

PS Subminiature Pressure Transducers

INSTRUCTION MANUAL

Thank you for purchasing the KYOWA product. Read this instruction manual carefully before starting to use. Also be sure that the manual is ready for reading at any time.

1. Calling the operator's attention

The following cautionary symbols and headlines are used to invite the operator's attention. Be sure to observe the accompanying precautions in order to safeguard the operator and preserve the performance of the instrument.

Warning! Improper handling can cause serious injury to the operator. To avoid it, be sure to observe the accompanying instructions.

Caution! Improper handling can cause deleterious effects to the operator's body. To avoid it, be sure to observe the accompanying instructions.

Notes In order to avoid the instrument's failure and malfunction, be sure to observe the accompanying instructions.

2. Handling precautions

Warning!

- Avoid pressure in excess of the allowable overload rating, or the instrument can explode.
- Avoid contact of a projection to the sensor, or it can be cracked resulting in the instrument's explosion.

Caution!

- Beryllium copper is used where the instrument contacts a liquid. Avoid application of the instrument to a corrosive liquid or gas.

3. Installation and removal

Notes

- Epoxy adhesive has been used to assemble the liquid contacting section. Do not therefore use the transducer to measure organic solvents (such as toluene, ketone, etc.). Underwater service will be limited to about three months.
- This transducer is delicate and accepts no repair. Handle it very carefully.

3-1 Installation of PS-A, C

- (1) As shipped, this transducer is calibrated in a movable condition. If it is fixed by other method than using RC-19 adhesive (offered free of charge), a change of the sensitivity may be caused. To bond the transducer with RC19, proceed as follows.
- (2) Polish the bonding surface of a measurement object with sandpaper (#120 or equivalent) and remove oil and fat with a solvent such as acetone or methylene chloride.
- (3) Make sure of the front and back of the transducer.
Front — Pressure sensing diaphragm
Back — Carries a red marking.

- (4) Apply the adhesive evenly to the back of the transducer and also to the bonding area of a measurement object, using a match stick or the like. To cure the adhesive coats, leave them in the atmosphere for about 3 minutes (at normal temperature, 50% humidity).

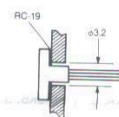
(If an ambient temperature is lower or higher, a longer curing time is required.)

- (5) Lightly press the circumferential area of the pressure sensing diaphragm using two match sticks at the same time. Take care never to press the central area of the diaphragm.

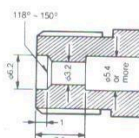
- (6) If the bonding area of a measurement object is porous, apply an adhesive coat to it two more or more times at intervals of about 10 minutes.

3.2 Installation of PS-B, D

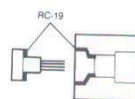
- (1) The simplest method is as follows. Drill a $\phi 3.2$ mm hole in the bonding area of a measurement object, insert PS-B in the hole, then bond it observing the above 3.1 instructions.



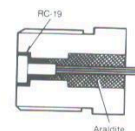
- (2) If the pressure sensing diaphragm should be on the same level as the surface of a measurement object, or if an adaptor is used, fabricate the measurement object as shown at right.



- (3) Apply adhesive coats to the respective bonding areas of the transducer and measurement object. Slowly insert the transducer into the hole in a manner to bring the diaphragm to the level of the object surface.



- (4) Make sure that the adhesive coat has hardened, then fill Araldite into the hole. In order to fill the hole completely and accelerate hardening of Araldite, preliminarily heat the hole area up to 60 or 70°C, and heat the said area for about 1 hour also after filling Araldite.



3.3 Wiring precautions

The lead wires are thin and weak especially at their bases. To keep the wire bases free from a force, hold or

KYOWA
KYOWA ELECTRONIC INSTRUMENTS CO., LTD.

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transducer
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adhesive

RC-19

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RC-19

Araldite

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tentatively bond their middle parts when soldering them. For the same purpose, relay terminals may well be used during wiring.

For underwater wiring, apply an adhesive coat to the wires to provide a sufficient insulation ability.

3.4 Removal of the transducer (in case of RC-19 in use)

To remove the adhesive, dissolve it using gauze moistened with methyl ethyl ketone.

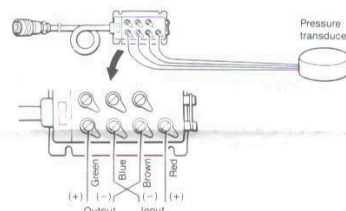
When the pressure transducer comes to move by lightly pushing it at the side with a match stick or the like, carefully lift it with tweezers.

In case Araldite is used in 3.2 procedures, removal of the transducer is impossible.

4. Connection

For connection of the lead wires, prepare a bridge box and use the 4-gage connection method.

If the lead wires have to be long, twist them several times. And if the lead wires are extended over 2 meters or longer from a bridge box, shielding or other insulation measures may be required under certain environmental conditions. In this case, contact Kyowa or the nearest KYOWA representative for advice.



5. Classification of rated output voltages

5.1 The following table shows the rated output voltage classification.

Class	mV/V	Class	mV/V	Class	mV/V	Class	mV/V
a	0.303	u	0.445	zm	0.625	F	0.892
b	0.310	v	0.455	zn	0.635	G	0.910
c	0.317	w	0.465	zo	0.645	H	0.928
d	0.324	x	0.475	zp	0.658	I	0.946
e	0.331	y	0.485	zq	0.673	J	0.965
f	0.338	z	0.495	zr	0.688	K	0.985
g	0.345	za	0.505	zs	0.703	L	1.005
h	0.352	zb	0.515	zt	0.718	M	1.025
i	0.360	zc	0.525	zu	0.733	N	1.045
j	0.368	zd	0.535	zv	0.748	O	1.066
k	0.376	ze	0.545	zw	0.763	P	1.088
m	0.384	zf	0.555	zx	0.778	Q	1.110
n	0.392	zg	0.565	zy	0.792	R	1.132
p	0.400	zh	0.575	A	0.807	S	1.155
q	0.409	zi	0.585	B	0.823	T	1.179
r	0.418	zj	0.595	C	0.839	U	1.203
s	0.427	zk	0.605	D	0.856		
t	0.436	zl	0.615	E	0.874		

Note: 1mV/V corresponds to 2000×10^{-6} equivalent strain.

5.2 The class of rated output voltage is indicated in alphabet in two places as follows.

- (1) The label's [Class column — Output sensitivity classification]
- (2) The product's pressure sensitive surface (in the lower line of two-line indication)

Sample indication on the pressure sensitive surface of product

500 ← Rated capacity 500kPa
H ← Output sensitivity (H=0.928mV/V)

Note: The indication on the pressure sensitive surface may disappear on occasions.

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V/V
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928
946
965
985
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088
110
132
155
179
203

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328mV/V)

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6. Conversion

6.1 For conversion, use the rated output voltage value described on the label.

6.2 If a strain amplifier is in use, the transducer's outputs is given in $\epsilon \times 10^{-6}$ equivalent strain.

$$\text{Pressure (Pa)} = \frac{(\text{Strain amplifier's output, } \epsilon \times 10^{-6})}{(\text{Rated output on label, mV/V})} \times \frac{\text{Capacity (Pa)}}{(2000 \times 10^{-6} / \text{mV/V})}$$

Example : When using PS-2KA, whose rated output description on the label is 0.807mV/V, and a strain amplifier, whose output is 500×10^{-6} , the following equation holds.

$$\begin{aligned} \text{Pressure (Pa)} &= \frac{500 \times 10^{-6} \times 200 \text{ kPa}}{0.807 \text{ mV/V} \times 2000 \times 10^{-6} / \text{mV/V}} \\ &= 62 \text{ kPa} \end{aligned}$$

6.3 When a different type of amplifier or a recorder is in use, it is necessary to measure a bridge voltage precisely. The label describes the rated output voltage against 1V bridge excitation voltage.

$$\begin{aligned} \text{Pressure (Pa)} &= \frac{\text{Bridge output voltage, mV}}{\text{Bridge exciting voltage, V}} \\ &\times \frac{\text{Capacity (Pa)}}{\text{Rated output voltage, mV/V}} \end{aligned}$$

Example: When using PS-2KA, whose rated output description on the label is 0.807mV/V, and whose bridge output voltage is 1mV against 2V bridge excitation voltage, the following equation holds.

$$\begin{aligned} \text{Pressure (Pa)} &= \frac{1 \text{ mV}}{2 \text{ V}} \times \frac{200 \text{ kPa}}{0.807 \text{ mV/V}} \\ &= 124 \text{ kPa} \end{aligned}$$

7. Specifications

Model	Rated capacity	Rated output	Thermal effect on zero point	Thermal effect on output	Natural frequency
PS-05KC PS-05KD	50kPa (509.9gf/cm ²)	0.3mV/V or higher (600 x 10 ⁻⁶ strain or higher)	±0.8%RO/°C	±0.3%/°C	Approx. 10kHz
PS-1KC PS-1KD	100kPa (1.020kgf/cm ²)	0.5mV/V or higher (1000 x 10 ⁻⁶ strain or higher)	±0.4%RO/°C	±0.3%/°C	Approx. 10kHz
PS-2KA, C PS-2KB, D	200kPa (2.039kgf/cm ²)	0.85mV/V±30% (1700 x 10 ⁻⁶ strain ±30%)	±0.3%RO/°C	±0.3%/°C	Approx. 14kHz
PS-5KA, C PS-5KB, D	500kPa (5.099kgf/cm ²)	1mV/V±20% (2000 x 10 ⁻⁶ strain ±20%)	±0.2%RO/°C	±0.2%/°C	Approx. 20kHz
PS-10KA, C PS-10KB, D	1MPa (10.20kgf/cm ²)	1mV/V±20% (2000 x 10 ⁻⁶ strain ±20%)	±0.2%RO/°C	±0.2%/°C	Approx. 37kHz

NOTE: The unit and numerical values in parentheses in the rated capacity column depned on the conventional unit expression just for reference.

Non-linearity: ±1%RO
Hysteresis: ±1%RO
Recommended excitation voltage: 1 to 2V, AC or DC
Safe excitation voltage: 3V, AC or DC
Bridge resistance: PS-A and PS-B: 120Ω±10%
PS-C and PS-D: 350Ω±10%
Compensated temp. range: 0 to 50°C

Safe temperature range: -20 to 70°C
Safe overload raging: 150%
Weight: Approx. 0.5g
Cable: ø0.1mm polyurethane coated copper wire, 5cm long, terminated in soldered end
■ Accessories
Inspection sheet 1
Instruction manual 1

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