eliminates the need for pneumatic supply piping.

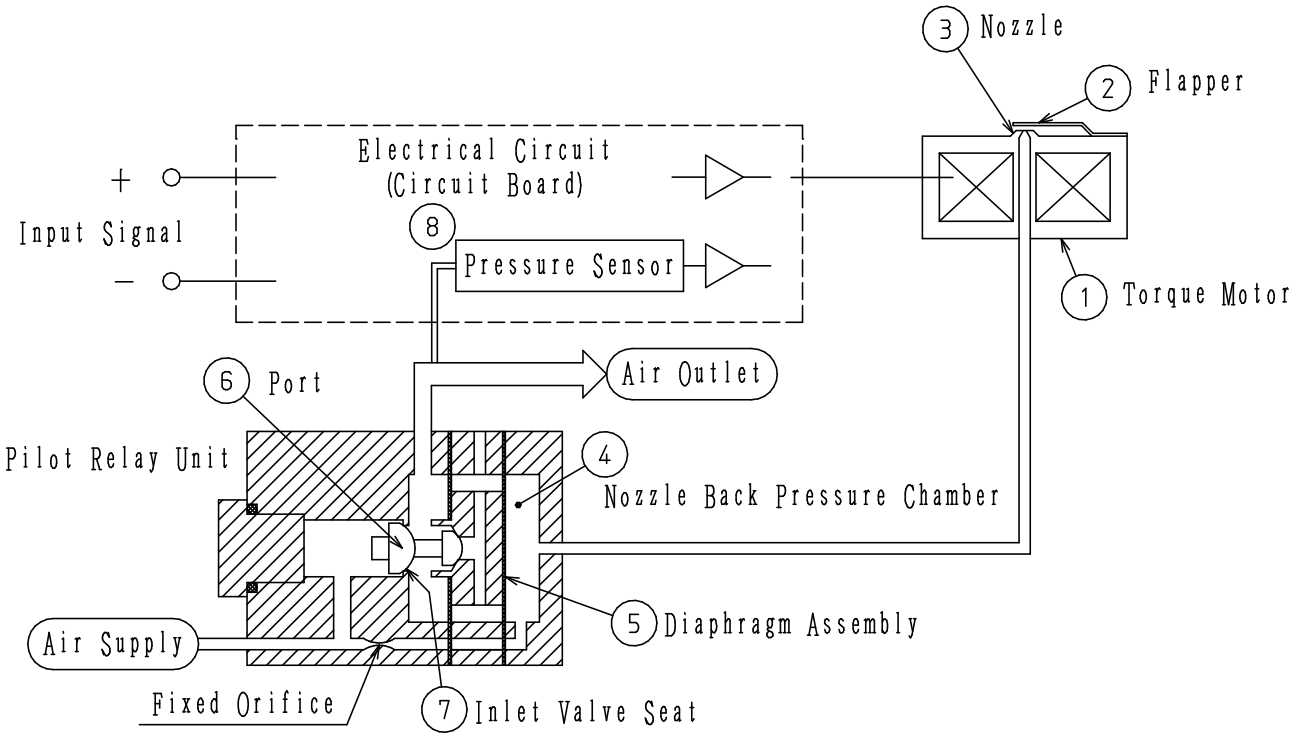
◆Optimum mounting

Both pipe mounting and wall mounting are available by well designed bracket.
These enable the I/P Converters to be used in locations where space is limited.

◆100 and 200 series models are available

Both 100 series (with terminal box) and 200 series (no terminal box) models are available, allowing you to select a model that best suits

## 2-2 Principle of Operation




＜Transducer Operation Schematic＞

As shown in the above schematic, the operation of the I/P Converter is controlled by applying a 4 to 20mA DC signal to the input which causes the internal circuit to generate a voltage. A drive current is also supplied to the torque motor which represents the circuit load to operate the overall system. If the level of the input signal increases, the current to the torque motor [1] increases and the flapper [2] moves so as to cover the nozzle [3] and raise the pressure in the pilot relay (pneumatic valve) nozzle back-pressure chamber [4]. The increased nozzle back-pressure causes a displacement in the diaphragm assembly [5] in the pilot relay, opening the port's [6] inlet valve seat [7]. This increases the output air pressure from the pilot relay. The output air pressure is also applied to the pressure sensor [8] and converted into an electrical signal proportional to the pressure. This electrical signal is then returned to the control circuit where it is used as a feedback signal. The control circuit compares the sensor signal against the input signal to control the output air pressure to match the input signal.

## 2-3 Specifications

| Parameter \ Series | | TE100 (with terminal box) | TE200 (no terminal box) |
|---|---|---|---|
| Supply pressure | | 140kPa (1.4kgf/cm²) | |
| Output pressure | | 20～100kPa (0.2～1kgf/cm²) | |
| Input signal | | 4～20mADC | |
| Accuracy | | Accuracy ±0.5% Linearity ±0.2% Hysteresis 0.2% Repeatability 0.1% | |
| Output air capacity | | approx. 40Nl/min | |
| Air consumption | | approx. 3Nl/min (approx. 4Nl/min with Mini-set fitted) | |
| Ambient temperature | | Standard version (non-explosion-proof) : −20～80℃ | |
| | S | Flame-proof : −20～60℃ | ---- |
| Air connection | | Rc1/4 (1/4NPT) | |
| Electrical | | G1/2 (1/2NPT) | |
| Housing | | Non-explosion proof | |
| | | Flame-proof : Ex d IIB T6 (TC13351) | —— |
| Weight | | approx. 1.6kg (1.8kg with a Mini-set) | approx. 1.3kg (1.5kg with a Mini-set) |
| Material (Primary) | | Aluminum Die-casting | |

## 2-4 Model Codes

1 2 3 4 5 6 7 8 9 10

TE □ □ □ — □ □ ／ □○ □○ □○ □○

| 1 | | 2 | | 3 | | 4 | | 5 | | | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic code | | Series | | Housing | | Pneumatic and Electrical Connections | | Ambient Temperature | | | AM Function | |
| TE | I/P Converter | 1 | 100 series | 0 | Standard | 1 | Rc1/4・G1/2 | S | Standard version (non-explosion-proof) | -20 ～ 80℃ | M | YES |
| | | 2*1 | 200 series | | | 3 | 1/4NPT・G1/2 | | Flame proof | -20 ～ 60℃ | | |
| | | | | 5 | Flame-proof | 5 | 1/4NPT・1/2NPT | | | | | |
| | | | | | | | | | | | | |

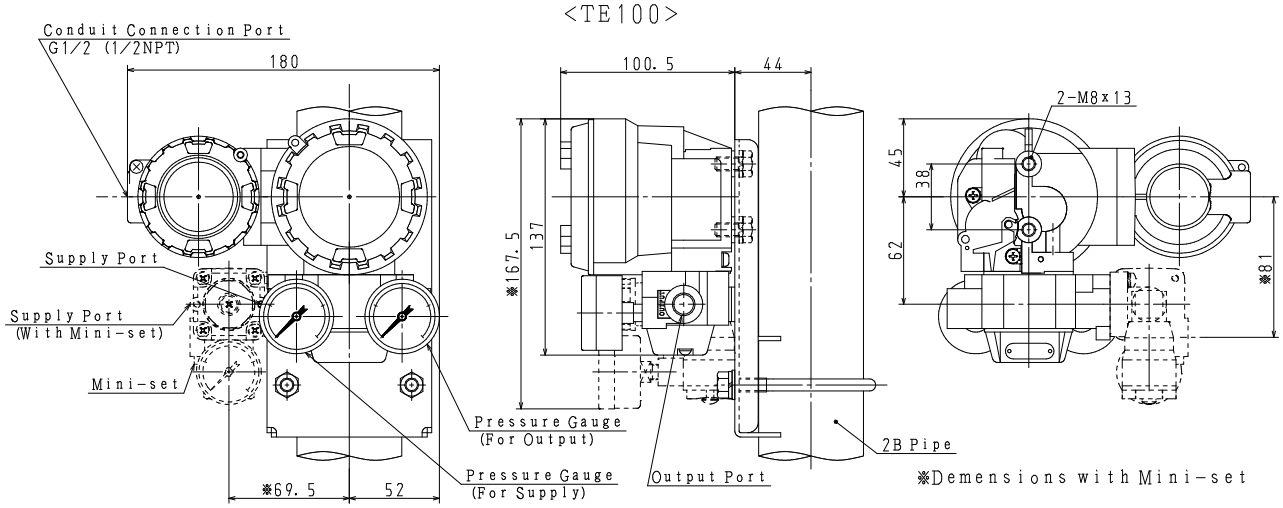
| 7 | | 8 | | 9 | | 10 | |
|---|---|---|---|---|---|---|---|
| Pressure Units | | Pressure Gauge | | Input Signal | | Mini-set Pneumatic Coupling | |
| K2 | 200kPa | G0 | NONE | M1 | 4～20mA | R1 | Rc1/4 |
| M2 | 0.2MPa | G1 | OUT-side only | M2 | 4～12mA | N1 | 1/4NPT |
| P2 | 30psi | G2 | SUP-side OUT-side | M3 | 12～20mA | (NONE) | Without Mini-set |
| B2 | 2bar | | | M4*2 | Special | | |

*1 : TE200 series is only non-explosion-proof.

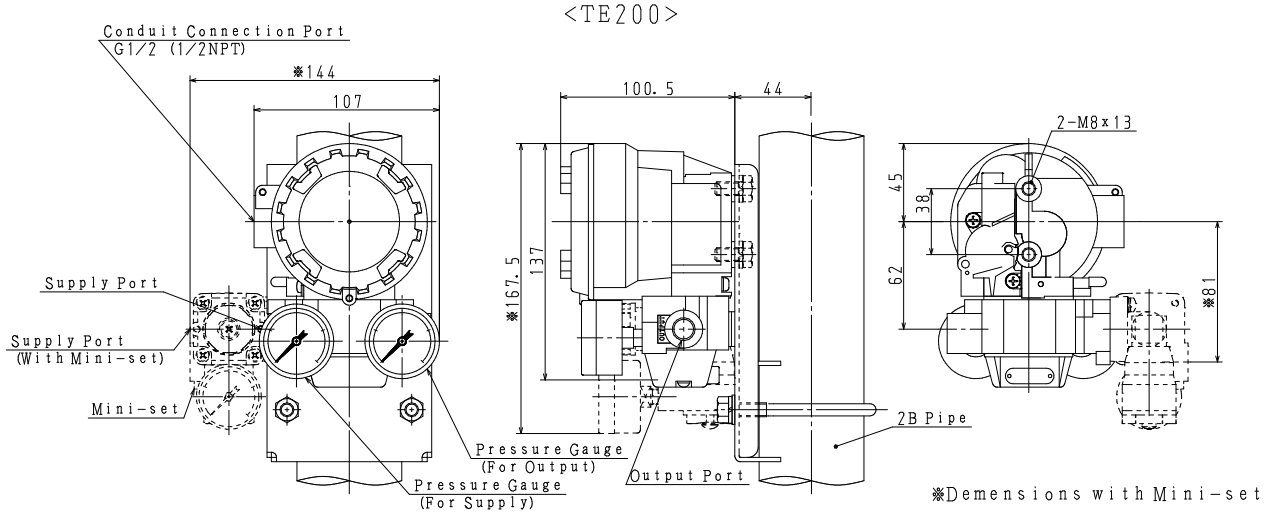
*2 : Please contact us.

## 2-5 Dimensions

<TE100>




<TE200>

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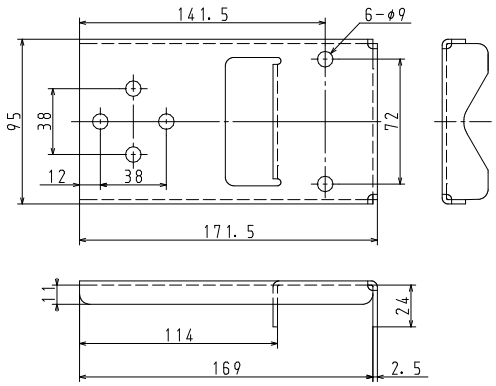
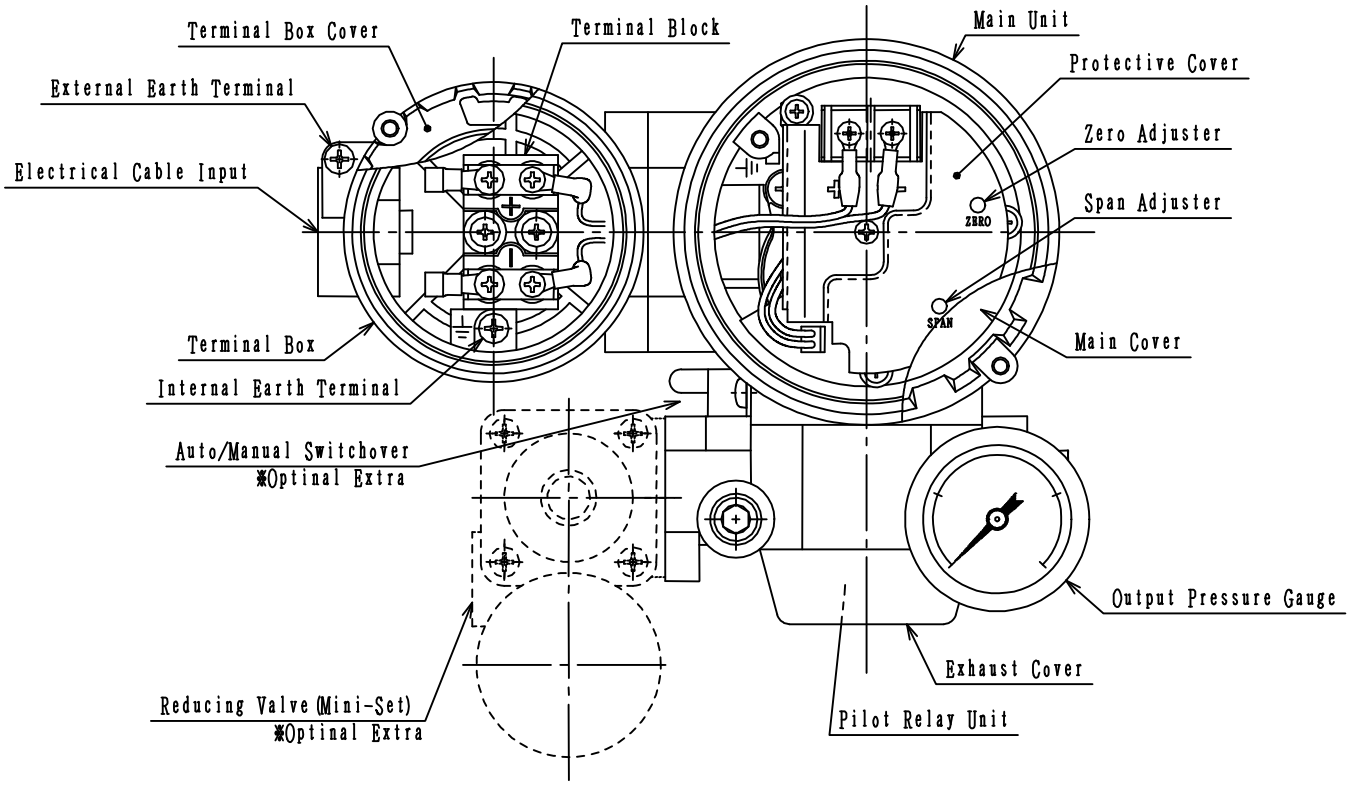
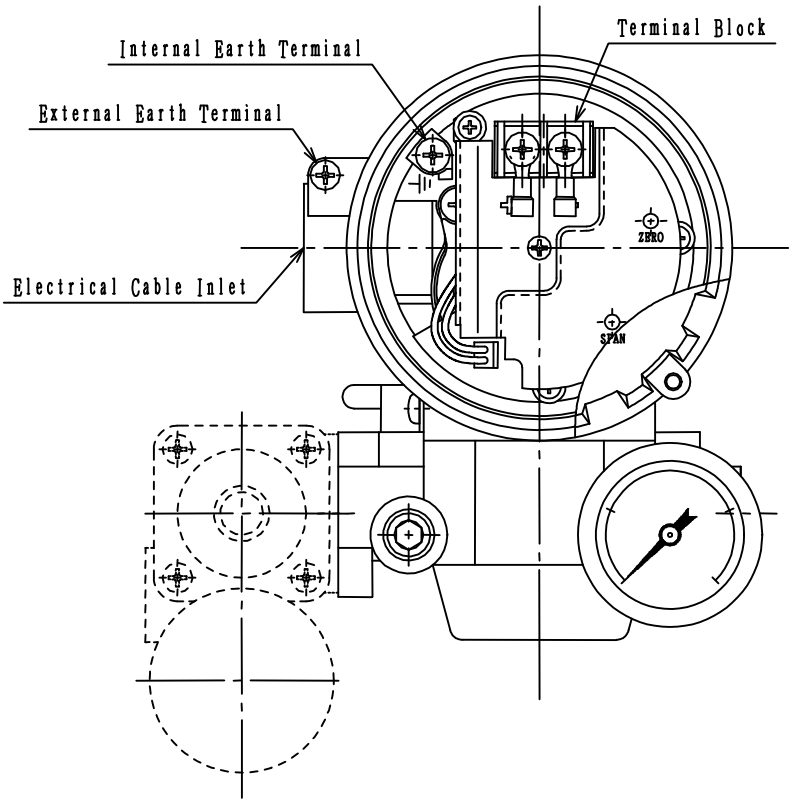


## 2-6 Name of Each Part

＜TE100＞




＜TE200＞



# 3.Design and Installation

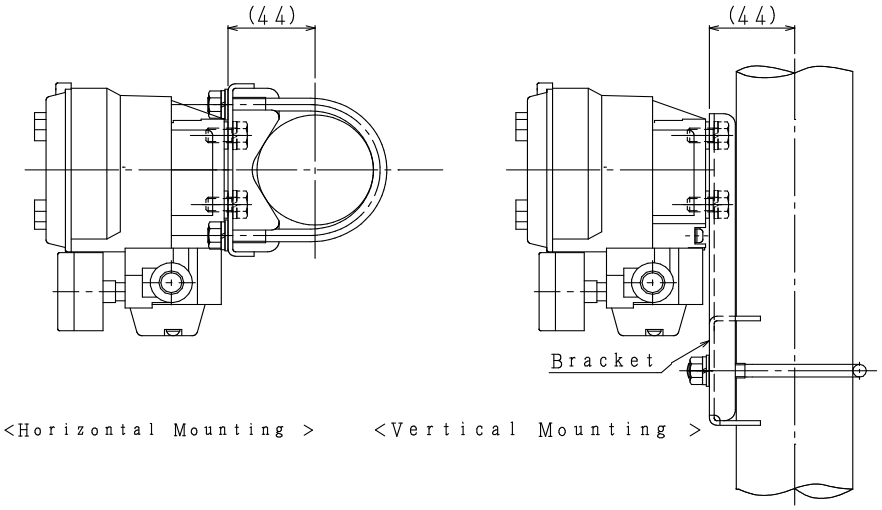
## 3-1 Design

### 3-1-1 Flame proof

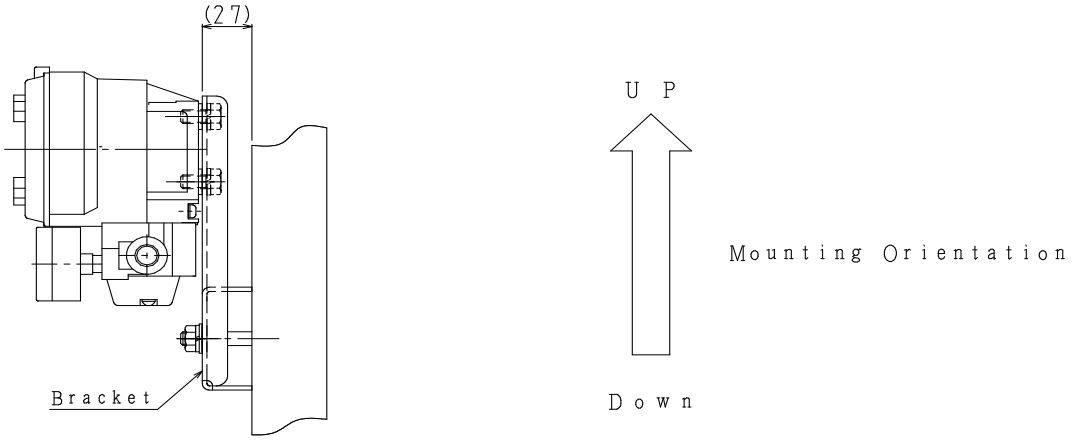
- Do not use the I/P Converter in hazardous environments containing gases other than those applicable to the explosion-proofing grade of the transducer.
- Use the I/P Converter with the ambient temperature in the range -20 to 60[deg]C.

## 3-2 Installation

### 3-2-1 Pipe Mounting




### 3-2-2 Wall-Mounting




## 3-3 Pneumatic and Electrical Installation

### 3-3-1 Pneumatic Installation

The I/P Converter requires a clean and dry air supply. Provide a system able to deliver such an air supply.

①The I/P Converter can be ordered with either Rc1/4 or 1/4NPT couplings. Ensure you use the correct couplings to match those on I/P Converter.

②Connect the piping using the appropriate procedure depending upon whether a reducing valve (Mini-Set XR100) is fitted or not.

If a reducing valve is not fitted, connect to the SUPPLY inlet on the I/P Converter.

If a reducing valve (Mini-Set XR100) is fitted, connect to the "P1" coupling on the Mini-Set unit.

③Ensure you fully purge the piping before connection to prevent any particles of dirt or foreign material from entering the system.

④Adjust the supply pressure to deliver a 140kPa (1.4kgf/cm$^2$) air supply. If using a Mini-Set, turn the adjustment knob on the Mini-Set to set the pressure to 140kPa (1.4kgf/cm$^2$).

3-3-2 Electrical Installation

(1)Flame-proof version

> When performing electrical installation, never remove the terminal box cover or attempt to connect the wiring while the electrical power is still connected. (Similarly, do not open the main cover.)

①Cabling

Use insulated cables able to withstand temperatures of 75[deg]C or higher for the external cabling.

②External conductor cabling

The following two methods can be used for conductor cabling on the Flame-proof version (Ex d IIB T6).

Cable pipe with threaded pressure coupling method

Use a G1/2 thick steel cable pipe (PF1/2 equivalent) with a lock nut to provide a full threaded coupling. Alternatively, use a sealing fitting.

Pressure-proof packing method

Use a cable gland.

The table below lists the applicable cable diameters.

Cable glands with the part numbers listed below are available as optional extras. Please specify when ordering.

| Model | Standard | Rating Number | Applicable Cable Diameters | Cable Gland Part No. |
|---|---|---|---|---|
| TE15● | Ex d IIB T6 | TC13351 | φ8～φ10 | KHB-0-16／PK1610 |
| | | | φ9～φ11 | KHB-0-16／PK1611 |
| | | | φ10～φ12 | KHB-0-16／PK1612 |

*Please contact us for NPT specification.

③Connecting the cables

To connect the cables, remove the terminal box cover and use the insulated crimping terminals on the terminal block.

Connect by crimping the + input terminal to the + terminal (red) and the - input terminal to the - terminal (blue). (See Figure 3-1)

* To remove the cover, undo the locking screw (hex set screw).

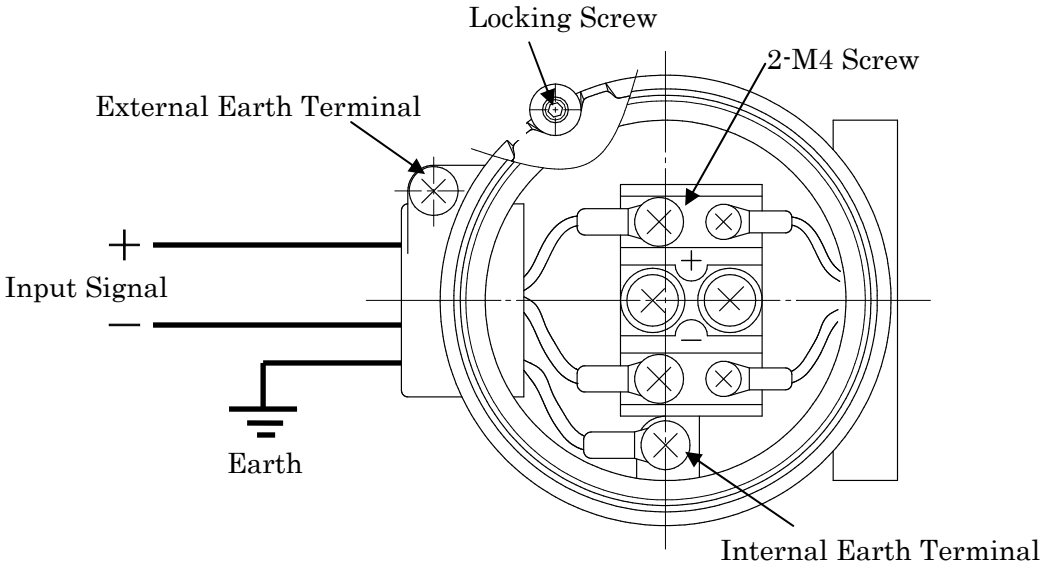



Figure 3-1

④Locking

After partially attaching the terminal box cover, lock the cover in place using the locking screw.

⑤Other details

All other aspects of the installation should be carried out in compliance with the “New Guidelines for Industrial Electrical Equipment Explosion-Proofing 1979” issued by the Industrial Safety Institute of the Ministry of Labor and in accordance with “technical procedures that comply with international standards”.

(2)Standard (non-explosion-proof)

①Cabling

If the ambient temperature is 60[deg]C or less, use 600V vinyl or better stranded cable.

If the temperature is above 60[deg]C, select cable with an appropriate tolerance for the conditions.

②Connecting the cables

- TE100 (with terminal box)

  To connect the cables, remove the terminal box cover and use the insulated crimping terminals on the terminal block.

  Connect by crimping the + input terminal to the + terminal (red) and the - input terminal to the - terminal (blue). (See Figure 3-1)

- TE200 (no terminal box)

  Remove the main cover and connect to the terminal block on the circuit board as described above.

  The terminal polarities are indicated on the protective plate.

  (See Figure 3-2)

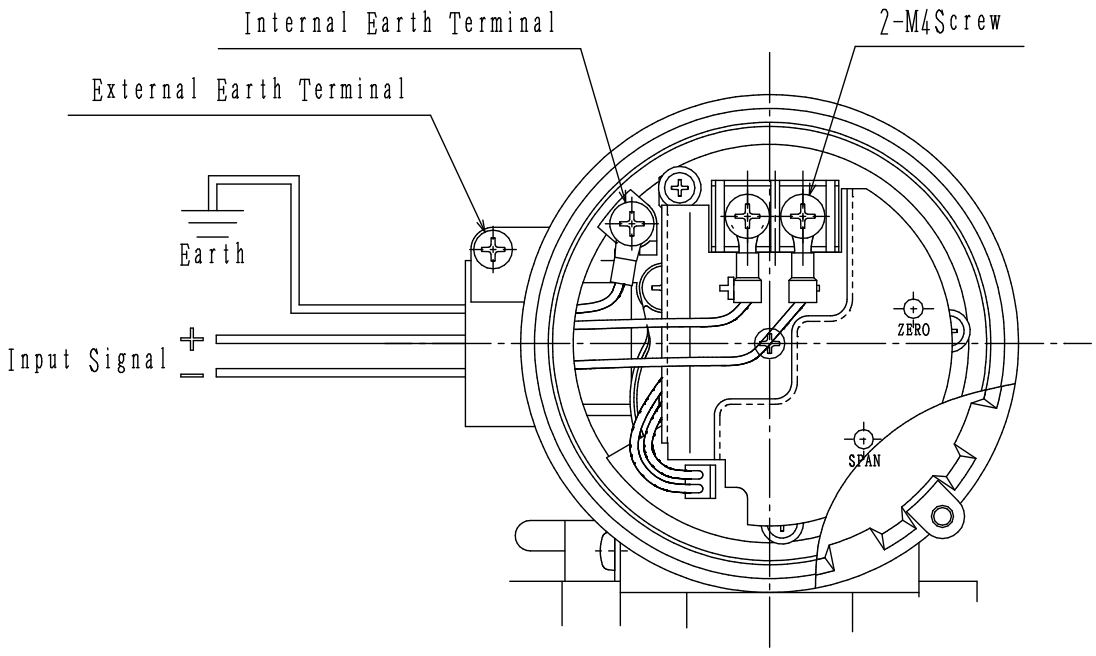



Figure 3-2

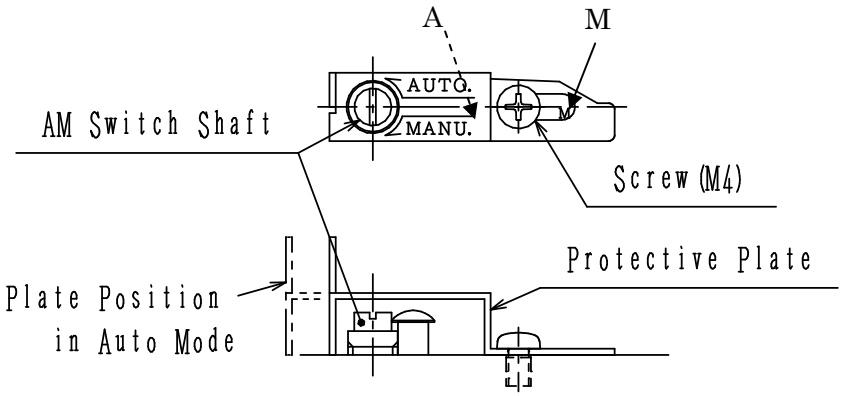
# 4.Operation

## 4-1 Auto/Manual Switchover Function

The I/P Converter is shipped set to automatic operation.

To operate the transducer manually, use the following procedure to switch to manual operation. (See Figure 4-1)

(The auto/manual switch is located on the left side of the I/P Converter unit.)




Auto/Manual Switch

Figure 4-1

<Changing to MANUAL>

[1] Undo the screw and slide the protective plate so that the "M" becomes visible. Partially retighten the screw in this position.

[2] Next, use a screwdriver to rotate the AM switch shaft as far as it will go in the direction of the arrow on the plate (MANU direction).

[3] Adjust the reducing valve used to control the air supply to set the I/P Converter output pressure. The output pressure is indicated on the output pressure gauge.

<Restoring to AUTO>

[1] To set back to AUTO, rotate the AM switch shaft as far as it will go in the AUTO direction.

[2] Slide the protective plate so that the "A" becomes visible again, then fasten in place.

## 4-2 Zero and Span Adjustment

(1) Set the AM switch function to AUTO and set the supply pressure to 140kPa (1.4kgf/cm$^2$).

(2) Remove the main cover.

> On the Flame-proof version, the main cover cannot be removed while the power is on. Move to a non-hazardous location before removing the main cover.

(3) Zero and span adjustment

(a) Apply a 0% (4mA) input signal

Rotate the zero trimmer to set the 0% output (20kPa, 0.2kgf/cm$^2$). Rotating clockwise increases the output and rotating counter-clockwise reduces the output.

(See Figure 4-2)

(b)Next, apply a 100% (20mA) input signal

Rotate the span adjustment trimmer to set the 100% output (100kPa, 1.0kgf/cm$^2$). Rotating clockwise increases the span and rotating counter-clockwise reduces the span.

(See Figure 4-2)

(c)Repeat the above adjustments two or three times to set the zero and span settings.

(d)After you have finished setting the zero and span adjustment, apply a step input (25%, for example) and check that the output is correct.

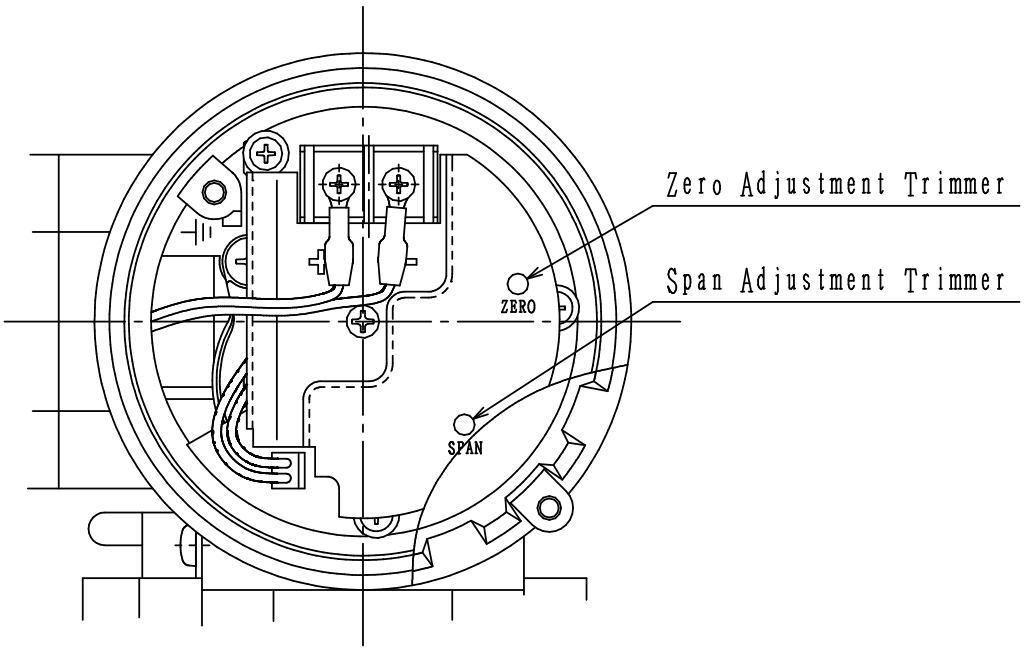



Figure 4-2

(4)1/2 split-range version

The I/O specifications for the 1/2 split range version are listed below.

Adjust the zero and span settings using the same procedure as for the standard range version.

| Range | 0% | 100% |
|---|---|---|
| 4～12mA | 4mA | 12mA |
| 12～20mA | 12mA | 20mA |

4-3 Width of Range Adjustment

The table below shows the width of the zero and span adjustment bands.

You can set the range to be different to the standard 0 to 100% output provided you stay within these limits.

| | |
|---|---|
| Zero adjustment width | －10%～＋10% |
| Span adjustment width | ＋75%～＋125% |

## 5.Maintenance

### 5-1 Maintenance of Flame-Proof version.

> 1.When performing maintenance on Flame-proof version, never remove the terminal box cover or main cover while the power is connected.
> 2. Always turn off the power before performing any maintenance or repair work.

### 5-2 Periodic Inspection

Performing periodic inspection and maintenance of the I/P Converter will help reduce the incidence of faults and extend the working life of the unit.

<Supply pressure filter>

・A metal mesh is fitted inside the SUPPLY coupling. Use a pair of tweezers or similar to remove any sealing tape or dirt particles caught in the mesh.

<Fixed orifice assembly>

・The fixed orifice plays an important role in supplying the air to the nozzle. If no nozzle back pressure is present, this may indicate a blocked orifice.
・Take off the exhaust cover, then remove the fixed orifice assembly from the pilot relay unit and replace with a spare assembly. (See Figure 5-1)
・If you do not have a spare fixed orifice assembly, use [phi]0.3 piano wire or similar to clean the blocked orifice. Then use clean air to blow off any remaining dirt.
・When finished cleaning, screw the assembly back into its original position. Take care to ensure that the O-ring is positioned correctly in the body of the pilot relay unit.

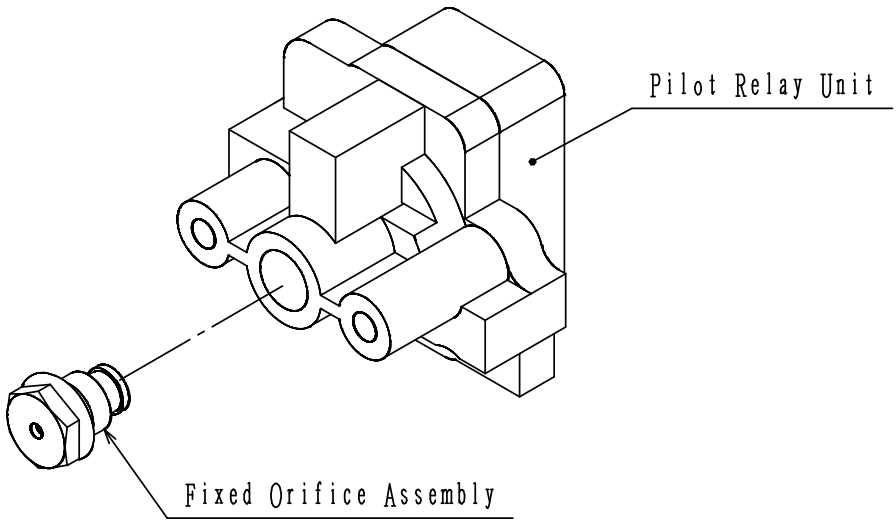



Figure 5-1

5-3 Replacing the Pilot Relay

To remove the pilot relay unit, remove the exhaust cover from the bottom of the I/P Converter and undo the two screws. (See Figure 5-2)

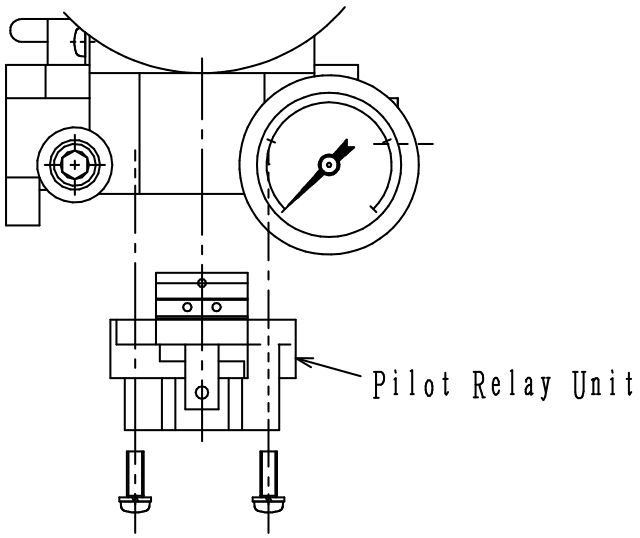



Figure 5-2

5－4 Replacement Parts

| Name | Part No. | Quantity |
|---|---|---|
| Circuit board | TE100： TE100-500-11A<br>TE200： TE100-500-11B | 1 |
| Pilot relay unit | TE100-200 | 1 |
| Filter for reducing valve | XR100-109 | 1 |

## 6. Troubleshooting

Refer to the table below in the event of problems with the I/P Converter .

If the action described below does not restore the transducer to normal operation, replace the I/P Converter with a spare and contact us.

| Symptom | Cause | Action |
|---|---|---|
| I/P Converter does not operate when an input signal is applied. | Fixed orifice is blocked. | Clean or replace fixed orifice. |
| | I/P Converter is set to manual operation. | Change to Auto (A) operation. |
| | Polarity of input signal wiring is reversed. | Check wiring and connections. |
| | No air supply | Supply 140kPa (1.4kgf/cm[2]) |
| | Pilot relay is faulty. | Inspect and/or replace pilot relay. |
| Output is unstable. | Large fluctuation in air supply pressure | Ensure air supply pressure is constant. |
| | The pressure leakage (volume) on the output circuit side is fluctuating. | Check for pressure leaks. |
| | Pilot relay is faulty. | Inspect and/or replace pilot relay. |
| Large output error | Zero and span settings are out of adjustment. | Re-adjust zero and span settings. |
| | Large fluctuation in ambient temperature | Fit thermal insulation or similar. |
| | Pressure leak in output circuit | Fix pressure leak. |