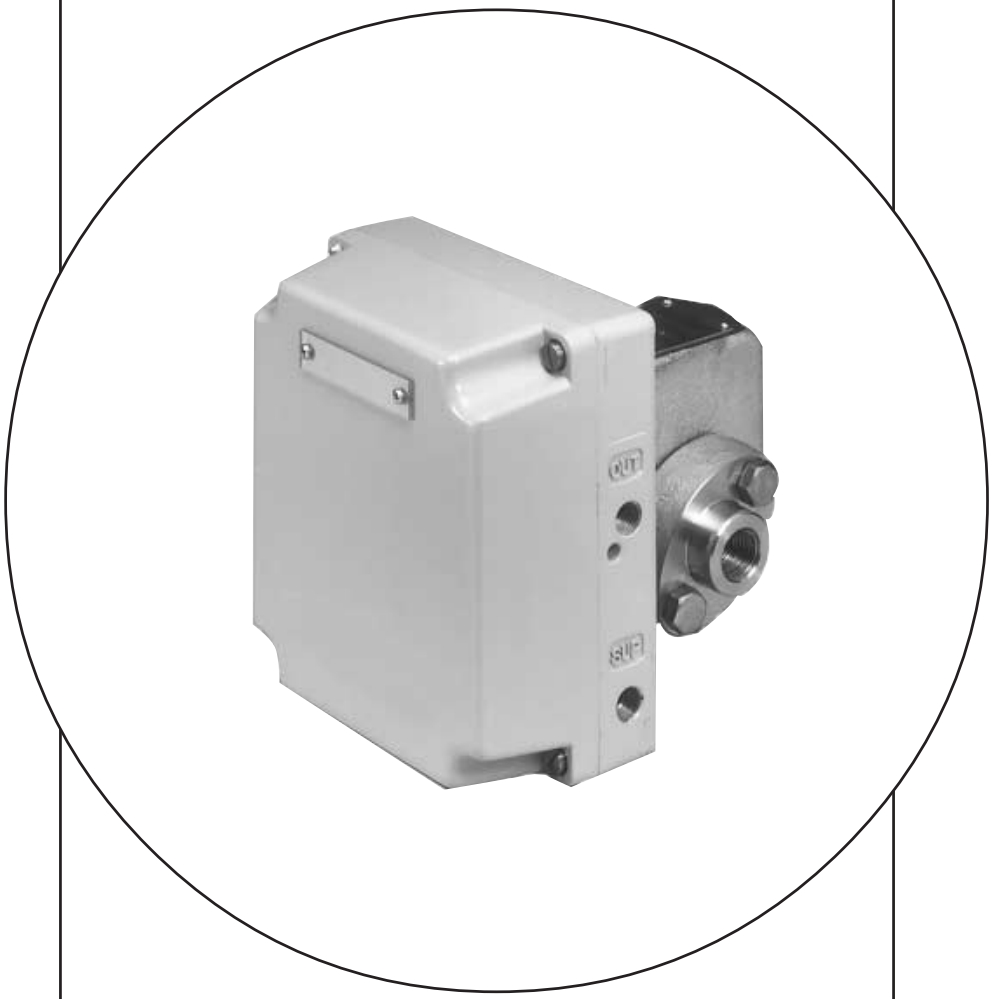
azbil

OM2-5240-1101

PREX3000 Series Pneumatic Pressure Transmitter Model KKP

User's Manual



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Unpacking & Verification

Unpacking the RREX 3000 Transmitter package

This device is a precision instrument and should be handled with care to prevent damage and breakage.

After unpacking the device, verify that the following items are contained:

- Transmitter itself
- Standard accessories
- Manual

Verifying the specifications:

The specifications of this device are written on its attached identification plate. Compare the specifications with para. 2 Specifications and para. 3 Model Numbers, and verify that all items of the specifications on the plate are correct.

Inquiries

If you have any questions regarding the specifications of the device, contact your nearest Azbil Corporation office or representative. When making inquiry, be sure to provide the model number, product number and serial number of this device.

The purpose of this manual is to provide the installation, operational and maintenance notes. The equipment undergoes a performance test and inspection before shipping. However, in order to insure maximum operating efficiency, you should learn how to handle the transmitter correctly under your specific environmental conditions. This manual contains instructions for use during and following installation, operation and maintenance

Practical Notes

Handling:

Carry the transmitter to the installation location in the packed condition and safe from accidental damage.

Storing:

When storing this device before use, observe the following precautions:

- Store indoors at room temperature (-40 to +85°C) and humidity (25°C and 65% RH recommended) in a place safe from vibration or other mechanical effects.
- Store it in the same condition as it was shipped.
- When storing this device after use, rinse the inside of the sensing head with water to eliminate residual fluid, then allow to dry.

Installation place.

To ensure reliable performance of the transmitter over a long time, check the following items on installation:

- A heat insulation or accelerated air flow should be provided if the transmitter is exposed to significant radiant heat.
- Avoid corrosive environments, shock and excessive vibration.

Application

a) Do not apply pressure over the specified level.
(Refer to 2. Specifications)
b) Do not tighten or loosen the tightening screws or bolts when pressure is being applied.
c) Be careful when handling even after pressure has been released, following the measurement of any processer.

Safety Precautions

Safety precautions in this manual are flagged as either --- Warning or Caution. The meaning of these flags is as follows:
Failure to observe the handling or operational instruction may produce dangerous conditions that could result in injury to the operator or in damage to property.

⚠ Warning — Potentially hazardous situation which,if notavoided,could result in death or serious injury.

⚠ Caution — Failure to observe the handling or operational instruction may produce dangerous conditions that could result in injury to the operator or in damage to property.

Precautions during installation

⚠ Warning

a)Avoid any projection of the gasket on the connection into the process. Use the adapter to leading tube with a flange, otherwise, liquid leakage or output error may be produced.
b) Every unit or instrument shall be used within the specified pressure, temperature and connection rat ings. Damage or leakage may lead to serious accident. The device is manufactured and shipped under internationally-certified quality assurance systems. Any modifications to the device may lead to damage of the device and/or property.

⚠ Caution

a) Do not step on this device. Applying such mechanical stress will cause damage to the instrument, and/or lead to injury.
b) Avoid contact of tools or other hard objects on the indi-cat or glass.
c) Grounding shall be done to get reduce grounding resis-tance and conform to local regulations. Inad equate grounding may cause output error.
d) While carrying, please wear safety shoes and watch your step.

Precautions during maintenance

⚠ Warning

a) Be careful to avoid gas or liquid spurting from process tubes, since residual fluid may exist in pipes. On disconnection of the lead tube from the process, such matter may be forced out by residual pressure.
b) Check the removal direction of the vent/drain when removing. Be careful not to bring the vent/drain into contact with the human body, as this may result in physical damage.

⚠ Caution

The device is manufactured and shipped under internationally-certified quality assurance systems. Any modifications to the device may lead to damage of the device and/or property.

CONTENTS

1. Overview

The pneumatic transmitter PREX 3000 comprises a sensing head, meter body and trans mitting section, and is used to convert process pressure into a pneumatic signal,20 to 100kPa.{0.2 to 1.0 kgf/cm^2}

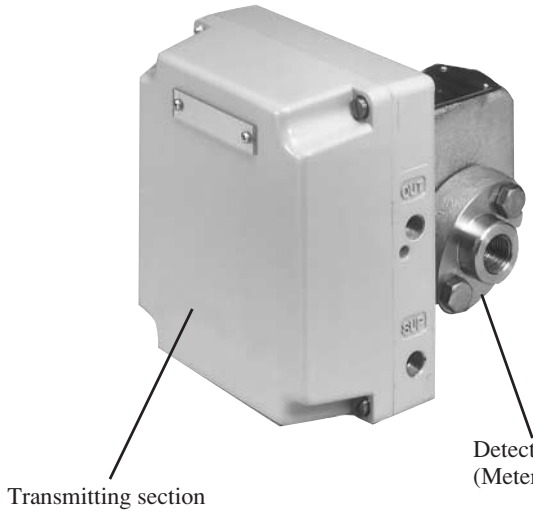


Fig. 1-1

2. Specitications

TRANSMITTING SECTION	DETECTOR(METER BODY)
Model and Measurement Span	[Gauge Pressure] KKP11: 0~5 to 0~70MPa{0~50 to 0~700kgf/cm2} KKP12: 0~1.25 to 0~25MPa {0~12.5 to 0~250kgf/cm²} KKP13: 0~0.35 to 0~7MPa{0~3.5 to 0~70kgf/cm²} KKP14: 0~0.175 to 0~3.5MPa{0~1.75 to 0~35kgf/cm²} KKP15:0~ 35 to 686kPa {0~0.35 to 0~7kgf/cm2} KKP16: 0~10 to 196kPa {0~0.1 to 0~2kgf/cm²} KKP17: 0~0.34 to 0~66.6kPa{0~25 to 0~500mmHg} KKP18:0~0.7 to 0~13.3kPa{0~5 to 0~100mmHg} [Absolute Pressure] KKP25: 0~35 to 0~686kPa{0~0.35 to 0~7kgf/cm2} abs KKP26: 0~10 to 0~196kPa{0~0.1 to 0~2kgf/cm²} abs KKP27:0~0.34 to 0~66.6kPa{0~25 to 0~500mmHg}abs KKP28:0~0.7 to 0~13.3kPa{0~5 to 0~100mmHg}abs [Remote Seal] KKP71: 0~5 to 0~70MPa{0~50 to 0~700kgf/cm²} KKP72: 0~1.25 to 0~25MPa{0~12.5 to 0~250kgf/cm²} KKP73: 0~0.35 to 0~7MPa{0~3.5 to 0~70kgf/cm²} KKP74: 0~0.175 to 0~ 3.5MPa{0~1.75 to 0~35kgf/cm²} KKP75: 0~0.035 to 0~0.686MPa{0~0.35 to 0~7kgf/cm²} KKP76: 0~0.01 to 0~0.196MPa{0~0.1 to 0~2kgf/cm²}

Applicable Pressure Range
Withstand Overload
Connectable Pipe Size

Model	Applicable Pressure Range	Withstand Overload	Connectable Pipe Size
KKP11	-0.1 to +70 MPa{-1to+700kgf/cm²}	75 MPa{750kgf/cm²}	Welded nipple: dia. 13.6mm x 50mm
KKP12	-0.1 to +30 MPa{-1to+300kgf/cm²}	32 MPa{320kgf/cm²}	Rc1/2 or 1/4, 1/2 or 1/4NPT female thread
KKP13	-0.1 to +10.5 MPa{-1to+105kgf/cm²}	14 MPa{140kgf/cm²}	
KKP14	-0.1 to + 5.25 MPa{-1to+52.5kgf/cm²}	7 MPa{70kgf/cm²}	
KKP15	-0.1 to +1.05MPa{-1to+10.5kgf/cm²}	1.4MPa{14kgf/cm²}	Rc1/2 or 1/4, 1/2 or 1/4NPT female thread
KKP16	-100 to +300kPa{-1to+3kgf/cm²}	400kPa{4kgf/cm²}	
KKP17	-66.6 to +66.6kPa{-500to+500mmHg}	400kPa{4kgf/cm²}	
KKP18	-13.3 to +13.3kPa{-100to+100mmHg}	400kPa{4kgf/cm²}	
KKP25	0 to +686kPa{0to+7kgf/cm²}	1.4MPa {14kgf/cm²}abs	Rc1/2 or 1/4, 1/2 or 1/4NPT female thread
KKP26	0 to 196kPakgf/cm² {0to+2kgf/cm²}abs	0.6MPa {6kgf/cm²}abs	
KKP27	0 to 66.6kPa{0to500mmHg}abs	0.4MPa {4kgf/cm²}abs	
KKP28	0 to 13.3kPa{0to100mmHg}abs	0.4MPa {4kgf/cm²}abs	

(Unit: MPa{kgf/cm²})

Model	Applicable Pressure Range (~120°C)	Withstand Overload	
		to 120°C	Normal Temperature
KKP71	-0.05 to +70 {-0.5to+700}	70 {700}	
KKP72	-0.05 to +30 {-0.5to+300}	32 {320}	
KKP73	-0.05 to +10.5{-0.5to+105}	14 {140}	
	-0.05 to +5.25{-0.5to+52.5}(2B-ANSI Wafer)	7 {70}	
KKP74	-0.05 to +5.1{-0.5to+51} (JIS30K Flange)	5.1 {51}	
	-0.05 to +3.82{-0.5to+37} (ANSI 300 Flange)	3.82 {37}	4.96 {50}
KKP75	-0.05 to +1.05{-0.5to+10.5}	1.4 {14}	
KKP76	-0.05 to + 0. 3{-0.5to+3}	0.4 {4}	

Connection / Model	Screwed PF1 1/2 (dia 34mm button diaphragm)	2B (RF) Wafer	Standard Model (RF) 80A-JIS10K	80A-JIS30K	3B-ANSI 150	3B-ANSI 300	Projection Model (RF) 100A-JIS10K	100A-JIS30K	4B-ANSI 150	4B-ANSI 300
KKP71	○									
KKP72	○	○								
KKP73		○								
KKP74		○		○		○		○		○
KKP75			○		○		○		○	
KKP76			○		○		○		○	

TRANSMITTING SECTION	DETECTOR(METER BODY)
Pneumatic piping connection	Rc1/4 or 1/4NPT female thread
Supply compressed air pressure	140±14kPa{1.4 ± 0.14kgf/cm²}
Output	20 to 100kPa{0.2 to 1.0kgf/cm²}
External load	ϕ4(ID) × 3m + 20cc or more
Supply compressed air flow rate	20N ℓ /min
Air consumption	5N ℓ /min or less(in balanced at output 100%)
Accuracy/Non-sensitive range	

Model	KKP11		KKP12		KKP13		KKP14	
Span	5-less 10	over 10	1.25-less 2.5	over 2.5	0.35-less 0.7	over 0.7	0.175-less 0.35	over 0.35
Unit:(MPa{kgf/cm²})	{50less100}	{100}	{12.5less25}	{25}	{3.5less7}	{7}	{1.75less3.5}	{3.5}
Accuracy(%FS)	±1	±0.5	±1	±0.5	±1	±0.5	±1	±0.5
Non-sensitive range(%FS)	0.1		0.1		0.1		0.1	

Model	KKP15(kPa{kgf/cm²})		KKP16(kPa{kgf/cm²})		KKP17(kPa{mmHg})		KKP18(kPa{mmHg})		
Span	35 -less 70	over 70	10 -less 20	over 20	3.4-less 6.8	over 6.8	0.7-less 1.4	1.4-less 9.8	over 9.8
	{0.35less0.7}	{0.7}	{0.1less0.2}	{0.2}	{25less50}	{50}	{5less10}	{10less70}	{70}
Accuracy(%FS)	±1	±0.5	±1	±0.5	±1	±0.5	±1	±0.5	±0.5
Non-sensitive range(%FS)	0.1		0.1		0.1		0.1		

Model	KKP25(kPa{kgf/cm²} abs)		KKP26(kPa{kgf/cm²} abs)		KKP27(kPa{mmHg}abs)		KKP28(kPa{mmHg}abs)		
Span	35-less 70	over 70	10-less 20	over 20	3.4-less 6.8	over 6.8	0.7-less 1.4	1.4-less 9.8	over 9.8
	{0.35less0.7}	{0.7}	{0.1less0.2}	{0.2}	{25less50}	{50}	{5less10}	{10less70}	{70}
Accuracy(%FS)	±1	±0.5	±1	±0.5	±1	±0.5	±1	±0.5	±0.5
Non-sensitive range(%FS)	0.1		0.1		0.1		0.1		

Model	KKP71		KKP72		KKP73		KKP74		KKP75		KKP76	
Span	5-less10	over 10	1.25-less 2.5	over 2.5	0.35-less 0.7	over 0.7	0.175-less 0.35	over 0.35	0.035-less 0.07	0.07 over	0.01-less 0.02	over 0.02
Unit:(Mpa{kgf/cm²})	{50less100}	{100}	{12.5less25}	{25}	{3.5less7}	{7}	{1.75less3.5}	{3.5}	{0.35less0.7}	{0.7}	{0.1less0.2}	{0.2}
Accuracy(%FS)	±1	±0.5	±1	±0.5	±1	±0.5	±1	±0.5	±1	±0.5	±1	±0.5
Non-sensitive range(%FS)	0.1		0.1		0.1		0.1		0.1		0.1	

Operation temperature range	Meter body (process fluid) : -40 to +120 Transmitter (approx.) : -30 to + 80
Operation humidity range	10~90%RH
Structure	Dust-proof/water-proof : IEC IP54, NEMA TYPE 3R conforming to JIS F8001 (Class 3 splash-proof) and JIS C0920 (rain-proof)
Material	Bourdon tube, bellows : SUS316 Gasket : Teflon Wetted parts of Meterbody : Meterbody cover : Carbon steel (SF440A)and SUS316 Flanges : Carbon steel (SF440A)and SUS304 Diaphragm : SUS316L, monel or tantalum Mounting bracket : Carbon steel U-bolt, nut : SUS304 Capillary tube : SUS316 Armored tube : SUS304
	Case: Aluminum alloy
Length of capillary tube	2, 3, 5m
Coating Baked	Acrylic, Munsell 4Y7.2/1.3 light beige
Mounting	2-inch pipe, horizontal/vertical
Weight	KKP 1 □ /2 □ Approx. 5.5 to 8kg KKP 7 □ Approx. 12.5kg (for 80A-JIS10K flange)

Additional Specifications

Pneumatic transmitter Elevation and suppression	Model	Span	Suppression (MAX)	Spring-A Elevation	Spring-B High-elevation	Max. Operation Pressure	Unit
Note: Elevation + Span ≦ Max. applicable pressure (Accuracy: 1.5 times)	KKP11	5 to 70{50 to 700}	-0.1 {-1}	65{650}	—	70{700}	MPa {kgf/cm²}
	KKP12	1.25 to 25{12.5 to 250}		22.5{225}	22.5 to 28.75{225 to 287.5}	30{300}	
	KKP13	0.35 to 0.686{3.5 to 70}		6{60}	6 to 10.15{60 to 101.5}	10.5{105}	
	KKP14	0.175 to 3.5{1.75 to35}		3{30}	3 to 5.075{30 to 50.75}	5.25{52.5}	
	KKP15	0.035 to 0.686{0.35to 7}		0.6{6}	0.6 to 1.015{6 to 10.15}	1.05{10.5}	
	KKP16	0.01 to 0.196{0.1 to2}		0.18{1.8}	0.18 to 0.29{1.8 to 2.9}	0.3{3}	
	KKP17	3.4 to 66.6{25 to 500}	-66.6{-500}	632{475}	—	66.6{500}	kPa {mmHg}
	KKP18	0.7 to 13.3 {5 to 100}	-13.3{-100}	12.6{95}	—	13.3{100}	
	KKP25	35 to 686{0.35 to 7}	—	653{6.65]	—	—	kPa {kgf/cm²}
	KKP26	10 to196{0.1 to 2}	—	186{1.9}	—	—	
	KKP27	3.4 to66.6{25 to 500}	—	63.2{475}	—	—	kPa {mmHg}abs
	KKP28	0.7 to13.3{5 to 100}	—	12.6{95}	—	—	
	KKP71	5 to 70{50 to 700}	-0.1 {-1}	65{650}	—	70{700}	MPa {kgf/cm²}
	KKP72	1.25 to 25{12.5 to 250}		22.5 {225}	2.25 to 28.75{225 to 287.5}	30{300}	
	KKP73	0.35 to 0.7{3.5 to 70}		6{60}	6 to 10.15{60 to 101.5}	10.5{105}	
	KKP74 2B-ANSI Wafen 80A,100A-JIS30K 3B,4B-ANSI300	0.175 to 3.5 {1.75 to 35}		3 {30}	3 to 5.075{30 to 50.75}	5.25{52.5}	
					3 to 4.925{30 to 49.25}	4.51{45.1}(carbon steel) 4.12{41.2}(SUS304)	
					3 to 3.525{30 to 35.25}	3.82{37}	
	KKP75	0.035 to 0.686{0.35to 7}	-0.05	0.6{6}	0.6 to 1.015{6 to 10.15}	1.05{10.5}	
	KKP76	0.01 to0.196{0.1 to 2}	{-0.5}	0.18{1.8}	0.18 to 0.29{1.8 to 2.9}	0.3{3}	
Air set (Reducing valve assembly with filter, attached)	Primary pressure range: 200 to 990kPa{2 to 9.9kgf/cm²} Secondary pressure : 140kPa{1.4kgf/cm²} Filter mesh diameter : 5 microns Connection : Rc1/4 or 1/4NPT female thread						

3. Model Numbers

3-1 Model:KKP11/12/13/14

Basic Model		Cover	Material of	Pneumatic Tube	Nominal Pressure	Options	Description
Model	Span	Material	Wetted parts	Connection	Unit/Signal pressure		
KKP 1							Gauge pressure type pneumatic transmitter
	1						Span; 0~5 to 0~70MPa{0~50 to 0~700 kgf/cm^2}
	2						Span; 0~1.25 to 0~25MPa{0~12.5 to 0~250 kgf/cm^2}
	3						Span; 0~0.35 to 0~7MPa{0~3.5 to 0~70 kgf/cm^2}
	4						Span; 0~0.175to 0~3.5MPa{0~1.75 to 0~35 kgf/cm^2}
		-2					SUS316
			2				SUS316
				A			Rc1/4
				B			1/4NPT female thread
					1		kgf/cm^2(or mmH_2O) / 0.2 to 1kgf/cm^2
					2		PSI / 3 to 15PSI
					3		bar / 0.2 to 1.0bar
					4		Pa / 20 to 100kPa
					8		Pa / 19.6 to 98.1kPa(0.2 to 1kgf/cm^2 equivaleat)
						-×	None
						-5	Elevation
						-6	Suppression
						-7	Air set

3-2 Model:KKP15/16/17/18

Basic Model		Cover	Material of	Pneumatic Tube	Nominal Pressure	Options	Description
Model	Span	Material	Wetted parts	Connection	Unit/Signal pressure		
KKP 1							Gauge pressure type pneumatic transmitter
	5						Span; 0~35 to 0~686kPa{0~0.35 to 0~7 kgf/cm^2}
	6						Span; 0~10 to 0~196kPa{0~0.1 to 0~2 kgf/cm^2}
	7						Span; 0~3.4 to 0~66.6kPa{0~25 to 0~500 mmHg}
	8						Span; 0~0.7 to 0~13.3kPa{0~5 to 0~100 mmHg}
		-1					Carbon steel (SF45A)[KKP17, 18 only]
		-2					SUS316
			2				SUS316
				A			Rc1/4
				B			1/4NPT female thread
					1		kgf/cm^2(or mmH_2O) / 0.2 to 1kgf/cm^2
					2		PSI / 3 to 15PSI
					3		bar / 0.2 to 1.0bar
					4		Pa / 20 to 100kPa
					8		Pa / 19.6 to 98.1kPa(0.2 to 1kgf/cm^2 equivaleat)
						-×	None
						-5	Elevation
						-6	Suppression
						-7	Air set

3-3. Model: KKP25/26/27/28

Basic Model		Cover	Material of	Pneumatic Tube	Nominal Pressure	Options	Description
Model	Span	Material	Wetted parts	Connection	Unit/Signal pressure		
KKP 2							Gauge pressure type pneumatic transmitter
	5						Span; 0 ~ 3 to 0~ 686kPa {0~0.35 to 0~7 kgf/cm^2} abs
	6						Span; 0 ~ 10 to 0~ 196kPa {0~0.1 to 0~2 kgf/cm^2} abs
	7						Span; 0 ~ 3.4 to 0~ 66.6kPa {0~25 to 0~500 mmHg} abs
	8						Span; 0 ~ 0.7 to 0~ 13.3kPa {0~5 to 0~100 mmHg} abs
		-1					Carbon steel (SF45A)
		-2					SUS316
			2				SUS316
				A			Rc1/4
				B			1/4NPT female thread
					1		kgf/cm^2(or mmH_2O) / 0.2 to 1kgf/cm^2
					2		PSI / 3 to 15PSI
					3		bar / 0.2 to 1.0bar
					4		Pa / 20 to 100kPa
					8		Pa / 19.6 to 98.1kPa(0.2 to 1kgf/cm^2 equivaleat)
						-×	None
						-5	Elevation
						-7	Air set

3-4. Model: KKP71/72/73/74/75/76

Basic Model	Flange / Screw Material	Material of Wetted parts	Rating of Flange Wetted parts	Length of Capillary Connection	Extersion lergth of pressure	Pneumatic Tube	Nominal Pressure Unit/Signal	Options	Discription
KKP7									Remote seal diaphragm type pneumatic transmitter
1									Span; 0 ~ 5 to 0~ 70MPa {0~50 to 0~700 kgf/cm^2}
2									Span; 0 ~ 1.25 to 0~ 250MPa {0~12.5 to 0~250 kgf/cm^2}
3									Span; 0 ~ 0.35 to 0~ 7MPa {0~3.5 to 0~70 kgf/cm^2}
4									Span; 0 ~ 0.175 to 0~ 3.5MPa {0~1.75 to 0~35 kgf/cm^2}
5									Span; 0 ~ 0.035 to 0~ 0.686MPa {0~0.35 to 0~7 kgf/cm^2}
6									Span; 0 ~ 0.01 to 0~ 0.196MPa {0~0.1 to 0~2 kgf/cm^2}
	-1								Carbon steel (SF45A) [excluding button and wafer types]
	-2								SUS316 [excluding button and flange types]
	-7								SUS304 [excluding wafer type]
	-8								US316L [excluding button and flange types]
		2							SUS316 (Diaphragm: SUS316L)
		3							Monel } [excluding button,
		4							Tantalum } wafer and projection type flanges]
		8							SUS316L
			01						Standard flange 80A-JIS 10K (PF) equivalent
			02						Standard flange 80A-JIS 30K (PF) equivalent
			03						Standard flange 3B-ANSI150K (PF) equivalent
			04						Standard flange 3B-ANSI300K (PF) equivalent
			05						Projection flange 100A-JIS 10K (PF) equivalent
			06						Projection flange 100A-JIS 30K (PF) equivalent
			07						Projection flange 4B-ANSI150K (PF) equivalent
			08						Projection flange 4B-ANSI300K (PF) equivalent
			09						Wafer type 2B-ANSI (RF) equivalent
			11						Button diaphragm type PF1 1/2 male thread
				02					2m
				03					3m
				05					5m
					00				Button, wafer, standard flange
					10				Projection type flange 100mm
					15				Projection type flange 150mm
						A			Rc1/4
						B			1/4NPT female thread
							1		kgf/cm^2(or mmH_2O) / 0.2 to 1kgf/cm^2
							2		PSI / 3 to 15PSI
							3		bar / 0.2 to 1.0bar
							4		Pa / 20 to 100kPa
							8		Pa / 19.6 to 98.1kPa(0.2 to 1kgf/cm^{2}equivaleat)
								-×	None
								-5	Elevation
								-6	Suppression
								-7	Air set

4. Structure & Mechanism

4-1. Transmitting Section

In the transmitting section, the housing itself, the base plate and each component mounted on the base plate form the air circuit. No pipes or tubes are used.

(1) Nozzle and flapper
The nozzle is attached in the side of the base plate and the flapper is attached on the tip of the beam.

(2) Pilot relay
The pilot relay, which amplifies the nozzle's back-pressure, is assembled in the manifold that is integrated with the enclosure.

(3) Feedback mechanism
The feedback mechanism comprises a feedback bellows--that generates force by responding to the output of the pilot relay--a floating fulcrum and a span arm clamp.
The flapper-attached beam is also included in this category.

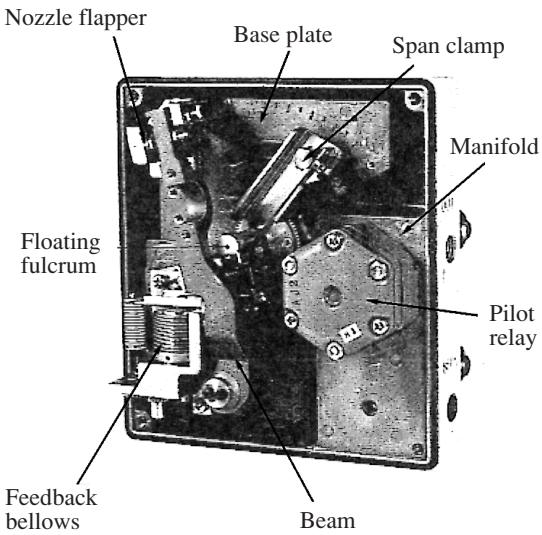
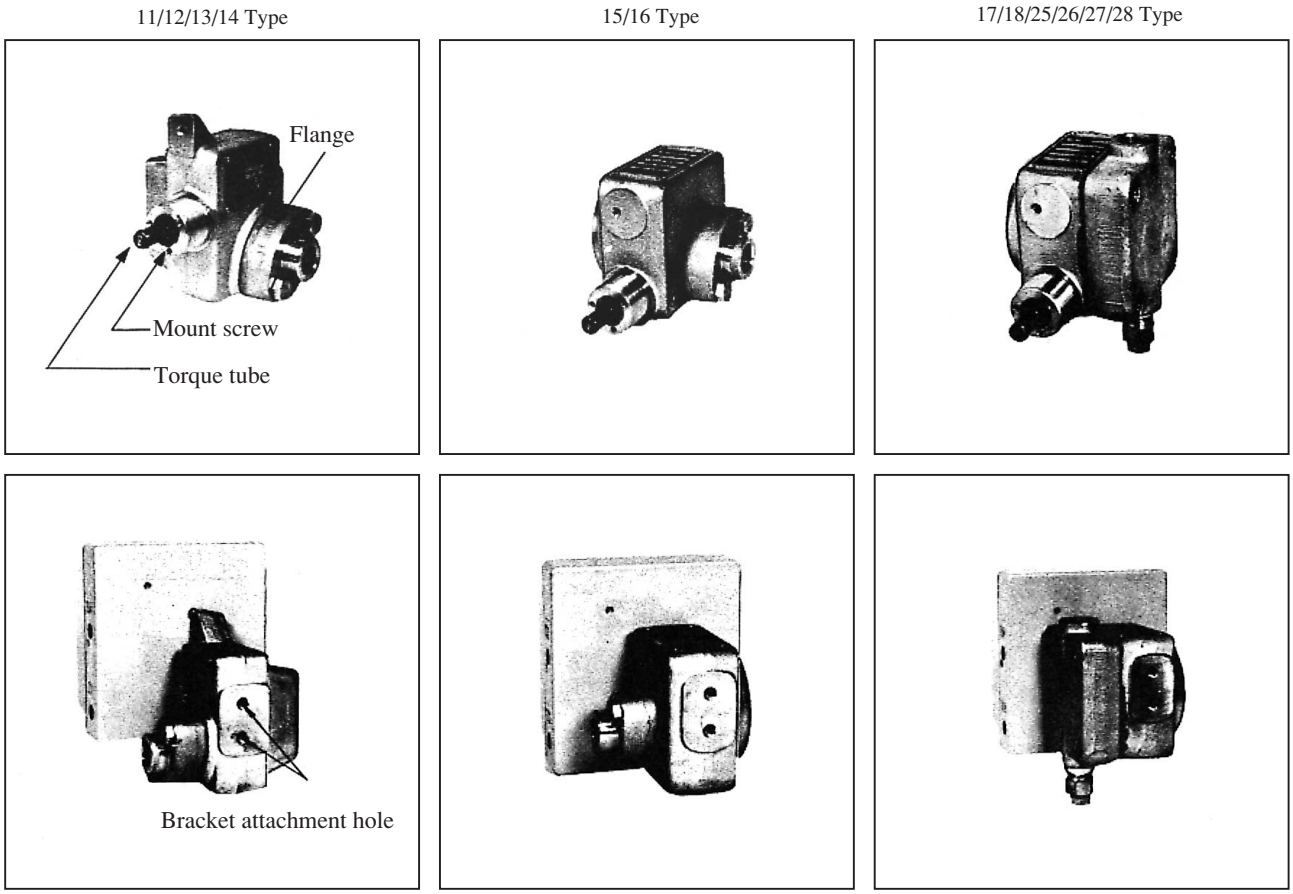


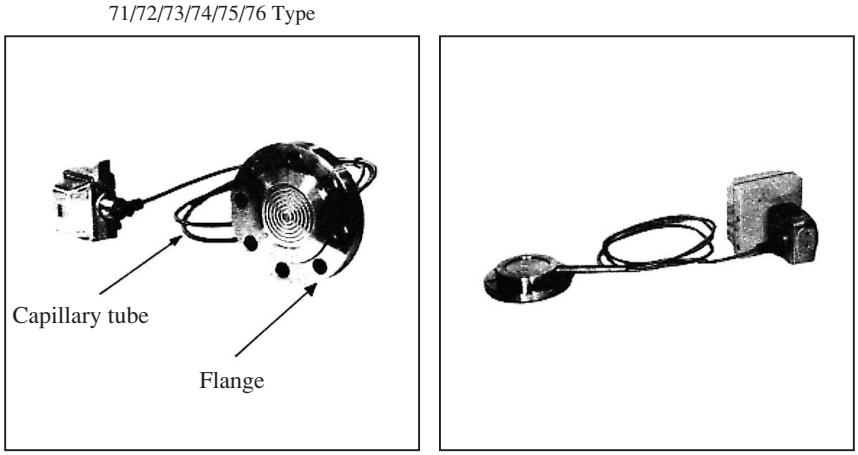
Fig.4-1

4-2. Sensing Head (Meter Body)

The following photograph shows various types of sensing head and meter body. The bracket and meter attach ment shown are the most common types of design.



(Each sensing head is mounted on the meter body)



(Sensing heads are connected to the meter body)

Fig. 4-2 Various Sensing Heads

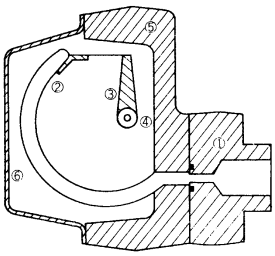
The pressure sensing element is SUS316 Bourdon tube (Fig. 4) for high- and mid-pressure use, and SUS316 bellows (Fig. 5 and Fig. 6) for low pressure use. The process pressure is induced through the flange, which is applied to the sensing element. A deformation proportional to the pressure is transferred to torque tube via the strap. Then, the torque proportional to the pressure is transferred from the torque tube to the input beam in the transmitting section.

All sections that come in contact with the process are welded.

The absolute pressure gauge is built in the same structure as the low pressure gauge except that the atmospheric pressure section is changed in a vacuum chamber.

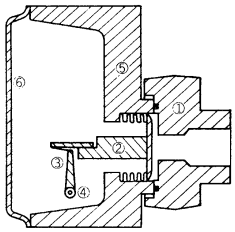
Flange type & Remote seal diaphragm type

The center body structure of the meter body is basically identical to that of the standard induced pressure connection type, to which a flange and capillary are attached.



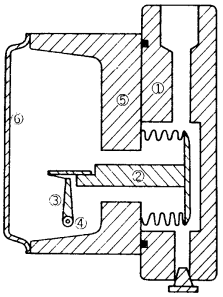
① Cover
② Sensing Element (Bourdon)
③ Torque Arm
④ Torque Tube
⑤ Body
⑥ Cover

Fig. 4-2-1 11/12/13/14 type meter body functional diaphragm (Bourdon tube element)



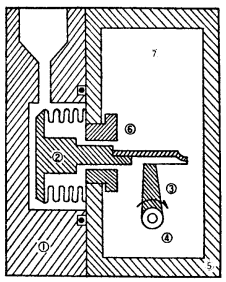
① Cover
② Sensing Element (Bellows)
③ Torque Arm
④ Torque Tube
⑤ Body
⑥ Cover

Fig. 4-2-2 15/16 type meter body functional diaphragm (Bellow element)



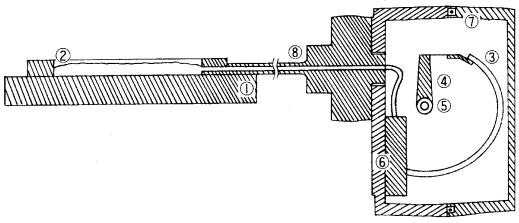
① Cover
② Sensing Element (Bellows)
③ Torque Arm
④ Torque Tube
⑤ Body
⑥ Cover

Fig. 4-2-3 17/18 type meter body functional diaphragm (Bellow element)



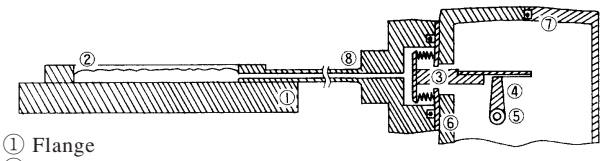
① Cover
② Sensing Element
③ Torque Arm
④ Torque Tube
⑤ Body
⑥ Stopper
⑦ Vaccum Chamber

Fig. 4-2-4 25/26/27/28 type meter body functional diaphragm



① Flange
② Seal Diaphragm
③ Sensing Element (Bourdon Tube)

Fig. 4-2-5 71/72/73/74 type meter body functional diaphragm(Bourdon tube element)



① Flange
② Seal Diaphragm
③ Sensing Element (Bellows)
④ Torque Arm
⑤ Torque Tube
⑥ Body
⑦ Cover
⑧ Capillary Tube

Fig. 4-2-6 75/76 type meter body functional diaphragm(Bellows element)

5. Principle

The input to the transmitter is transferred to the beam as torque via the torque tube, which varies the clearance between the nozzle and flapper.

The back pressure of the nozzle varies in proportion to the movement of the flapper. Then, the pilot relay boosts the pneumatic pressure/air volume, which is developed as the output pneumatic pressure.

The output pneumatic pressure is converted to a force by the feedback bellows. The vector component (F1) of the force as shown in Fig. 5 is transferred to the beam via the strap, which forms as a feedback loop. Therefore, the output is settled in a value proportional to the input. The exertion of the spring force to the beam produces the elevation/suppression.

Also, the directional variation of the vector F3 can vary the component of the vector F1 to vary the feedback gain, and adjust the span.

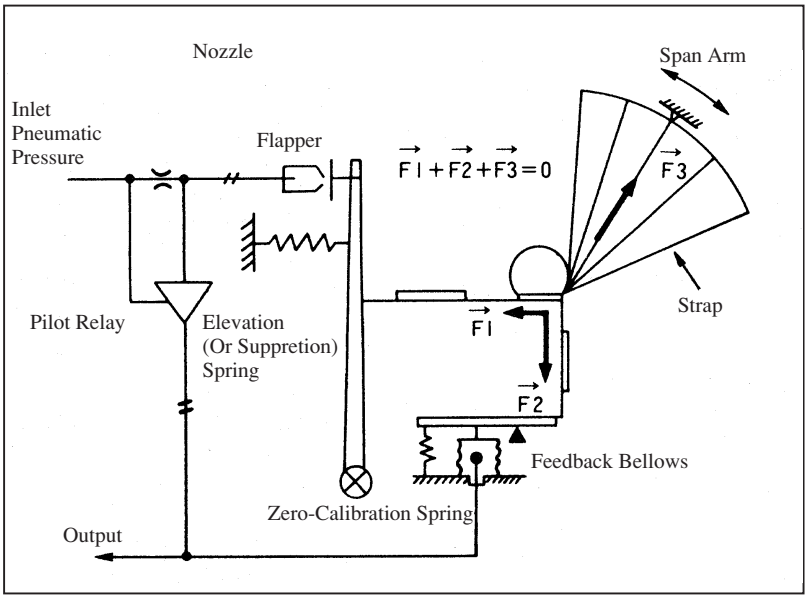


Fig. 5

6. Installation

6-1. Installation location

The installation location should be selected in consideration of the following items pertaining to maintenance, parts replacement, servicing and safety:

a) The ambient temperature is -30 to +80 deg C and temperature variation is low as possible. Especially, avoid locations subject to high levels of radiant heat, as this may cause the instrument to overheat.
For the measurement of water, apply some heat insulation to prevent freezing and breakage.
b) Minimal damp and vibration
c) Provide a space for adjustment and changing the measurement range.

6-2. How to install the transmitter

Mounting the transmitter
With a bracket, mount the transmitter on a 50A vertical or horizontal pipe and fix it with U-bolts. Tightly fix the pipe to the base avoiding any slackness or loose fitting.
When installing a remote seal diaphragm type transmitter, ensure that the capillary tube is not folded or twisted and the diaphragm surface cannot be scratched.

6-3. Fixtures Bracket

The bracket (Fig. 6-1) is attached to the transmitter as standard.

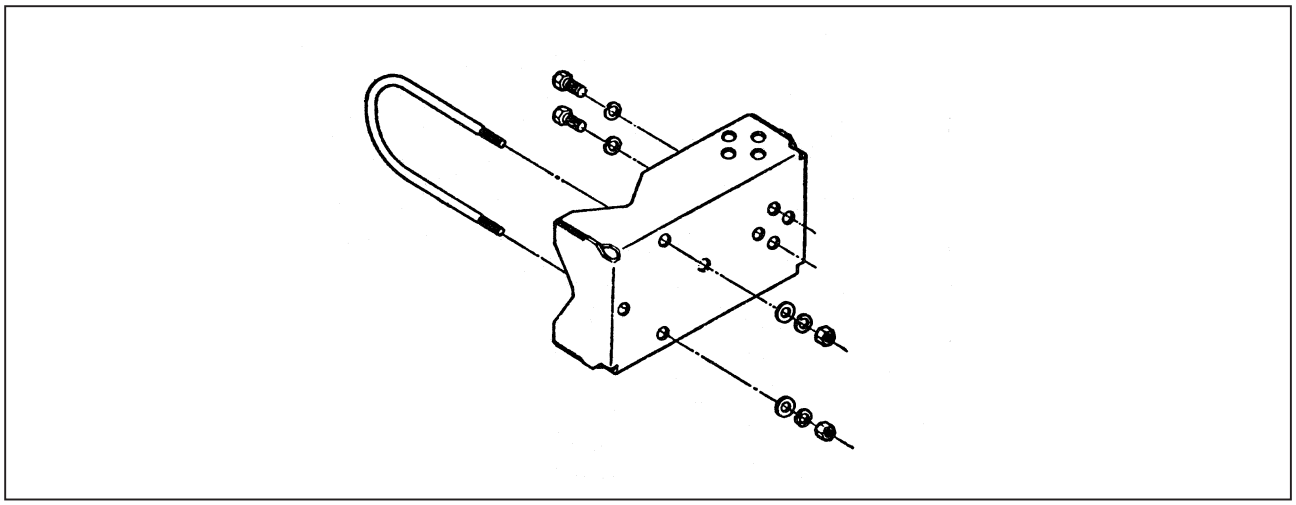


Fig. 6-1 Bracket

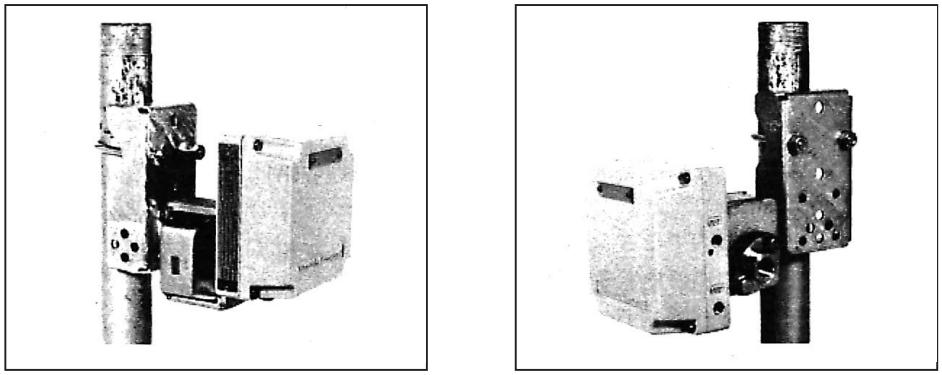


Fig. 6-2 Mounting examples

6-4. Remote seal diaphragm type transmitter

Mount the transmitter on the pipe as described in para.
6-2.
The mounting procedure for the transmitter on the process flange is as follows:

1) Mount the transmitter flange on the process flange, inserting a gasket and fixing bolt. To prevent leak age, tighten all bolts equally. Fix the caterpillar tube with a proper rigid support having a low tempera ture coefficient. The installation height of the trans mitter should be lower than that of the flange.
2) After installation, the zero-calibration point may be deviated by the enclosed pressure due to the height differential between the center of the flange and transmitter center. Calibrate the zero by eleva tion and suppression.
3) When installating the button diaphragm, refer to the drawing for the external dimensions. To remove a diaphragm that has been set, fit the special (optional) collar into the groove at the back of the element (on the capillary tube side), loosen the screw, and retighten it to remove the diaphragm.

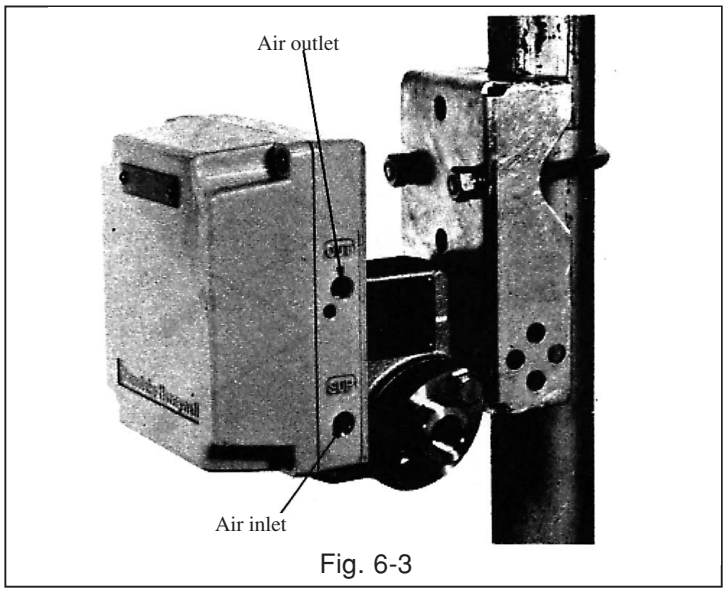


Fig. 6-3

6-5. Pneumatic piping

If your model has no airset (an assembly of regulator and filter) assembled, connect the air supply to the inlet port marked "SUP" (female-thread) on the right side of the meter. "OUT" port is the outlet.

If you model has an airset (an assembly of regulator and filter) assembled, connect the air supply to the air inlet port on the side of the airset. Remove the red vinyl protection cap from each port.

6-6. Piping and installation for the process

a) Piping to the measurement object depends on the installation position and the status of the piping line.

b) A typical piping example is shown in Fig. 6-4. The procedure is as follows:

1) Apply the T-type joint to the pressurized pipe line.
2) Provide a stop valve between the inlet of the pres surized pipe line and the T-type joint.
3) Provide a slope so that the drainage flows into the pressurized line if the process piping is horizontal.
   Note: For high pressure, consider the type of joints, pipe size and material.
4) Determine the schedule number and nominal thickness of the lead tube from the process line based on the pressure and other process condi tions. For instance, a 1/2B schedule 80 copper tube is generally used for the object measurement fluid, water or steam.

6-7. Auxiliary units

a) Oil-seal and air-purge

Apply an oil-seal or air-purge if the direct introduction of the pressure medium (suspension, highly-viscous or corrosive fluid) may damage the pressure sensing element.

b) Preventing pulsation

Install a throttle valve in the lead tube to suppress pulsation if excessive pulsation or pressure variation may occur in the process.

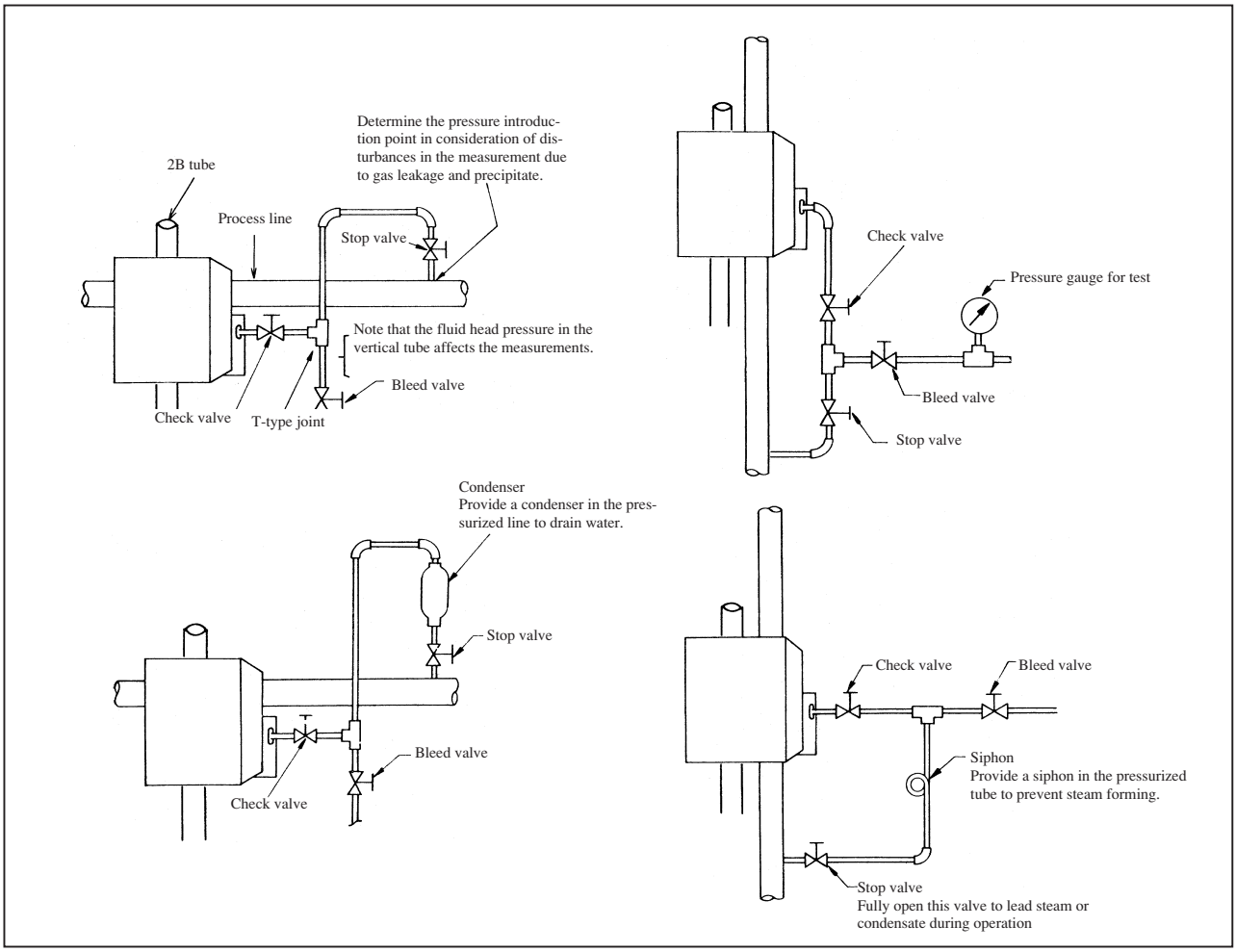


Fig. 6-4 Typical piping systems

6-8. Elevation & Suppression

The elevation and suppression are defined as follows

a) Elevation

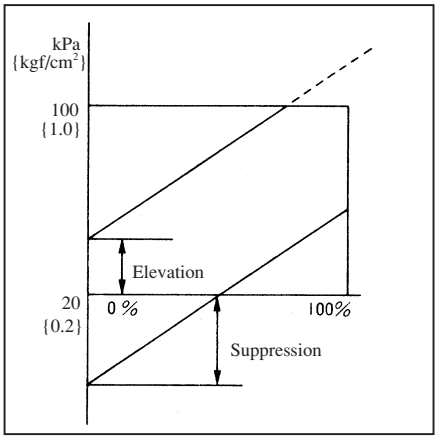
The elevation is short for Elevated Zero Range; the lower limit of the input range larger than zero, for instance, 20 to 100{0.2 to 1.0}.

The suppression is short for Suppressed Zero Range; the lower limit of the input range less than zero, for instance, -20 to 0.

b) How to adjust the suppression or elevation

For details about the adjustment of the suppression and elevation, refer to para.9 Calibration & Adustment.

Generally, the elevation should be obtained by mul tiplying the positional difference between the center of the diaphragm and center of the transmitter by the input fluid density (specific gravity) when the head pressure of the enclosed fluid is calculated.



Note: For types 25, 26, 27 and 28, only elevation can applied, and for other types, the suppression is applied to the negative pressure.

Fig. 6-5

7. Operation

The transmitter comes into operation when the sensing head is assembled with the transmitter.
The transmitter starts to operate when the pneumatic pressure is supplied and process input signal is entered. It is recommended that the zero calibration and operation check are performed before the run.

1) Liquid and gas (excluding negative pres sure process)

Close the check valve, open the bleed valve and stop valve to remove foreign matter in the pressur ized piping. Then, close the bleed valve, allow the l eading tube to cool (if the process temperature is high) and open the check valve to lead the fluid into the sensing head (meter body). Do not operate the bleeding under negative process pressure.

2) Steam

This procedure is basically identical to that of item
1) However, remove foreign matter and close the bleed valve before condensing the steam to fill the lead tube and siphon and open the check valve.

3) Compensation against the installation height of the meter

Compensation must be performed against the head pressure for the installation height of the transmitter when the measurement object is liquid, or when condensate steam is left in the leading tube (low pressure measurement range). The above compensation is also required for the remote seal diaphragm type transmitter.
In this case, compensate the zero point of the trans mitter by the product of the height difference between the pressure outlet and the process inlet port, and the specific gravity of the liquid. --- elevation

4) Checking the zero point

Check the zero point under the measurement condition in which the instrument has been set up. Calibrate the zero if deviated.

8. Maintenance

8-1. Daily check

a) Check leaks along the piping.

Tighten the joint if loose.

b) Blowing and cleaning the transmitter and piping

Piping and sensing head must always be kept clean.

If precipitate or foreign matter deposits on the sensing head, measurement errors may occur. Blow out using the following procedure and referring to the piping example in para. 6-6. Piping and installation for the process:

1) Open the stop valve.
2) Quickly open the bleed valve when the check valve is open.
3) Close the bleed valve and open the stop valve.
   For the negative pressure process, blow out only under positive pressure in the process.
   For the remote seal diaphragm type transmitter, no blowing is required.

c) Note on the cooling condition

Drain the measurement liquid from the sensing head of the transmitter with the bleed valve when the measurement of water or other liquid having cooled and when the measurement is stopped.

8-2. Servicing and replacing units

Only the pilot relay requires servicing. Operate the following service if the pilot fails, and replace the pilot relay if necessary.

If the sensing head must be replaced due to specification or application changes, or due to failure, please place an order on Azbil Corporation for a replacement.

a) Replacing the pilot relay

Loosen 3 assembling screws to remove the pilot relay shown in Fig. 8-2. If the gasket has deteriorated or is damaged, also replace the gasket. To assemble, fit the gasket in place and fit the guide pin into the guide hole at the bottom of the pilot relay.

Then, put the assembly on the manifold and tighten it with even torque.

b) Servicing the pilot relay

Remove the pilot relay with the procedure in the Titem a) and assemble again after servicing.

1) Remove 3 assembling screws and nuts.
2) Remove parts Pin this order. The part need not be removed unless it requires replacement.
3) Clean the metallic part with an appropriate solvent such as petroleum, naphtha or chlorocene. When cleaning, push the valve stem in the direction to depress the conical spring, so that the solvent can soak through the surface on which the port of the valve stem contacts.
4) Check the exhaust ring and valve stem for dirt. Clean the ring and valve stem with a cloth soaked in solvent.
5) Completely dry all of the part in clean compressed air.
6) Check the diaphragm and. Replace if worn or damaged.
7) When assembling the pilot relay, collect up all the parts in order of assembly and evenly tighten the screws and nuts.

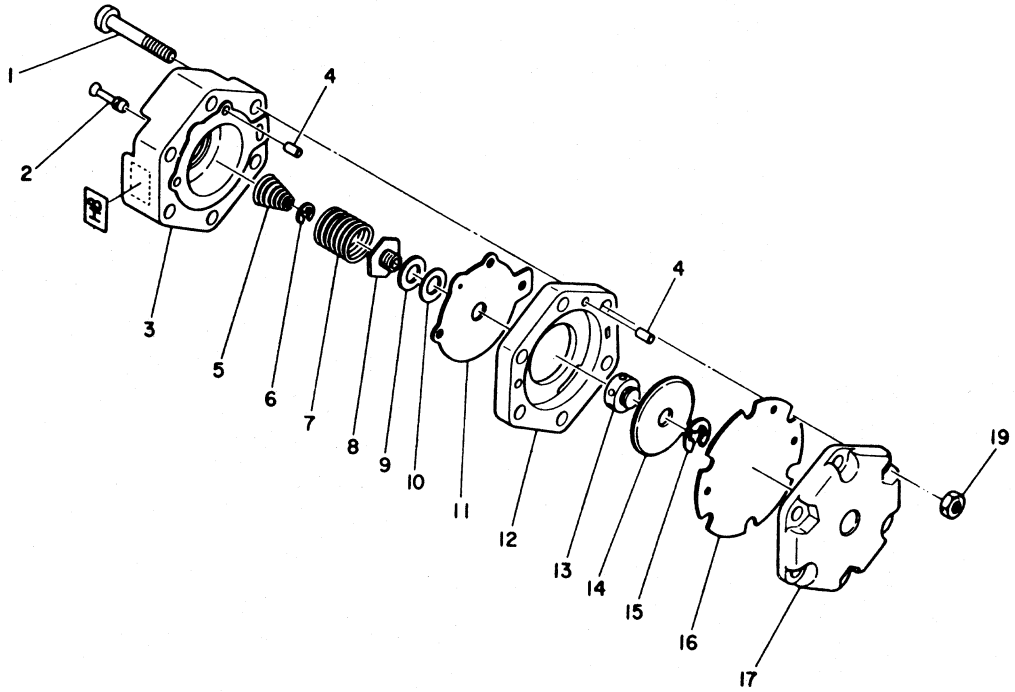


Fig. 8-1 Disassembling the pilot relay

No.	Part Name	Quantity
1	Assembling screw	3
2	Valve stem	1
3	Housing	1
4	Guide pin	6
5	Conical spring	1
6	Pin washer	1
7	Spring	1
8	Nozzle	1
9	Washer	1
10	Seal	1
11	Diaphragm(lower)	1
12	Exhaust ring(outer)	1
13	Exhaust ring(inner)	1
14	Disk	1
15	Pin washer	1
16	Diaphragm(upper)	1
17	Cover	1
18	Nut	1

9. Calibration and Adjustment

9-1. Overview

The sensing head (meter body) transfers the torque tube torque proportional to the detection signal to the transmitting mechanism in the transmitter. Accordingly, adjust the transmitter so that it can linearly develop a signal of 20 to 100kPa {0.2 to 1.0 kgf/cm^2}in the measurement range 0% to 100% regardless of the sensing head installed.

For the elevation and suppression incorporated transmitter, remove the spring assembly and set the measurement range without the elevation and suppression, that is, no zero point shift.

Calibrate the zero point before checking the operation of the transmitter. When the sensing head is replaced or the measurement range is changed, adjust the transmitter by connecting a 0 to 150kPa{0 to 1.5 kgf/cm^2} range precision pressure meter to the outlet port.

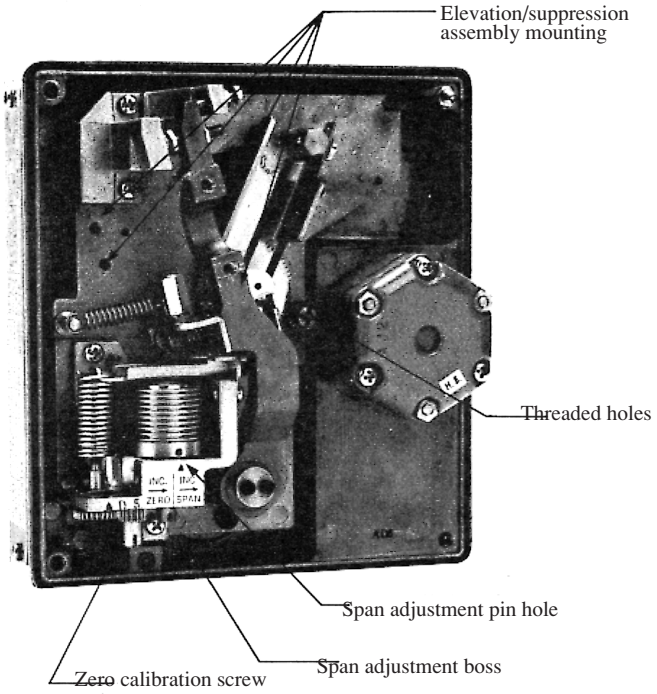


Fig. 9-1

9-2 Measuring the gauge pressure

1) Connect a variable pressure generator (a pneumatic pressure source with regulator) to the input port of the sensing head, and also connect a precision pres sure reading unit (a piping adapter is required for the flange type unit).

2) Operate the pressure generator to apply a pressure equivalent to 100% of the specified pressure to the high-pressure side of the sensing head.

3) If the output largely deviates from the above speci fied pressure (100kPa{1.0kgf/cm^2}), adjust the out put to the full specified pressure by turning the ad justing boss with a screwdriver.
   (Adjusting the span)
   Clockwise turn--> narrow the span --> increase pressure
   Counterclockwise turn --> extend the span --> decrease pressure
4) Open the inlet port to atmosphere.

5) If the output is deviated from 0% (20kPa{0.2kgf/ cm^2})adjust the output to 0% by turning the zero ad just screw.
   Clockwise --> increase pressure
   Counterclockwise --> decrease pressure

6) Apply a pressure equivalent to 100% pressure input to the input port.

7) If the pressure deviates from 100% pressure, turn the adjusting boss under the feedback bellows to set he pressure as follows:
   If the output is over 100%, set the pressure lower t han 100% by 1/4 of the deviation (e.g., when the output level is 104%, the objective adjustment level is 100 - 1/4 x 4 = 99%.)
   If the output is less than 100%, set the pressure higher than 100% by 1/4 of the deviation (e.g., when the output level is 98%, the objective adjust ment level is 100 + 1/4 x 2 = 100.5%.)
   Instead of the span adjusting boss, the output pressure can be adjusted by turning the feedback bellows with the pin.
   Turn rightward --> extend span --> increase pres sure Turn leftward --> narrow span --> decrease pressure

8) Repeat the operation from the item 4) to 7) until the accuracy is satisfied.

9-3. Measuring absolute pressure

For the full negative pressure measurement range only or a negative pressure range significantly occupied on a compound pressure meter, apply an oil-sealed rotary vacuum pump and/or precision needle valve to the variable pressure generator in item 1) of para. 9-2 and adjust the pressure with the procedure in item 2) and following.

A negative pressure digital manometer or negative pressure mercury bulb can be used as the pressure measurement.

For the positive pressure range significantly occupied on a compound pressure meter, the atmo spheric pressure is processed as an input component converted to a percentage and the compound meter can be calibrated and adjusted.

9-4. Setting the elevation and suppression

Provide the zero shift that is first removed as described in para. 9-1 according to the actually required value. Then, apply the 100% input according to the procedure of the calibration and adjustment. If a deviation is found, finely adjust the span again.
In this case, the set level of zero point and 100% point shall include a consideration of the shift.

a) How to provide the elevation

After completing the adjustment without ele vation, mount the elevation spring assembly on the input beam.
Provide the input equivalent to the necessary zero-shifting deviation and set the output in 20kPa{0.2 kgf/cm^2} by turning the spring screw with a wrench.
Counterclockwise turn of screw --> increase the elevation

b) How to provide suppression

Provide suppression according to the procedure identical to that for the elevation.
Clockwise turn screw --> increase the suppression

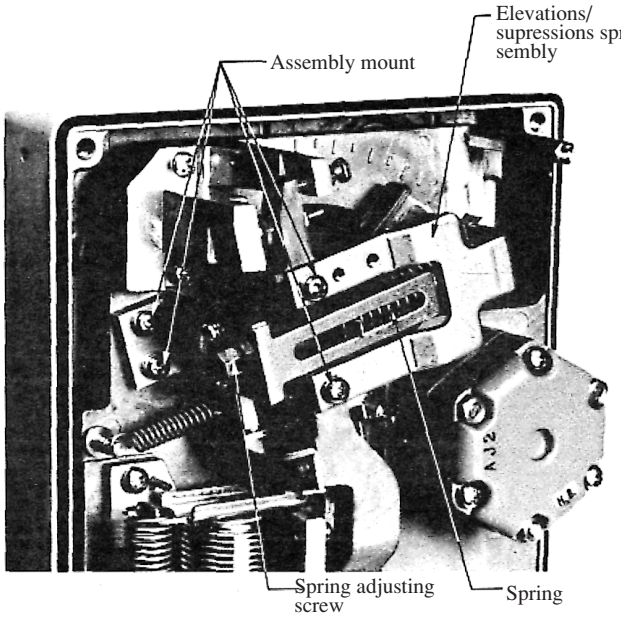


Fig. 9-2

Document Number :	OM2-5240-1101
Document Name :	PREX3000 Series Pneumatic Pressure Transmitter Model KKP
Date :	1st edition: July 1998 2nd edition: Mar. 2013
Issued / Edited by :	Azbil Corporation

Azbil Corporation