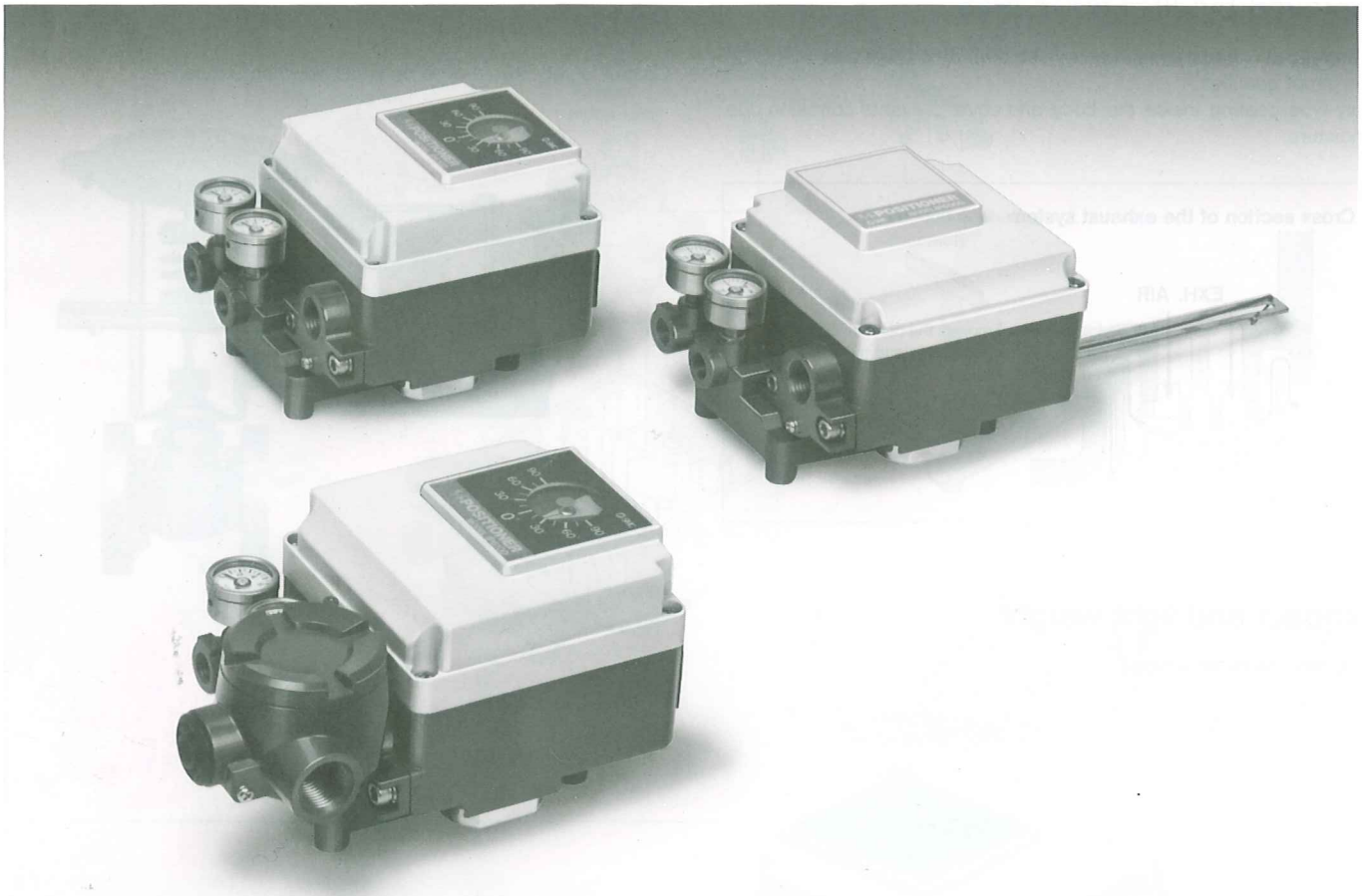
CAT.E608-Ⓐ

SMC

# Electro-Pneumatic Positioner

## Series IP6000/IP6100



High performance positioner
Resistant to hostile environments.
Exceptional shock and vibration performance.

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Resistant to hostile environments, Exceptional shock and vibration performance

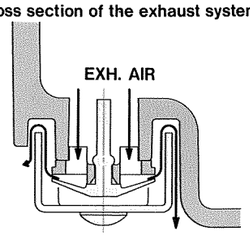
# Series IP6000/IP6100

## No resonances: 5～200Hz

## Approved by JIS F8007 IP55

A centralized exhaust system enhances both dust-proof and water-proof qualities.
Epoxy-type coating inside the body and cover prevents corrosion due to moisture.

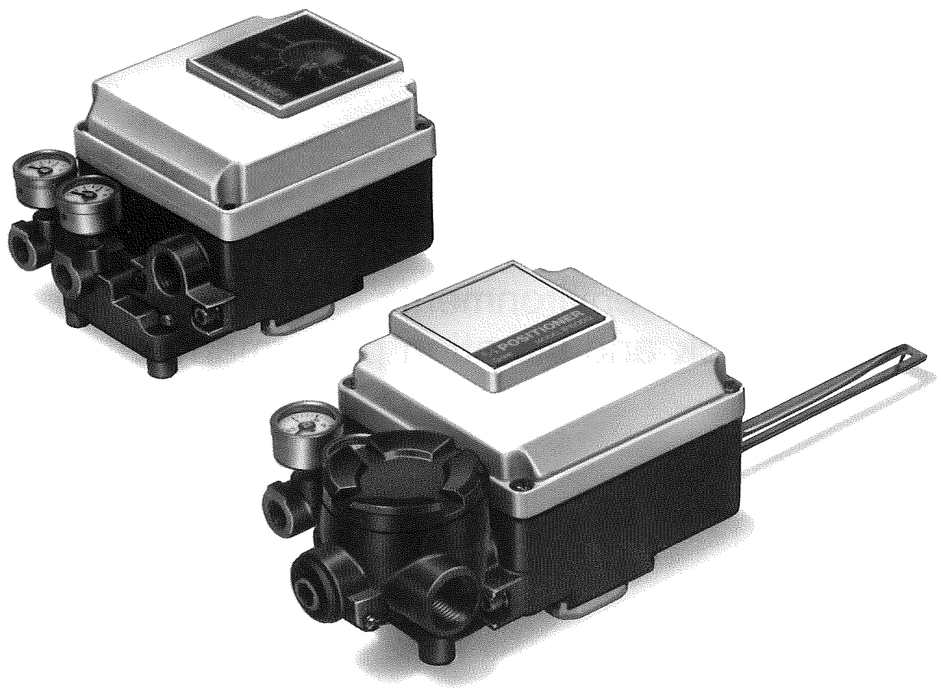
**Cross section of the exhaust system**




Employs the combination of the check valve and the labyrinth effect.

## Compact and light weight

20% Lighter than other types.

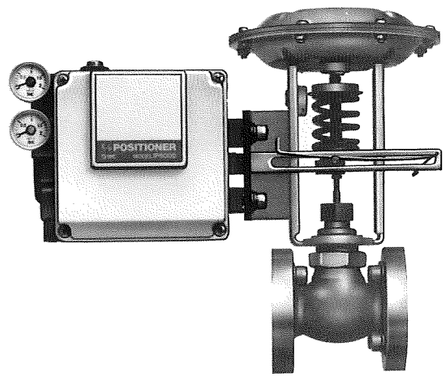


## Easy to attach small diaphragm actuators

The pneumatic and electrical ports are on the side of the body and do not interfere with the feedback lever on the other side.

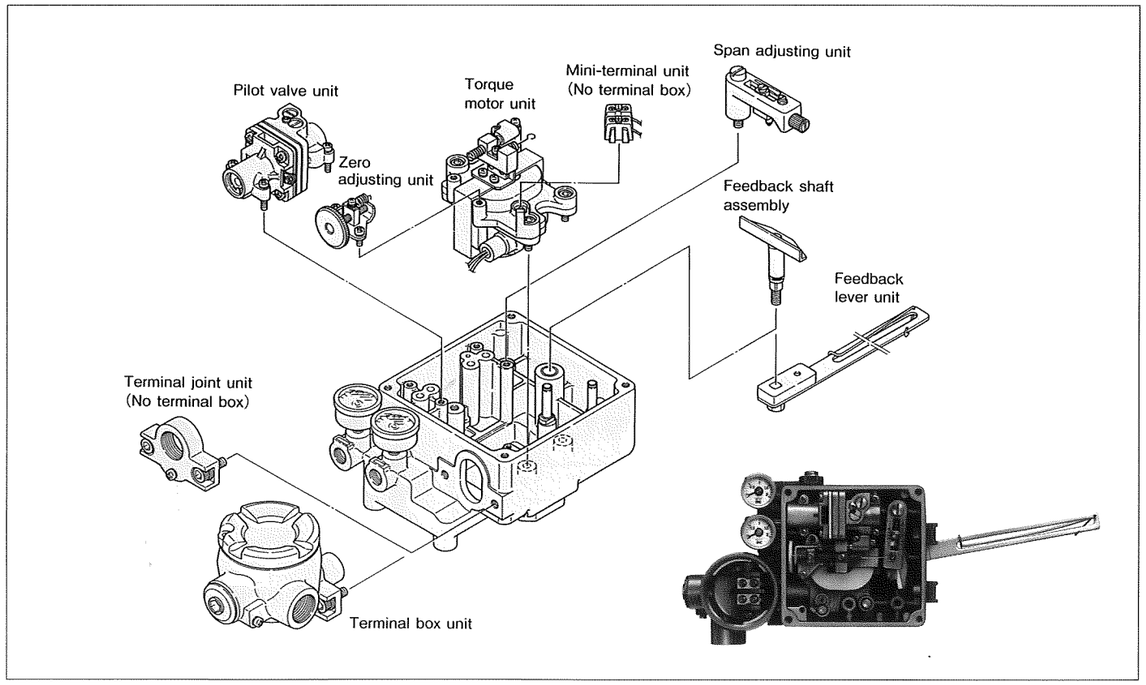
## Stable operation

Control is very stable even on small sized actuators.




## Easy maintenance

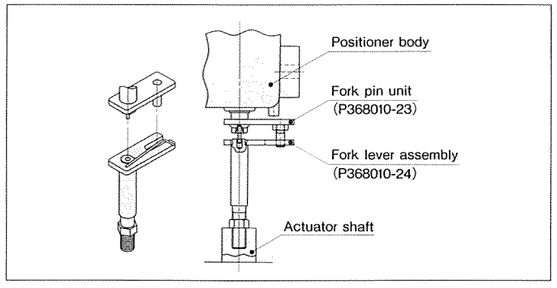
Maintenance and parts replacement made easy by modular construction.




## Standardization of fork lever joint

**(IP6100 type)**

Linkage design tolerates a slight misalignment of shafts

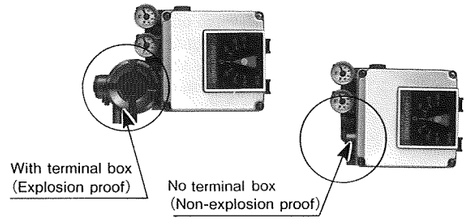



## Position indicator: Standard equipment

**(IP6100 type)**

## Two electric wiring configurations

With terminal box (Explosion proof)・No terminal box (Non-explosion proof)




Span adjuster accommodates ½ split range.

## Excellent explosion proof specification

Explosion proof standard—— sd2G4/Exsd II BT5

## Interchangeable

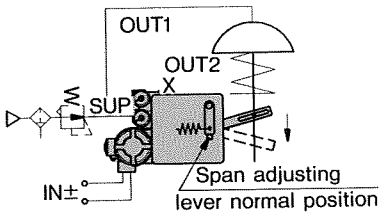
Compatible with IP600 series mounting bracket.

# Piping method

## IP6000 Lever type

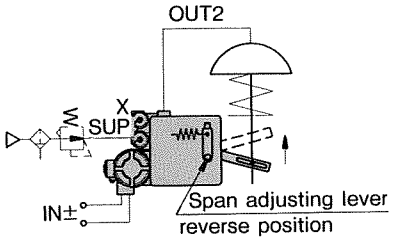
### Single action

**Positive operation** : When the input signal is increased, the stem extends.



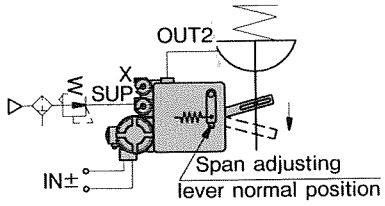

OUT2 is Plugged

**Reverse operation** : When the input signal is increased, the stem retracts. (Reverse valve operation by its positive operation mode)



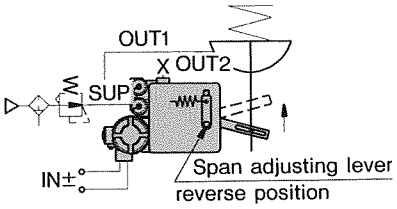

OUT1 is Plugged

When the input signal is increased, the stem extends. (Positive valve operation by its reverse operation mode)




OUT1 is Plugged

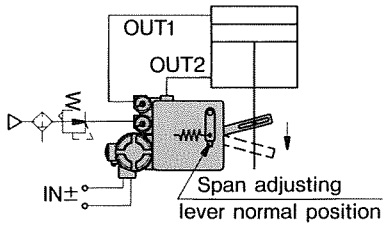
When the input signal is increased, the stem retracts.



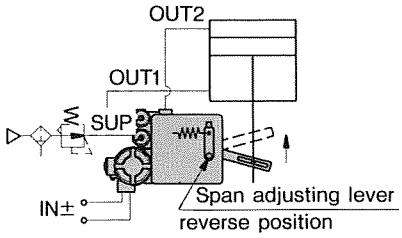

OUT2 is Plugged

### Double action

**Positive operation** : When the input signal is increased, the cylinder rod extends.



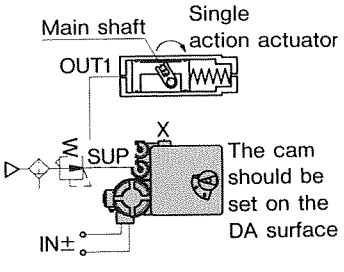

**Reverse operation** : When the input signal is increased, the cylinder rod retracts.




## IP6100 Rotary type

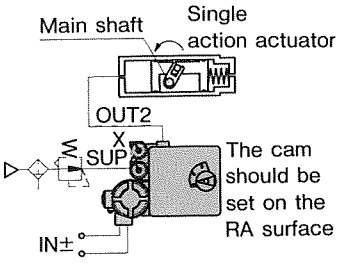
### Single action

**Positive operation** : When the input signal is increased, the actuator shaft rotates in a counter clockwise direction.




OUT2 is Plugged

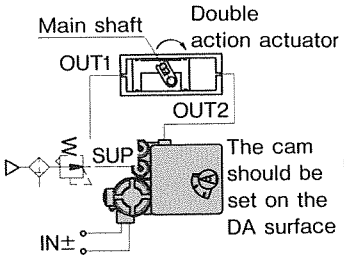
**Reverse operation** : When the input signal is increased, the actuator shaft rotates in a counter clockwise direction.



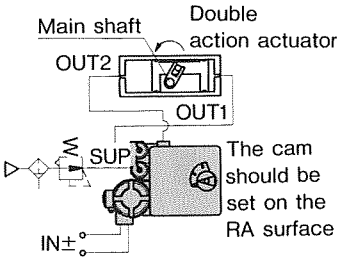

OUT1 is Plugged

### Double action

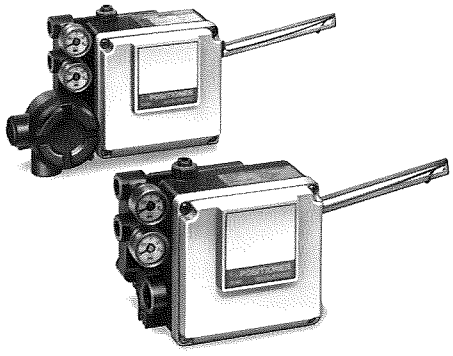
**Positive operation** : When the input signal is increased, the actuator shaft rotates in a clockwise direction.




**Reverse operation** : When the input signal is increased, the actuator shaft rotates in a counter-clockwise direction.



# SMC Electro-Pneumatic Positioner IP6000/6100



IP6000

IP6100

## How To Order

IP6 □ □ □ □ □

**Type**

| | |
|---|---|
| 000 | Lever type lever feedback |
| 100 | Rotary type cam feedback |

**Input current**

| | |
|---|---|
| 0 | 4~20mA DC (Standard) |
| 1 | 10~50mA DC |

**Pressure gauge (SUP, OUT 1)**

| | |
|---|---|
| 1 | 0.2MPa{2kgf/cm²} |
| 2 | 0.3MPa{3kgf/cm²} |
| 3 | 1.0MPa{10kgf/cm²} |

**Construction**

| | |
|---|---|
| 0 | No terminal box (Terminal on the body non-explosion proof) |
| 1 | With terminal box (sd2G4, Exsd II BT5) Note 1) |

**Accessories** Note 2)

| | | |
|---|---|---|
| Nil | None (Standard) | IP6000 has standard lever for stroke (10~85mm) |
| A | φ0.7 Output restriction with pilot valve | Accessory for IP6000, 6100 small capacity actuator Note 3) |
| B | φ1.0 Output restruction with pilot valve | |
| C | Fork lever joint M | Accessory for IP6100 |
| D | Fork lever joint S | |
| E | For stroke 35~100mm with lever unit | Accessory for IP6000 Note 4) |
| F | For stroke 50~140mm with lever unit | |
| G | Compensation spring (A) | For IP6000, 6100 Note 5) |

Note 1) For construction No. 1 (with terminal box), the ambient and fluid temperatures are as follows:
- sd2G4 ——— −20~70°C
- Exsd II BT5 —— −20~60°C
- Non-explosion proof (non hazardous locations only) —— −20~80°C

Two labels (sd2G4, Exsd II BT5) are on the body.

Note 2) If two or more accessories are required, the part numbers should be made according to alphabetical order. (ex. IP6000-011-AG)

Note 3) "A" is applied to approx 90cm³-capacity actuator.
"B" is applied to approx 180cm³-capacity actuator.

Note 4) Standard lever is not attached.

Note 5) The following combinations are available: A+G or B+G

## Specifications

| Item \ Type | IP6000 | | IP6100 | |
|---|---|---|---|---|
| | Lever type lever feedback | | Rotary type cam feedback | |
| | Single action | Double action | Single action | Double action |
| Input current | 4～20mADC (Standard) Note 1) | | | |
| Coil resistance | 235±15Ω (4～20mADC) | | | |
| Supply air pressure | 0.14～0.7MPa{1.4～7.1kgf/cm²} | | | |
| Stroke | 10～85mm (Deflection angle 10°～30°) | | 60°～100° Note 2) | |
| Sensitivity | Within 0.1%F.S. | Within 0.5%F.S. | | |
| Linearity | Within ±1%F.S. | Within ±2%F.S. | | |
| Hysteresis | Within 0.75%F.S. | Within 1%F.S. | | |
| Repeatability | Within ±0.5%F.S. | | | |
| Coefficient of temperature | Within 0.1%F.S./°C | | | |
| Output flow | Note 3) 80ℓ/min (ANR) or more (SUP=0.14MPa) | | | |
| Air consumption (Bleed) | Note 3) 5ℓ/min (ANR) or less (SUP=0.14MPa) | | | |
| Ambient and fluid temperature | −20°C～80°C (Non-explosion proof) | | | |
| | −20°C～70°C (Pressure tight explosion proof sd2G4) | | | |
| | −20°C～60°C (Pressure tight explosion proof Exsd II BT5) | | | |
| Explotion proof construction | Pressure tight explosion proof construction | sd2G4 (Type certification approval number. No.43907) | | |
| | | Exsd II BT5 (Type certification approval number. No.C10474) | | |
| Air port | Rc (PT) ¼ female | | | |
| Electrical connection | G (PF) ½ female | | | |
| Wiring method | Conduit system・Pressure tight packing system | | | |
| | Resin G (PF) ½ connector (Non-Explosion proof, option) | | | |
| Material | Aluminum diecast body | | | |
| Weight | With terminal box 2.6kg (None 2.4kg) | | | |

Note 1) ½ Sprit range (Standard) Note 2) Stroke adjustment : 0～60, 0～100°
Note 3) Standard air temperature : 20°{298k}, Absolute pressure : 760mmHg, Relative humidity : 65%

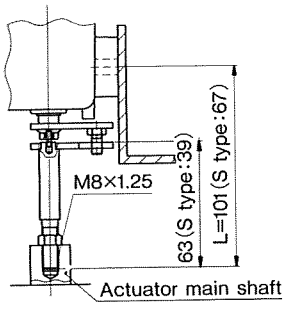
## Fork lever joints (IP6100 type)

Fork-lever rotary joints are available that tolerate small misalignments between positioner and actuator shaft.
These are available in two standard sizes.

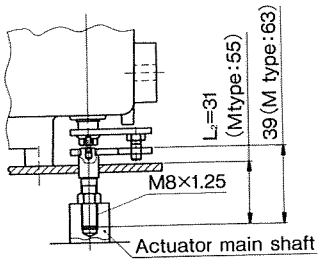
**Fork lever joint**

| Part name | Part number |
|---|---|
| Fork lever assembly M | **P368010-24** |
| Fork lever assembly S | **P368010-25** |

Side mounting with the fork lever assembly M




Rear mounting with the fork lever assembly S

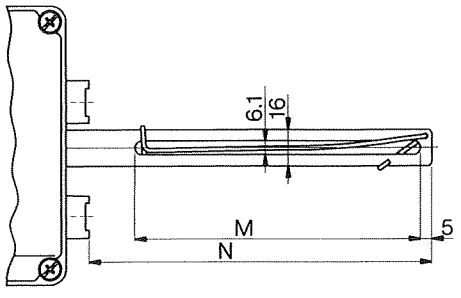



## External feedback lever (IP6000 type)

The feedback lever is selected according to valve stroke.
Consult factory for strokes less than 10mm.

**External feedback lever**

| Stroke | Order code | Unit number | Size M | Size N |
|---|---|---|---|---|
| 10～85mm | (Nil) | **P368010-20** | 125 | 150 |
| 35～100mm | (E) | **P368010-21** | 110 | 195 |
| 50～140mm | (F) | **P368010-22** | 110 | 275 |



## Pilot valve with output restriction (IP6000, 6100 type)

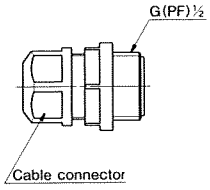
In general, mounting on a small-size actuator may cause hunting. For prevention, a pilot valve with a built-in output restriction is available. The restriction is removable.

**Restrictions**

| Actuator Capacity | Orifice size | Part number | Pilot unit part number |
|---|---|---|---|
| 90cm³ | φ0.7 | P36801080 | **P368010-28** |
| 120cm³ | φ1.0 | P36801081 | **P368010-29** |

## Resin connector (Non-explosion proof specification)

Optional cable connectors are available for two different cable sizes. These are not for explosion proof applications.




**Cable connector (Option)**

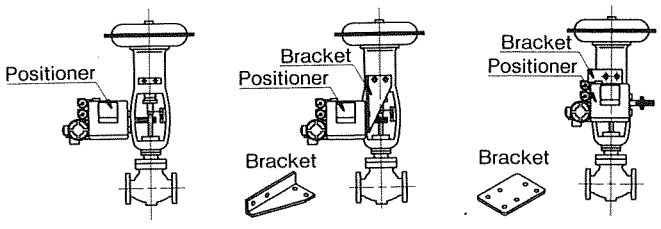
| Part name | Part number | Suited cable outer diameter |
|---|---|---|
| Resin-made cable clamp unit (A) | **P368010-26** | φ7～φ9 |
| Resin-made cable clamp unit (B) | **P368010-27** | φ9～φ11 |

## Installation

### IP6000 type (Lever type lever feedback)

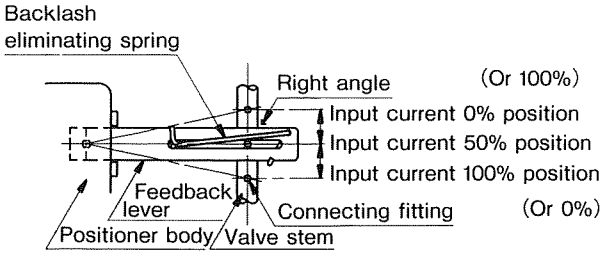
❶ The unit should be mounted using bolts firmly fixed through mounting holes on the side or back of the positioner.

No bracket L-type bracket Front bracket




❷ A connecting fitting or pin to transfer the displacement of valve stem should be mounted at a position so that the feedback lever is at right angles to the valve stem for an input current of 50%. The following figure is the configuration viewed from the front.

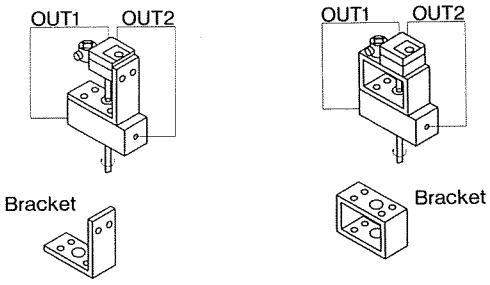
**Installing feedback lever**




❸ A fullscale deflection of 20° is optimum.
It should be at least 10° and at most 30° to achieve specified accuracy and lineartiy.

### IP6100 type (Rotary type cam feedback)

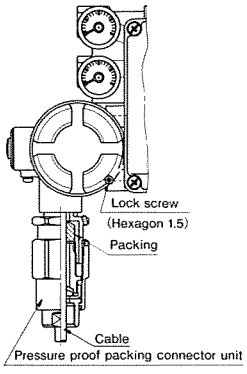
● The positioner should be mounted so that the feedback shaft is aligned with the shaft of the rotary actuator.




### Explosion Proof

This product has the following approvals.
※sd2G4:Explosion-protected construction standard of electrical equipment (Notification No.16 of the ministry of labor, Japan in 1969.)
※ExsdⅡBT5:Newly established standard based on international specifications (IEC No.79).

Use as sd2G4
(A) Pressure-proof packing. As shown below in the chart, use "cable gland" (option).
(B) Flameproof threaded joint steel conduit type lead in method.
Use as ExsdⅡBT5
(A) Pressure-proof packing.
As shown below in the chart, use "Cable gland"(option).
(B) Metal Piping.
Attach the sealant fitting near the cable port.
For details, refer to "Factory electric equipment explosion proof guide line" published by the industry safety association.




**Cable gland armour with pressure proof packing (Option)**

| Part name | Part number | Suited cable outer diameter |
|---|---|---|
| Pressure proof packing connector unit | **P368010-32** | φ7.0～φ10.0 |
| | **P368010-33** | φ10.0～φ12.0 |

## Precautions

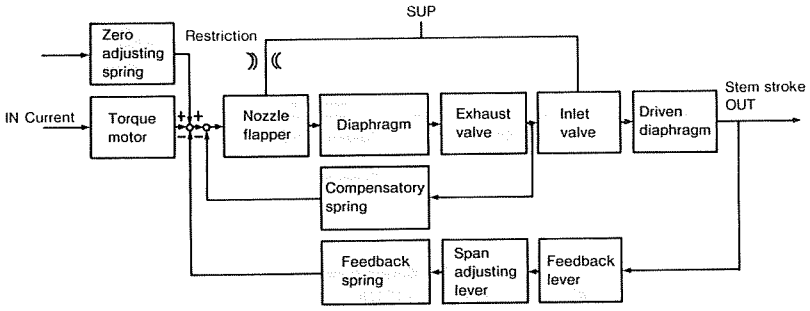
❶ Avoid impact to positioner while transporting and handing.
❷ Operate within specified temperature range to prevent deterioration of seals.
❸ Do not remove terminal cover in a hazardous location.
❹ Covers for the terminal and body should be in place while operating in the presence of moisture and gases.
❺ To extend the life of the positioner when used outdoors, extra protection is recommended against rain and dust.
Units should also be protected against moisture in high heat and humidty conditions during transport, packaging should protect against moisture.

# Principle of Operation

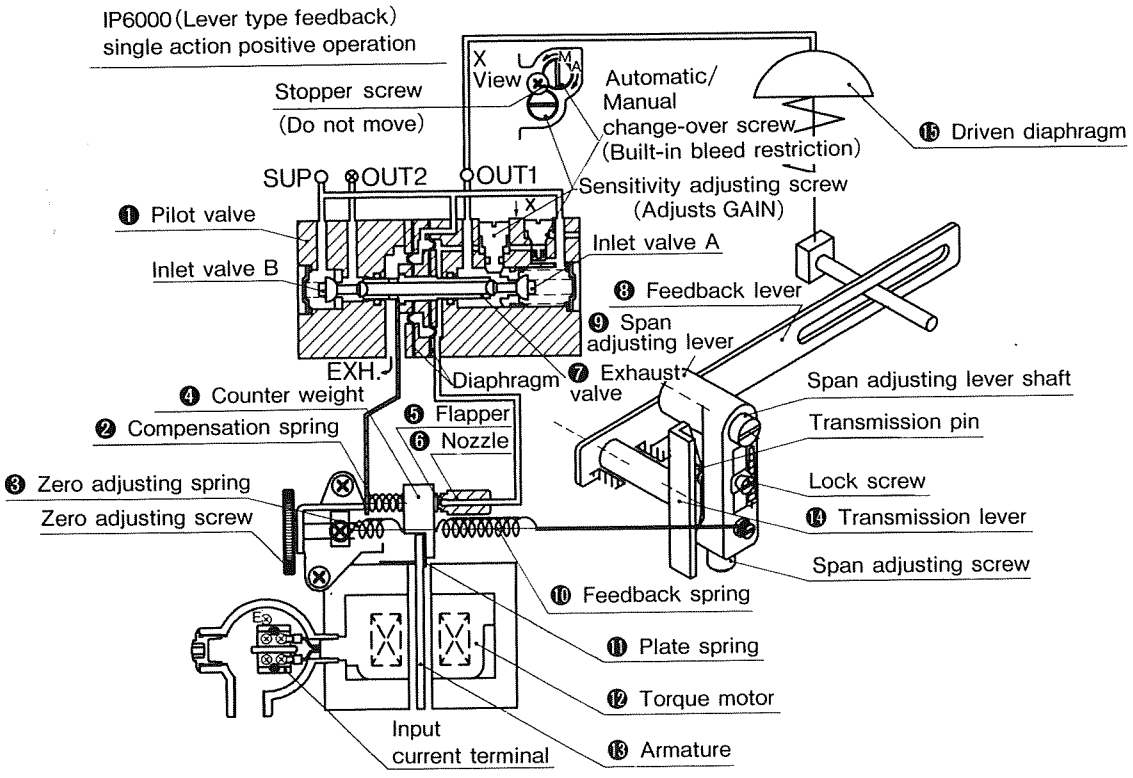
### IP6000 type

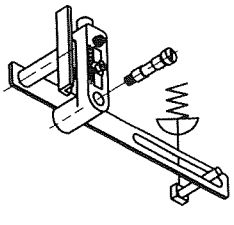
When the input current increases, ⓫ the plate spring of ⓬ the torque motor will work as a pivot, ⓭ armature will receive a counter clockwise torque, ❹ the counter weight will be pushed to the left, the clearance between ❻ the nozzle and ❺ the flapper will increase, and the nozzle back pressure will decrease. Consequently, ❼ the exhaust valve of ❶ the pilot valve moves to the right, the output pressure of OUT 1 increases and ⓯ the diaphragm moves downwards. The motion of ⓯ the diaphragm acts on ⓫ the feedback spring through ❽ the feedback lever, ⓮ the transmission lever and ❾ the span adjustment lever to rest at the balance position generated by the input current. ❷ The compensation spring is for direct feedback of the motion of ❼ the exhaust valve to ❹ the counter weight to increase the stability of the loop. The zero point should be adjusted by change of ❸ the zero adjustment spring tention.

### IP6000 type Block diagram of operating principle




### IP6000 Principle of operation



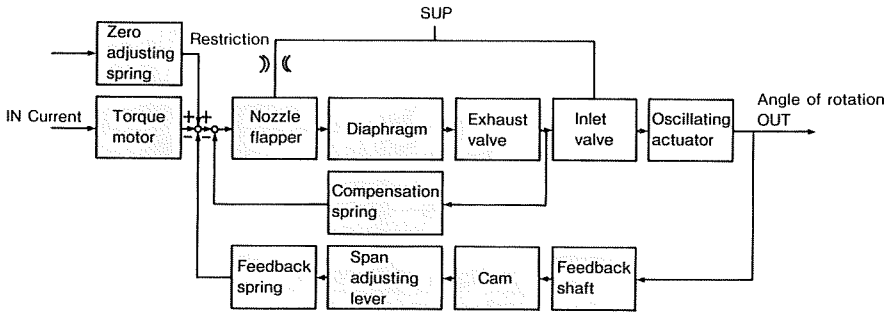
For reverse position, exchange the shaft of the span adjusting lever to the oppsite side. The span adjusting screw faces upward in this condition. (See "Piping method")

# Principle of Operation

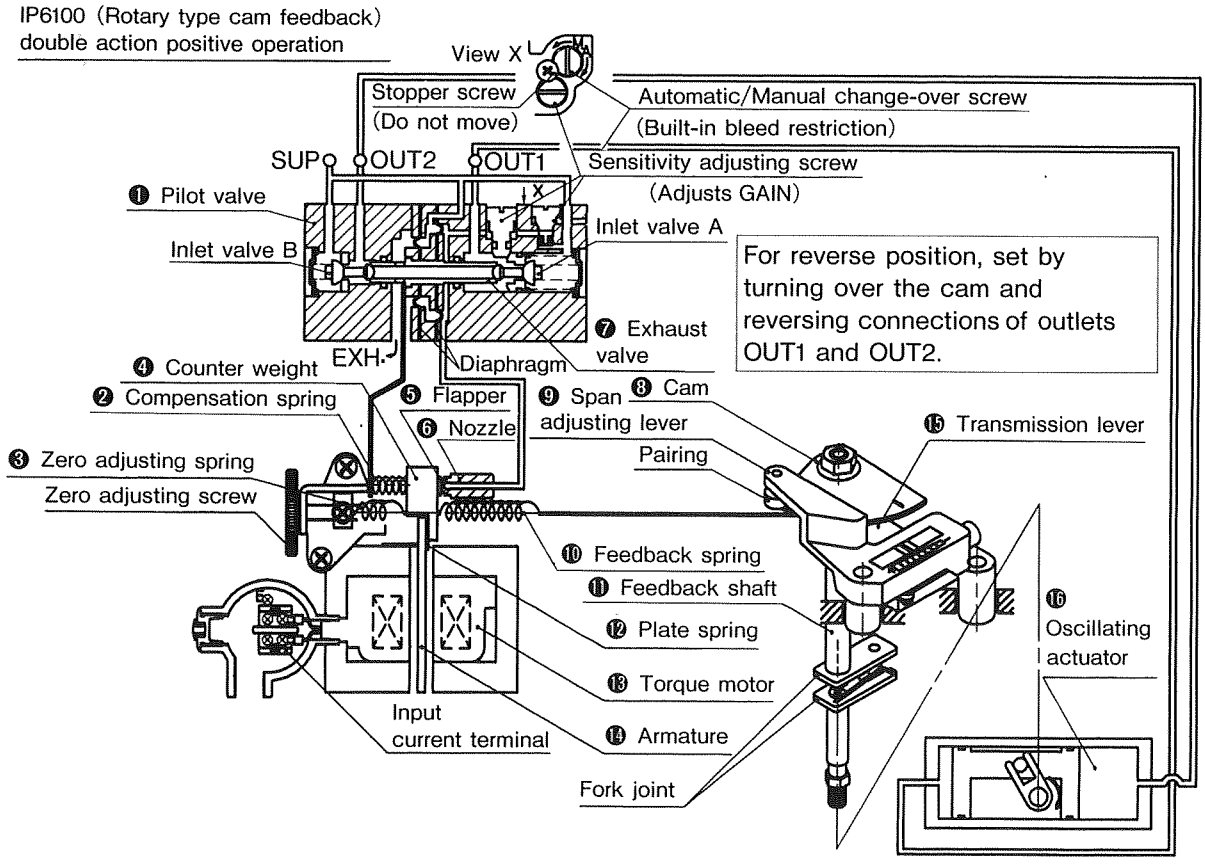
### IP6100 type

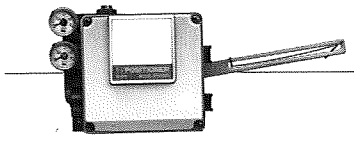
When the input current increases, ⓬ the plate spring of ⓭ the torque motor will work as a pivot, ⓮ armature will receive a counter-clockwise torque, ❹ the counter weight will be pushed to the left and the clearance between ❻ the nozzle and ❺ the flapper will increase, and the nozzle back pressure will decrease. Consequently, ❼ the exhaust valve of ❶ the pilot valve moves to the right, the output pressure of OUT 1 increases, that of OUT 2 decreases and ⓰ the rotary actuator moves. The motion of ⓰ the actuator acts on ⓾ the feedback spring through ⓫ the feedback shaft, ❽ the cam, ❾ the span adjustment lever and ⓯ transmission lever to rest at the balance position generated by the input current.
❷ The compensation spring is for direct feedback of the motion of ❼ the exhaust valve to ❹ the counter weight to increase the stability of the loop. The zero point should be adjusted by change of ❸ the zero adjustment spring tension.

### IP6100 type Block diagram of operating principle



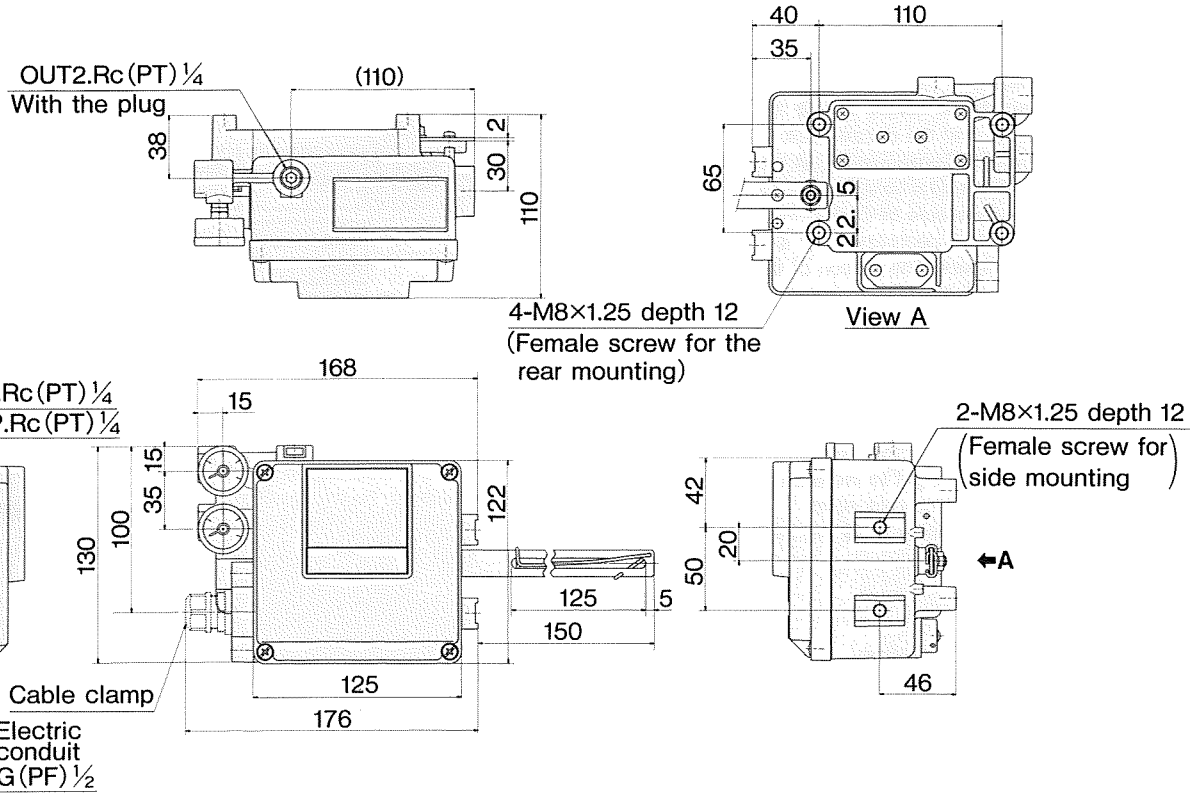

### IP6100 Principle of operation

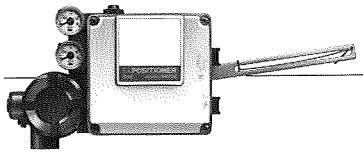




## IP6000 type(Lever type feedback(No terminal box))

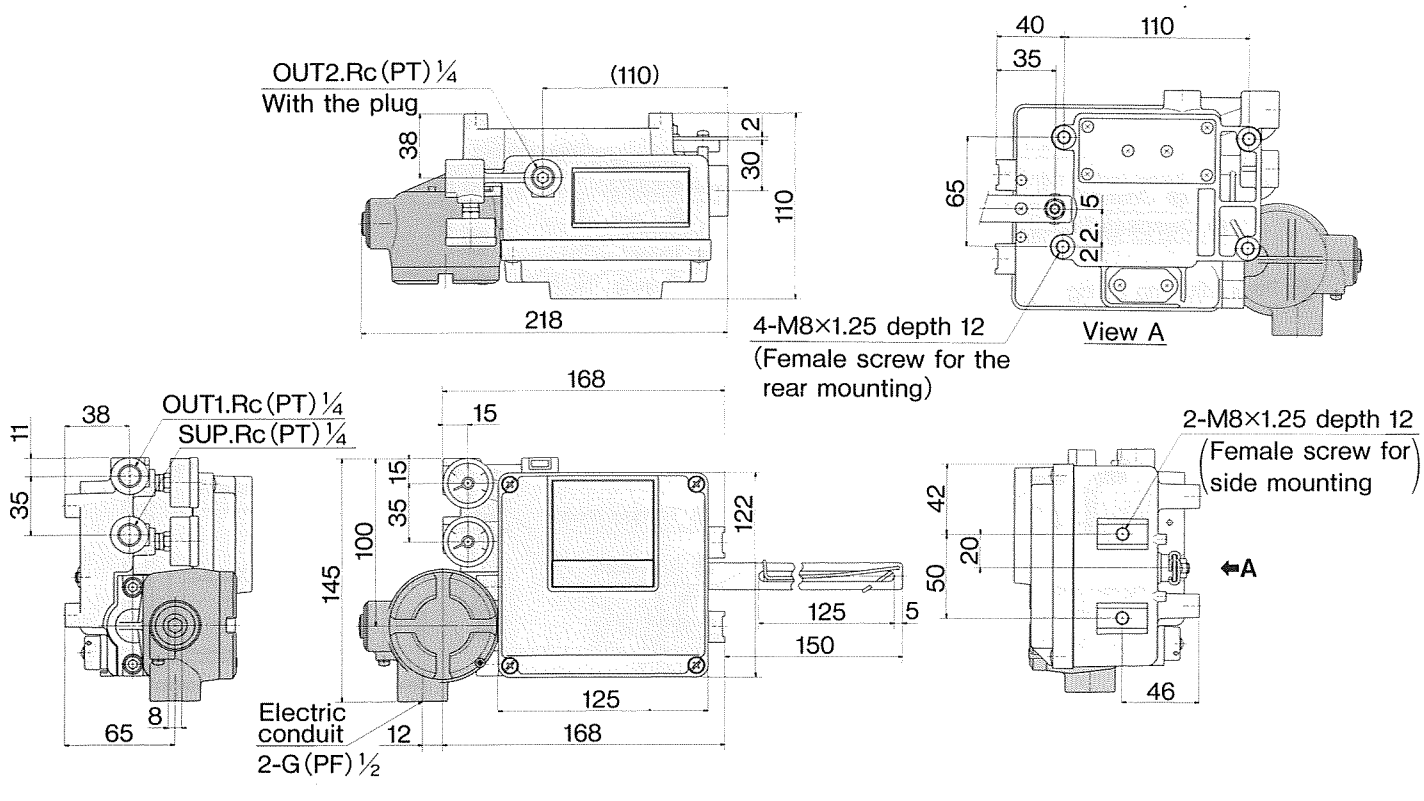
Scale: 1/5

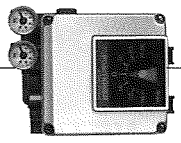


## IP6000 type(Lever type feedback(With terminal box))

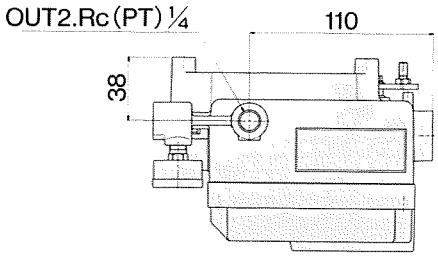
Scale: 1/5

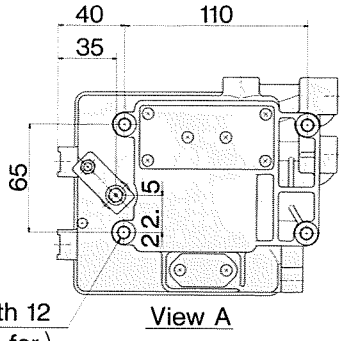


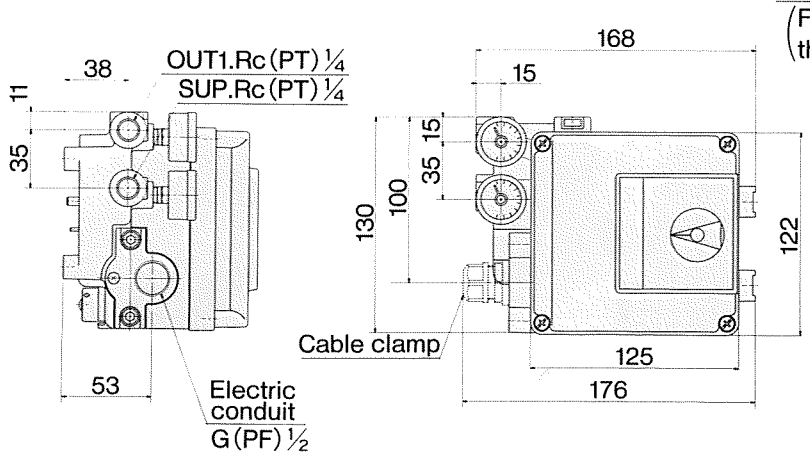


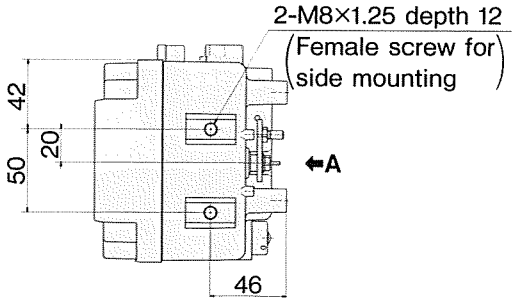
## IP6100 type(Rotary type cam feedback(No terminal box))

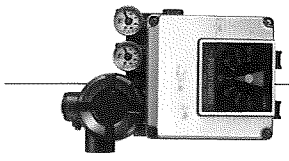
Scale: 1/5



## IP6100 type(Rotary type cam feedback(With terminal box))

Scale: 1/5