

Field-Type I/P Converter

Model KUX113

User's Manual



Azbil Corporation

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Chapter 1 : General

External view

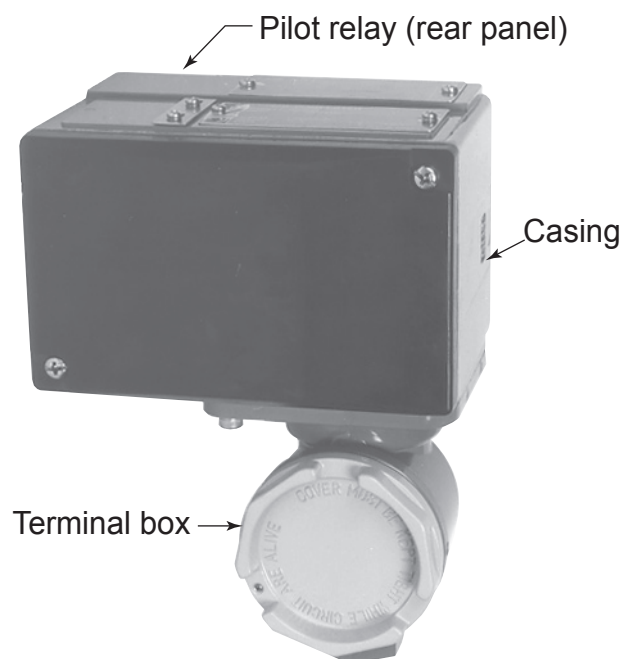


Figure 1-1 External view

Accessories

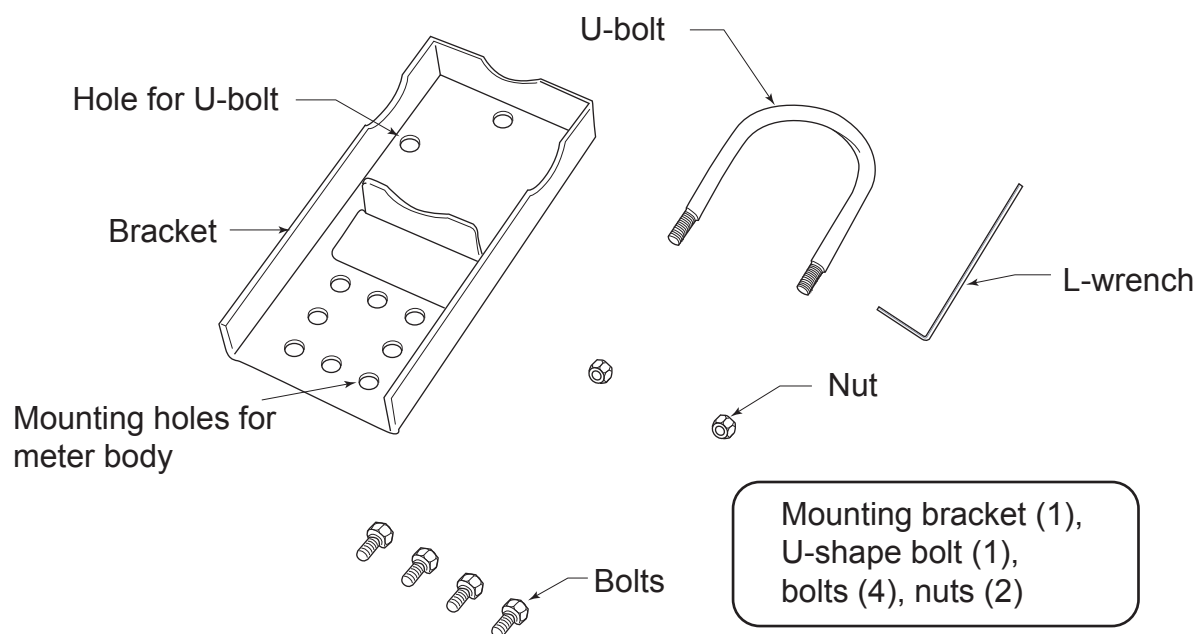


Figure 1-2 Accessories

1-1 : Description

The model KUX113 Field-type I/P Converter is a field installation type of instrument (to be installed on a 2-inch pipe stanchion). It converts an electric current signal of 4 - 20mA DC into a pneumatic pressure signal of 0.2 - 1.0 kgf/cm² (or other unit of measure).

1-2 : Structure and Features

The KUX113 I/P Converter is comprised of a casing (in which the converter mechanism is directly installed), a pilot relay and a cover. The KUX113 can be installed on a 2-inch pipe stanchion employing a standard type of mounting bracket (which is identical to those used for other DSTJ3000 field-type instruments).

The protective feature of a water splashproof casing, a flameproof enclosure, or of an intrinsic safety barrier.

The water splashproof casing complies with of JIS F8001 Class 3 requirements.

For the flameproof type, flameproof structure consists of the terminal box and magnet unit. These structures allow you to open the cover of the casing to maintain even while the instrument is operating in a hazardous area.

The intrinsic safety barrier type of instrument employs two spark killer diodes connected in parallel to the coil in the magnet section, in conjunction with a barrier.

If a bypass manifold is provided, the Converter can use manually produced signals as its outputs.

Chapter 2 : Specifications

2-1 : Performance Specifications

Table 2-1 Performance specifications

Item	Specifications
Input signal	4 to 20mA DC (Maximum allowable current approx. 30mA.)
Input resistance	250 ohms maximum
Output signal	20 to 100 kPa, 3 to 15 psi, 0.2 to 1.0 bar, 0.2 to 1.0 kgf/cm ² (Maximum allowable pressure 200kPa)
Air supply pressure	140 kPa { 1.4 kgf/cm ² } ±10%
Air consumption	4 ℓ/min(N) (With output 50% balanced)
Maximum air supply capacity	110 ℓ/min(N)
Maximum air exhaust capacity	110 ℓ/min(N)
Minimum load capacity	I.D. 4 mm copper tube × 3 m + 20 cc
Air piping connections	Rc1/4, 1/4NPT internal thread
Electrical conduit connection	G1/2 internal thread
Material of major components	Aluminum alloy
Operating temperature range	Waterproof, dust proof type: -30 to +80°C Flame-proof type explosionproof type: -10 to +70°C Intrinsic-safety explosionproof type: -10 to +60°C
Operating humidity range	10 to 90% RH
Accuracy	± 0.5% F.S.
Linearity (with reference to zero)	± 0.2% F.S.
Hysteresis error	≤ 0.5% F.S.
Reproducibility	≤ 0.4% F.S.
Dead band	≤ 0.05% F.S.
Temperature effect	Zero shift: ±3% F.S. /30°C (Maximum) Span shift: ±2% F.S. /30°C (Maximum)
Mounting	2-inch pipe (Horizontal or vertical)
Net weight	Approx. 3 kg
Finish and color	Finish: Acrylic baked finish Color: Case; Dark beige, Cover; Black PPS resin, Terminal box cover; Light beige
Construction	Waterproof, dust proof type: JIS C 0920 Watertight, JIS F 8001 Class 3 Splashproof Flame-proof type explosionproof type: JIS C 0903, d2G4 (Operating temperature -10 to +70°C) Intrinsic-safety explosionproof type: JIS C 0903, i3aG5 (Operating temperature: -10 to +60°C, signal power supply: 23 to 27.5V DC)

2-2 : Model Number Table

Basic Model No.	Selections						Options	Description
	Power Supply	Case type	Input	Output	Connections	Environments		
KUX113								Field-type I/P converter
	-X							Not necessary
		W						Waterproof
		E						TIIS Flameproof
		F						FM Explosionproof *3
		M						FM Intrinsically safe
			1					4 to 20 mA DC
				1				20 to 98 kPa {0.2 to 1.0 kgf/cm ² }
				3				0.2 to 1.0 bar
				4				20 to 100 kPa
					A			Rc1/4
					B			1/4NPT
						X		Standard
						A		Corrosion-resistant paint
						B		Heavy-corrosion-resistant paint
						D		Silver finish
							-X	No options
							-P	With Flameproof packing cable adapter *1
							-G	With output air pressure gauge
							-6	With by-pass set (on special order)
							-7	With air-set
							-J	With elbow for flame-proof type*2
							-N	Electrical conduct connection 1/2 NPT *2 *3

*1. Available for TIIS Flameproof only

*2. Code "J" and code "N" can not be selected simultaneously.

*3. Option code "N" must be selected, when FM explosion-proof is selected.

2-3 : Dimension Drawings

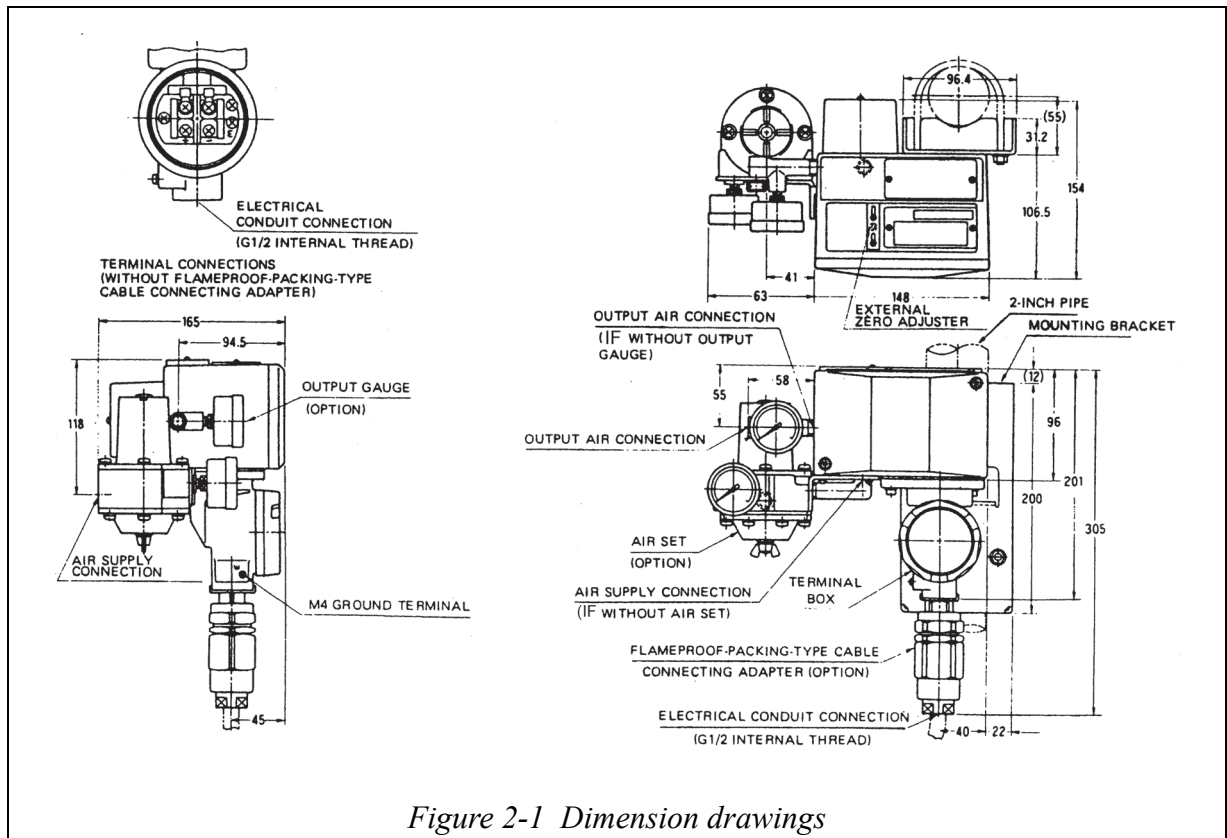


Figure 2-1 Dimension drawings

Chapter 3 : Operating Principle

The electrical input signal (current signal) is converted by the magnet unit into a mechanical force which causes the beam position to change. The change in beam position is converted by the nozzle/flapper mechanism into a pneumatic signal, which is boosted by the pilot relay into the pneumatic output signal. The pneumatic output signal is fed back via the feedback bellows to the beam, thereby attaining a state of equilibrium. Thus, the electrical input signal is converted into a pneumatic output signal, which is directly proportional to the input signal.

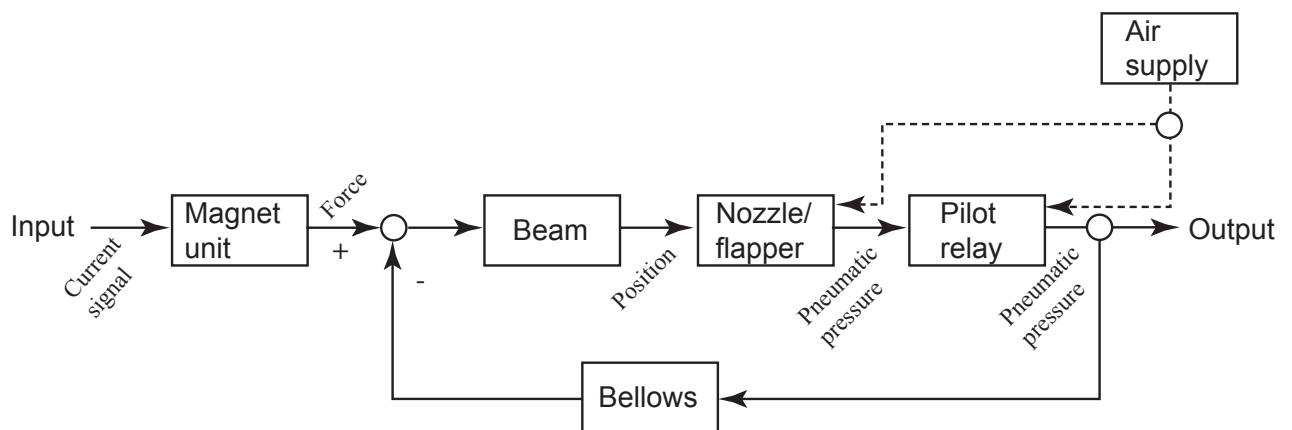
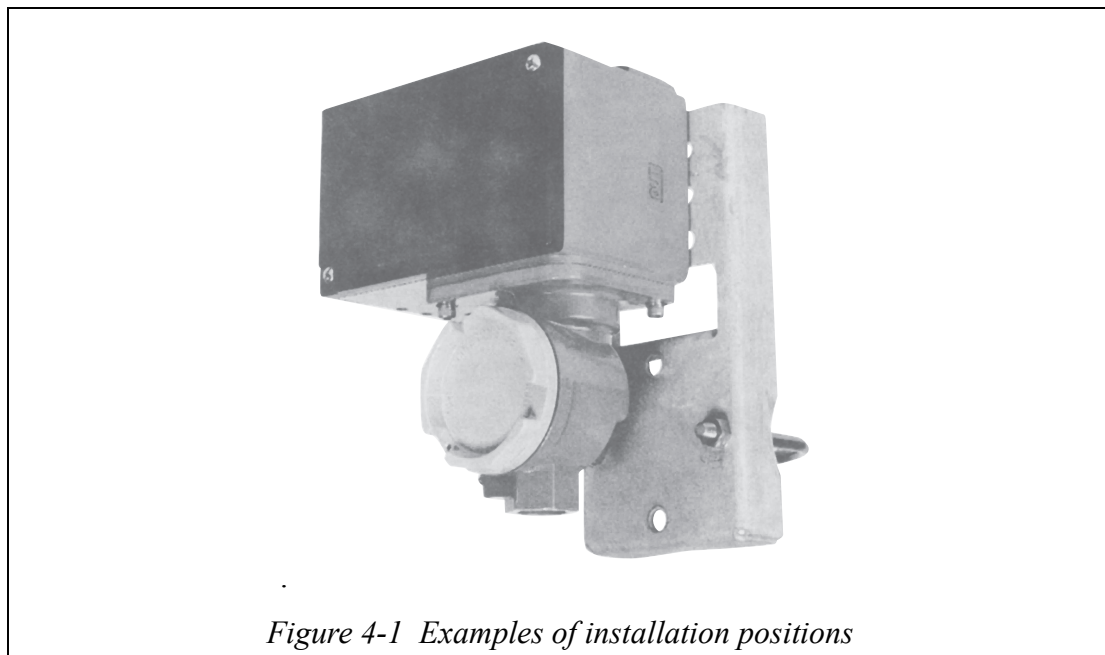


Figure 3-1 Block diagram of I/P converter

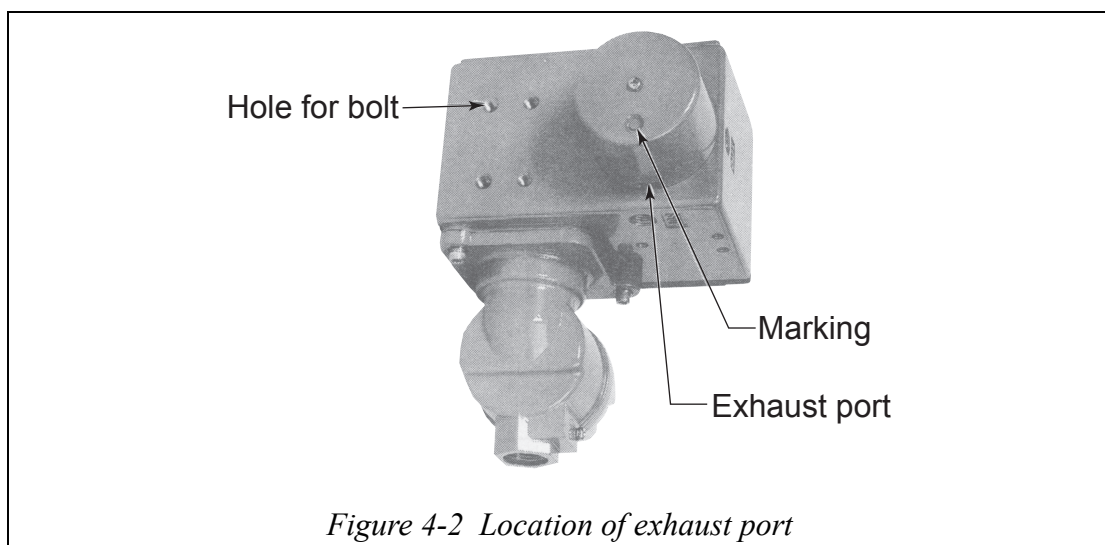
Chapter 4 : Installation

4-1 : Installation Method

- (1) The mounting holes are drilled through the rear panel of the casing as shown in Figure 4-2. Fix the bracket (supplied) to the casing with the four bolts. Select an appropriate mounting position according to the direction of the 2-inch pipe stanchion.
- (2) Hook the U-shape bolt onto the 2-inch pipe stanchion and pass its ends through the bracket holes and fix the ends securely with the nuts.



- (3) The I/P Converter should be installed vertically as shown in Figure 2-1. Note that the exhaust port of the pilot relay must face downward. To position the exhaust port downward, loosen the screw of the cover and rotate the cover. The location of the exhaust port is labelled on the surface of the cover.



4-2 : Environmental Conditions

The place of installation must be within the specified temperature and humidity range (See Chapter 2 :Specifications) and must be reasonably free from mechanical vibration.

For an explosionproof type of instrument, fasten the terminal box cover with the lock screw after installing the cover. Install the instrument observing all applicable explosionproof instrument installation standards and recommendations.

4-3 : Customer Connections

Electrical Connections

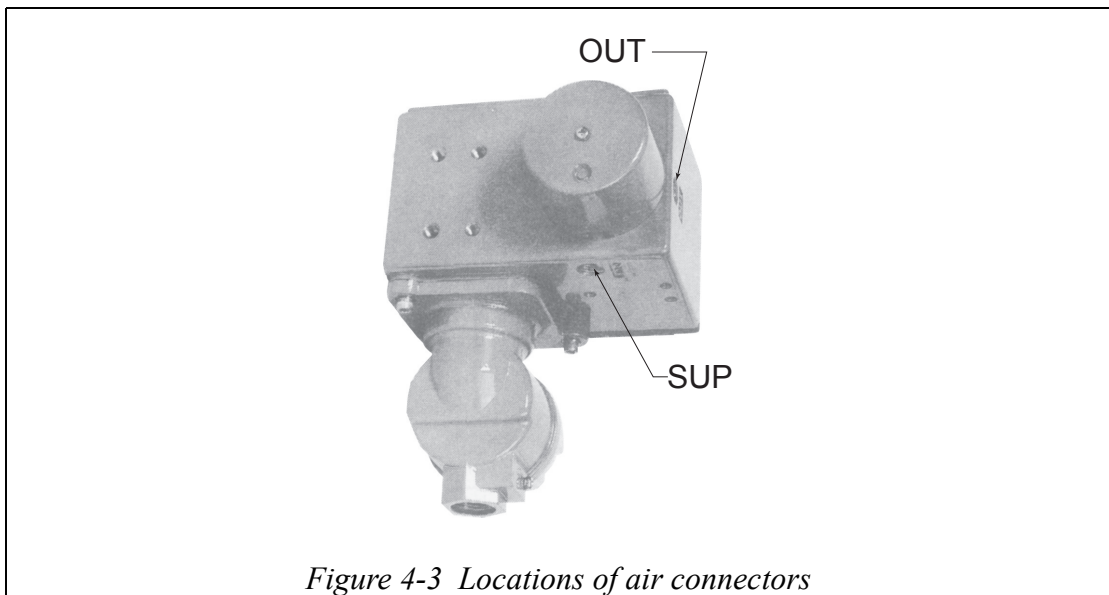
Connect the electrical input signal to the “+” and “-” terminals in the terminal box. The terminals have binding screws (M4, 6mm). For earth grounding, connect the “-” terminal to the “E” terminal.

The instrument has no internal fuse or switch. Provide them externally (if possible a wiring block should be used).

Air Connections

Two air connectors (Rc1/4 or 1/4NPT internal thread) are provided near the pilot valve. Remove the caps and connect the air supply piping to the SUP connector and the output air pressure piping to the OUT connector.

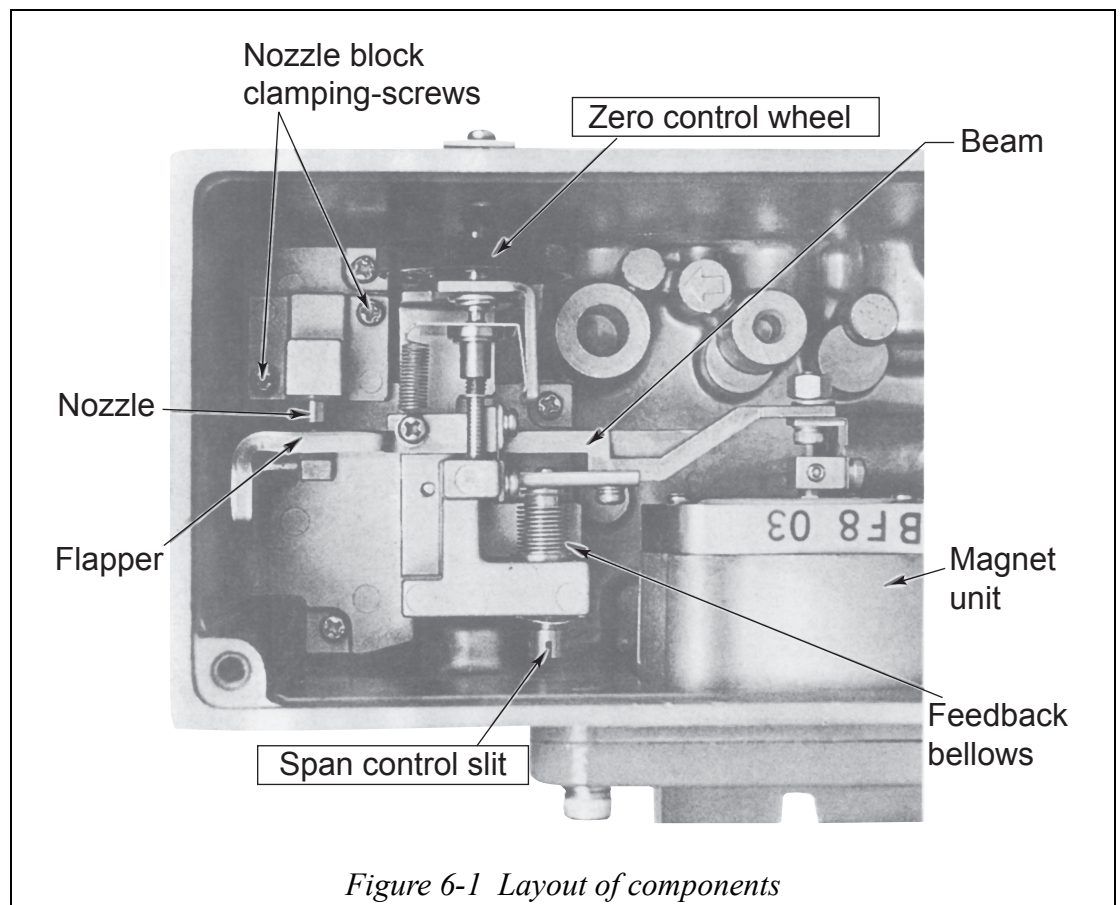
The supply air must be clean. Provide it via an Airset (a regulator and a filter). The air supply pressure must be 140 kPa {1.4 kgf/cm²}



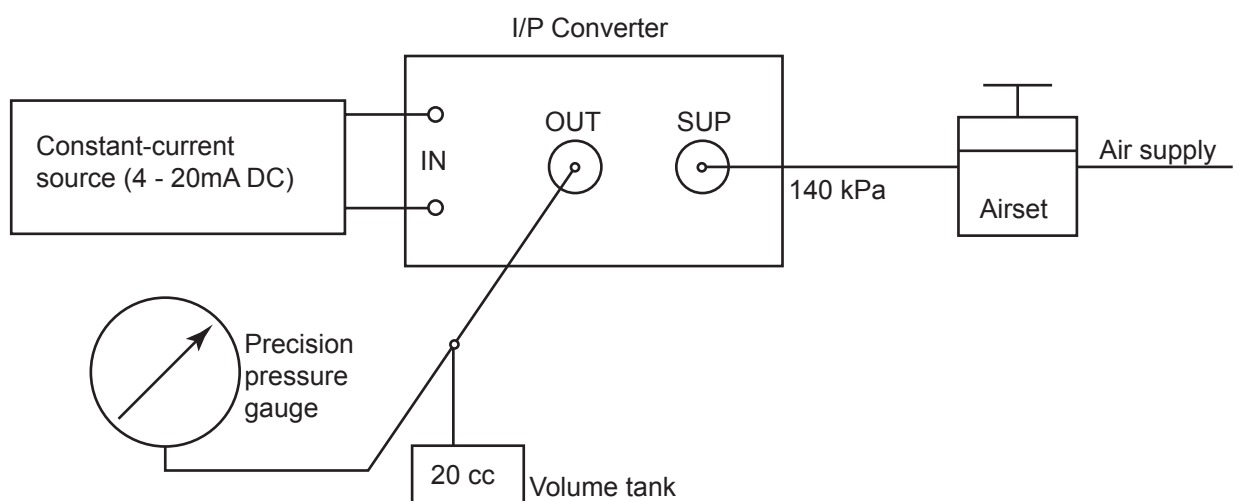
Chapter 5 : **Operation Procedure**

After the I/P Converter has been installed and electrical wiring and air piping have been completed, it is ready for operation. Provide the air supply.

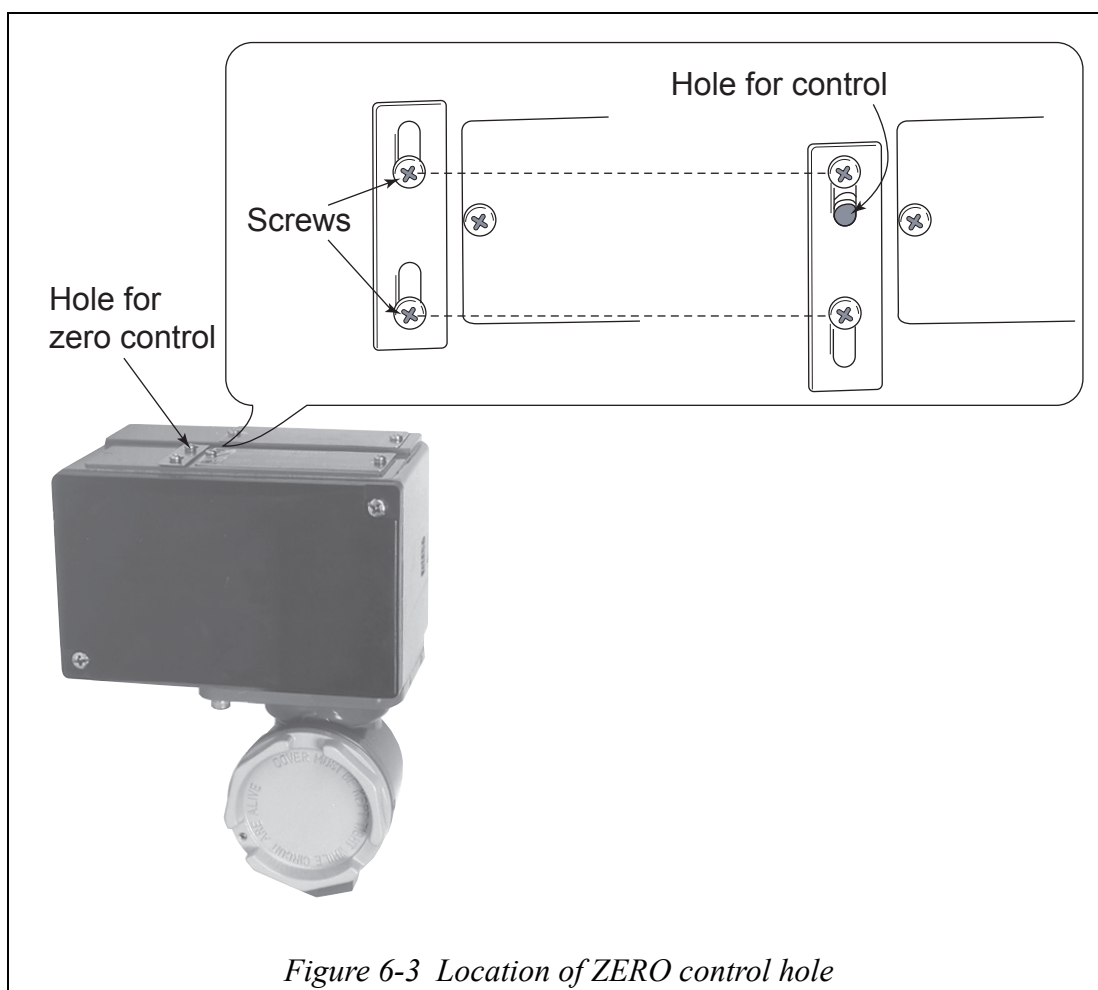
Chapter 6 : Calibration



- (1) Connect an air supply to the SUP connector and a precision air pressure gauge to the OUTPUT connector.
- (2) Connect a precision electrical signal source (4 - 20mA DC) to the electrical input terminals.



- (3) Feed a current signal of 4mA from the constant-current source. Adjust the ZERO control wheel so that the output pressure become 20 kPa $\{0.2 \text{ kgf/cm}^2\} \pm 0.25\%$. The output pressure rises as you turn the wheel counterclockwise as viewed from the top in the attitude shown in Figure 6-1.
 - (4) Feed a current signal of 20mA from the constant-current source. Adjust the SPAN control by inserting a screwdriver into the SPAN control slit so that the output pressure becomes 100 kPa $\{1.0 \text{ kgf/cm}^2\} \pm 0.25\%$. The output span becomes wider as you move the screw driver to the right as viewed in the attitude shown in Figure 6-1.
 - (5) Repeat step (3) and (4) until the required zero and span accuracies are obtained.
- The ZERO control is also adjustable externally.



To gain access to the ZERO control hole, loosen the two screws of the cap near the nameplate on the casing, then slide it downward.

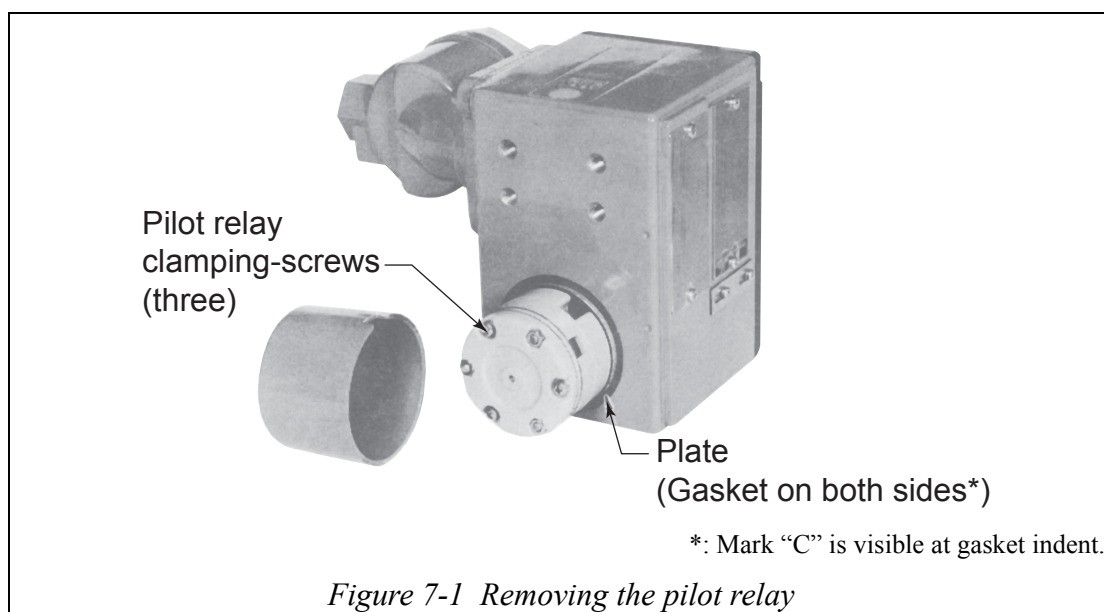
~Note If you have removed the cap by mistake, exercise care not to misplace the O-ring of the ZERO control hole.

Chapter 7 : Maintenance

Normally the I/P Converter requires no maintenance service. However, if the I/P Converter is operated in adverse conditions (such as in environments prone to dust), disassemble the pilot relay and clean the restriction hole (employing a steel wire of 0.27 mm dia.) and the port and seat (employing a soft cloth). If the output pressure has become abnormally high and cannot be lowered, clean the nozzle with a steel wire of 0.6 mm dia. To do this, remove the nozzle block. (See Figure 6-1)

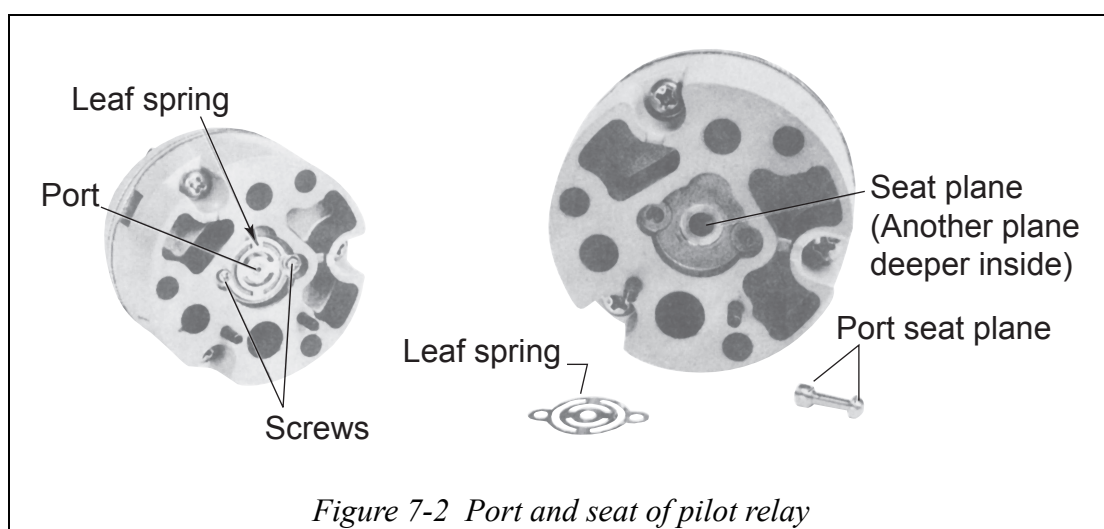
7-1 : Cleaning the Pilot Relay Port and Seat

- (1) Remove the pilot relay cover by loosening its screws.



- (2) Detach the pilot relay by removing its three clamping-screws.

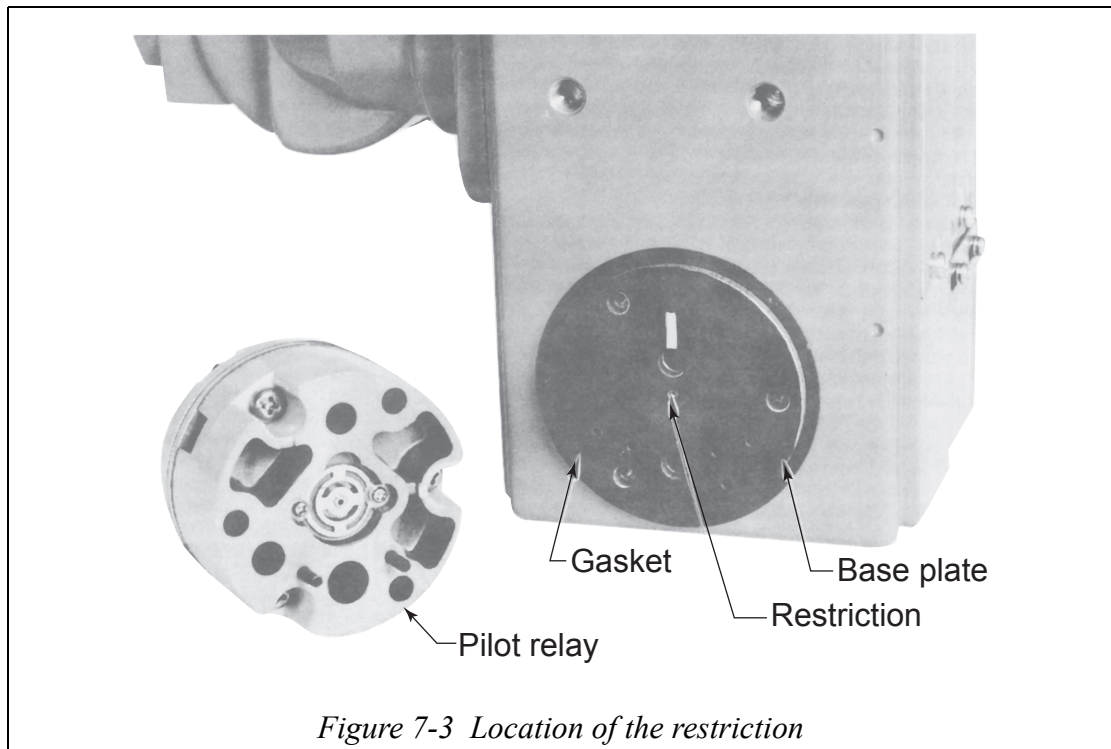
Remove the leaf spring from the bottom of the pilot relay by loosening its two screws, and then take out the port.



- (3) Clean the seating planes. There are two seating planes to be cleaned - one at the front and another deeper inside the hole. To clean the deeper seat plane, use a cloth formed into a bar shape.

7-2 : Cleaning the Restriction for Nozzle Back-pressure

To gain access to the restriction for the nozzle back-pressure, proceed as follows: Remove the pilot relay. Now the plate which is sandwiched between the two gaskets is accessible. The restriction is located in the center of the plate.



7-3 : Notes on Installing the Pilot Relay

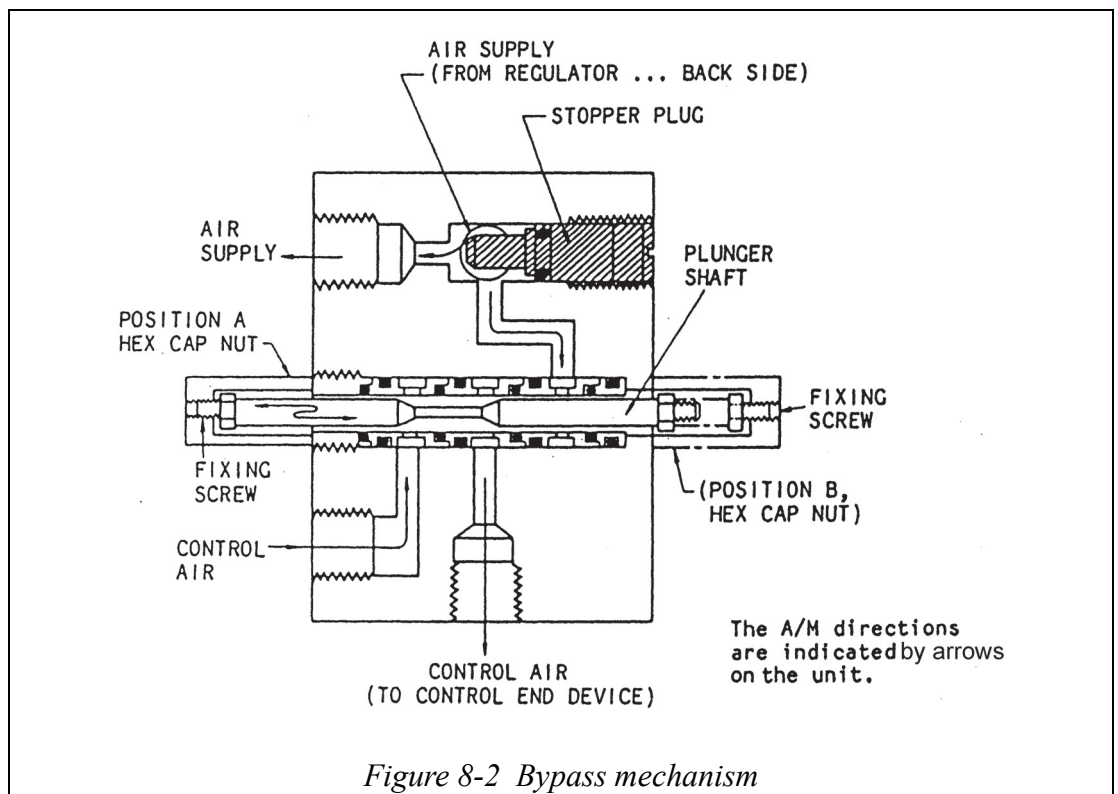
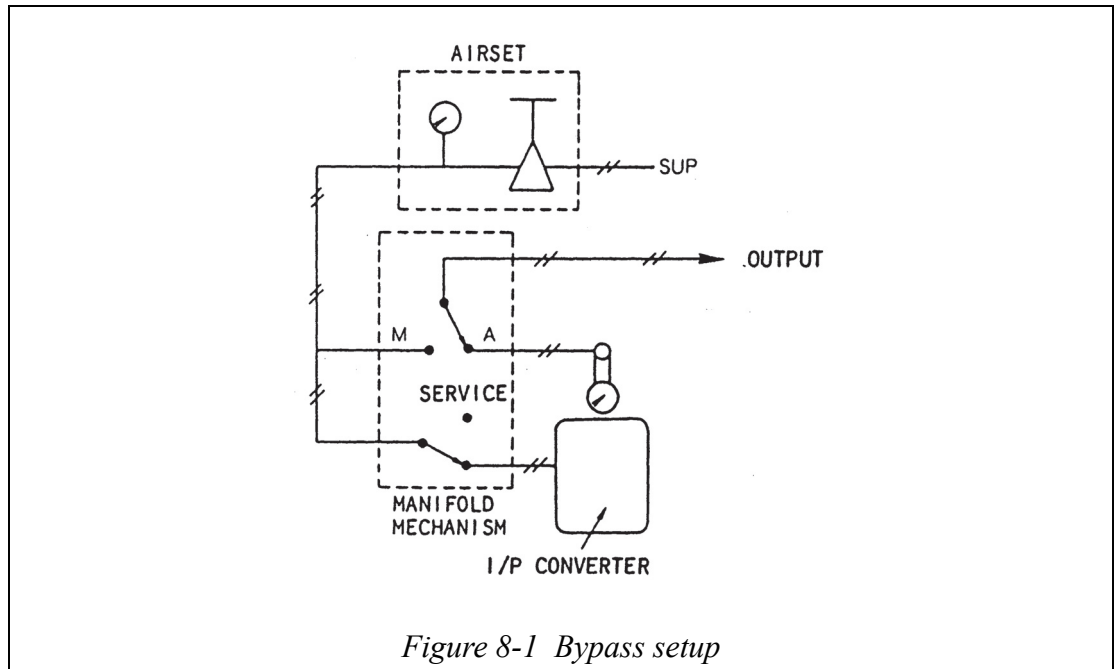
Install the pilot relay by following the two guide pins and exercising care not to damage the two gaskets. Position the gasket so that its indentation is aligned with the “C” mark on the plate. A circlet mark is provided on the side of the pilot relay to facilitate positioning. Align the circlet to the position of the OUT connector.

7-4 : Cleaning the Nozzle

To clean the nozzle, detach the nozzle block by loosening its two clamping-screws (see Figure 6-1).

Chapter 8 : Bypass Manifold

This chapter is for the Bypass Manifold which is installed on a I/P Converter. The Bypass Manifold is comprised of an Airset and an air switching mechanism, and allows the selection between an auto (A) position, a manual (M) position, and a service position. A bypass setup is shown in Figure 8-1 and the manifold mechanism is shown in Figure 8-2.



8-1 : A/M Switching

The bypass manifold is used when it is necessary to drive the control valve manually into the full open state or fully closed state (A/M position change).

When manually operating the control valve, it is recommended to change the manifold to the service position by means of the plug, in addition to the A/M position change. (This is recommended as this will prevent hunting which could be caused when in the M mode).

To return to the control valve to the manual mode, set the manifold to the A position.

8-2 : Switchover Procedures and Functions

Switchover from Auto (A) to Manual (M)

- (1) Turn the fixing screw counterclockwise at the head of the hex cap nut with a screwdriver.
- (2) Remove the hex cap nut by turning it counterclockwise.
- (3) Push the plunger shaft into the manifold in the M direction until the shaft touches the stopper.
- (4) Replace the hex cap nut at the M position.

When in manual, the I/P converter remains idle. The air supply adjusted by turning the knob of the Airset is fed to the actuator, allowing you to manually drive the control valve.

Service Position

To set the manifold to the service position from the manual (M) state, drive the stopper plug into the manifold with a screwdriver, until the plug touches the stopper. The service position basically is of an M state.

When in the service position, the I/P converter air supply is shut off. The control valve, however, can be driven manually the same as when the manifold is in manual.

Switchover from Manual (M) to Auto (A)

- (1) If the stop plug has been set to the service position, rotate the plug by several turns counterclockwise with a screwdriver to allow the air supply to flow.
- (2) Turn counterclockwise the fixing screw at the head of the hex cap nut with a screwdriver.
- (3) Remove the hex cap nut by turning it counterclockwise.
- (4) Push the plunger shaft into the manifold in the A direction until the shaft touches the stopper.
- (5) Replace the hex cap nut at the A position.

When in auto the actuator is driven by the output of I/P converter.

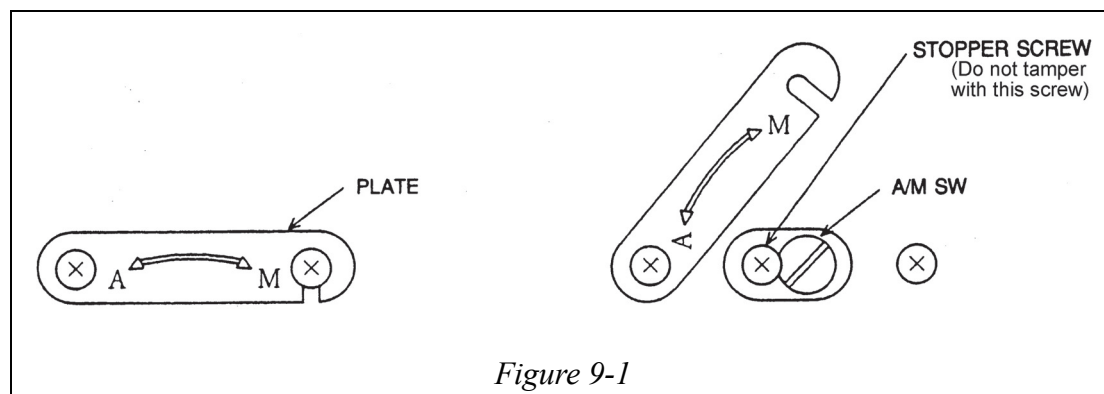
The air supply for the converter is fed through the Airset.

Adjust its output pressure to obtain the required value.

Chapter 9 : Handling Procedure for A/M Switch (Pipingless type)

9-1 : Setting the A/M Switch

To set the A/M switch to the A (auto) or M (manual) mode, proceed as follows



- (1) Loosen the clamping-screw of the plate and move the plate to a position where it grants you access to the A/M switch.
- (2) If you want to change the A/M switch to the A mode, turn the A/M switch in the “A” direction (counterclockwise) until it hits the stopper screw.
- (3) If you want to change the A/M switch to the M mode, turn the A/M switch in the “M” direction (clockwise) until it hits the stopper screw.

9-2 : Verifying the A/M Switch

To verify the setting of the A/M switch, proceed as follows:

(A) Verifying the A mode

- (1) Be sure that the A/M switch has been set to the A mode.
- (2) Set the pressure regulator output to 140 kPa {1.4 kgf/cm²}.
- (3) Check and adjust overall operation of the I/P converter.

(B) Verifying for the M mode

- (1) Be sure that the A/M switch has been set to the M mode.
- (2) Set the pressure regulator output to 140 kPa {1.4 kgf/cm²}.
- (3) Check that the I/P converter output can be adjusted between a range of 0 to 140 kPa {1.4 kgf/cm²} by changing the pressure regulator output.

After setting and checking for the M mode of operation has been completed, return the A/M switch to the A mode, and replace the plate to its original position and fix it securely with the clamping-screw. Finally, reset the pressure regulator output to 140 kPa {1.4 kgf/cm²}

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.

You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

1.2 Warranty scope

In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

- (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
- (2) Failure caused for other reasons than Azbil Corporation's product;
- (3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
- (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
- (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
- (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

- (1) Regulations and standards or laws that your Equipment is to comply with.
- (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
- (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use

Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with safety design such as fool-proof design,*1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,*3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

*1. A design that is safe even if the user makes an error.

*2. A design that is safe even if the device fails.

*3. Avoidance of device failure by using highly reliable components, etc.

*4. The use of redundancy.

3. Precautions and restrictions on application

3.1 Restrictions on application

Please follow the table below for use in nuclear power or radiation-related equipment.

	Nuclear power quality*5 required	Nuclear power quality*5 not required
Within a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Cannot be used (except for limit switches for nuclear power*7)
Outside a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Can be used

*5. Nuclear power quality: compliance with JEAG 4121 required

*6. Radiation controlled area: an area governed by the requirements of article 3 of "Rules on the Prevention of Harm from Ionizing Radiation," article 2 2 4 of "Regulations on Installation and Operation of Nuclear Reactors for Practical Power Generation," article 4 of "Determining the Quantity, etc., of Radiation-Emitting Isotopes," etc.

*7. Limit switch for nuclear power: a limit switch designed, manufactured and sold according to IEEE 382 and JEAG 4121.

Any Azbil Corporation's products shall not be used for/with medical equipment.

The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

3.2 Precautions on application

you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below. Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

- (1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
- (2) For use of specific purposes, such as:
 - * Nuclear energy/radiation related facilities
[When used outside a radiation controlled area and where nuclear power quality is not required]
[When the limit switch for nuclear power is used]
 - * Machinery or equipment for space/sea bottom
 - * Transportation equipment
[Railway, aircraft, vessels, vehicle equipment, etc.]
 - * Antidisaster/crime-prevention equipment
 - * Burning appliances
 - * Electrothermal equipment
 - * Amusement facilities
 - * Facilities/applications associated directly with billing
- (3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
- (4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
- (5) Machinery or equipment that may affect human lives, human bodies or properties
- (6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.

In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquiries or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice. After manufacturing is discontinued, we may not be able to provide replacement products even within the warranty period.

For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

- (1) Installation, adjustment, guidance, and attendance at a test run
- (2) Maintenance, inspection, adjustment, and repair
- (3) Technical guidance and technical education
- (4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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