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Introduction

This Technical Information (TI) introduces the test data of the DPharp differential pressure transmitter (EJA110A-DM).

Because the test data shown in the TI is better than that shown in the GS, we believe that the customer will be satisfied with the performance of the DPharp.

The test data shown here is applicable to model EJA110A-DM. However, the test data* which is not pressure specific to the capsule is applicable to other DPharp models.

* The test data which is not pressure specific to the capsule.

- Vibration Test
- Supply Voltage Test
- Load Resistance Test
- External Magnetic Field Test
- Noise Voltage Test in Series Mode
- Noise Voltage Test in Common Mode
- Electromagnetic Susceptibility Test
- Impulse Insulation Withstanding Test

1-1 Input/Output Characteristics Test

Test Purpose

To verify the input/output characteristics under normal temperature and air pressure.

Test method

Inputs of 0%, 25%, 50%, 75%, and 100% are applied. The output current corresponding to each input value is measured.

Design-base value

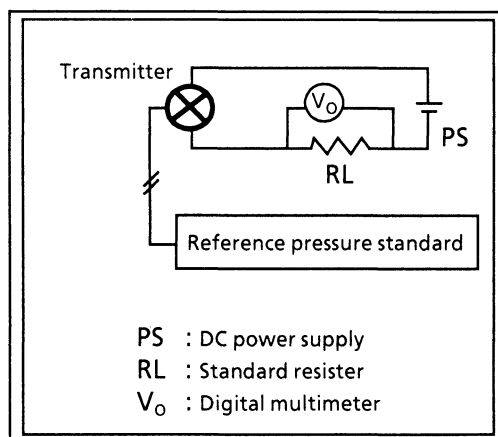
Accuracy:

$\pm 0.075\%$ of span for 0 to 10000 mmH₂O

$\pm 0.075\%$ of span for 0 to 1000 mmH₂O

$\pm 0.275\%$ of span for 0 to 200 mmH₂O

(Accuracy includes the effect of linearity, hysteresis, and repeatability.)



Measured value

Accuracy :

-0.011% of span for 0 to 10000 mmH₂O

-0.009% of span for 0 to 1000 mmH₂O

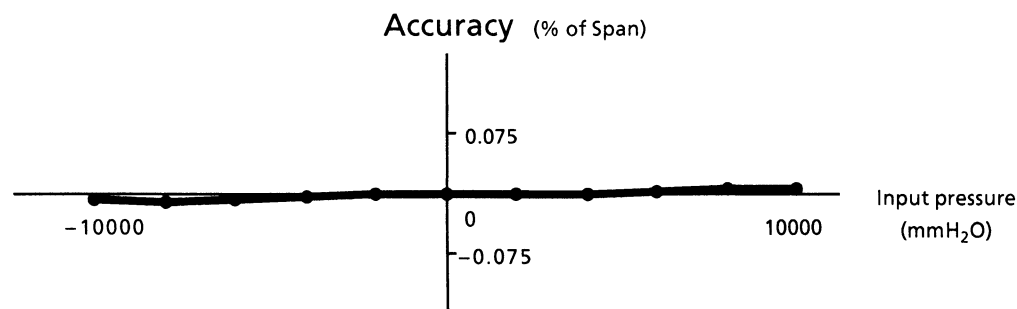
-0.025% of span for 0 to 200 mmH₂O

Explanation

The DPharp EJA A has high linearity and very little hysteresis. These characteristics are good when the range is changed using the BRAIN TERMINAL.

The DPharp EJA A uses a silicon resonant sensor (introduced for the first time in the market) with superior characteristics, ensuring accuracy of $\pm 0.075\%$ over a range from 1000 mmH₂O to 10000 mmH₂O.

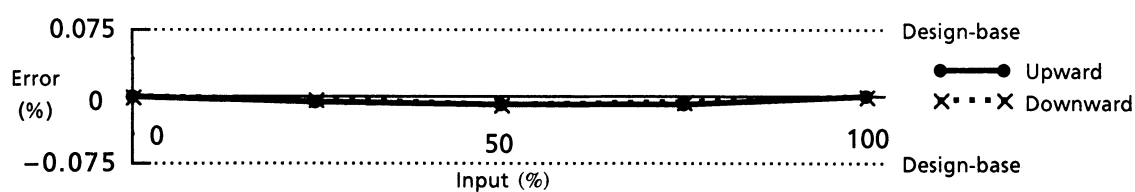
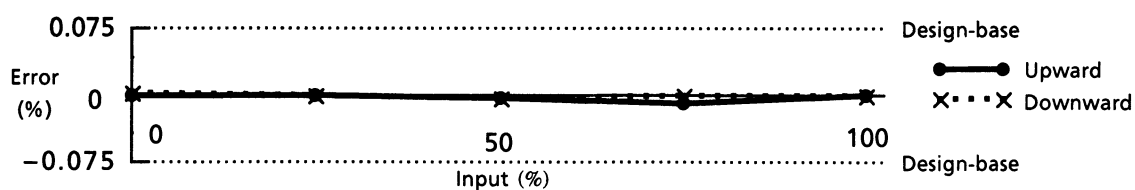
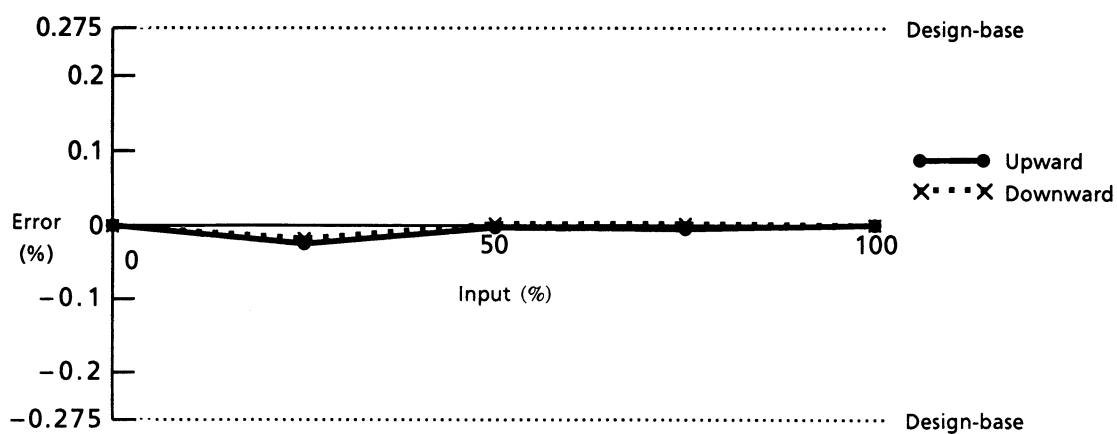
The DPharp EJA A has superior characteristics not only in a range between 0 and 10000 mmH₂O, but also in the (positive and negative) range between -10000 and $+10000$ mmH₂O. The DPharp EJA A can also be used for normal and reverse flow measurement. The figure below shows the accuracy characteristic in that range.



Range	Design-base value	Measured value
0—10000mmH ₂ O	±0.075%	-0.011%
0—1000mmH ₂ O	±0.075%	-0.009%
0—200mmH ₂ O	±0.275%	-0.025%

Model EJA110A-DMS2A-80DA

◆The input/output characteristics

Range 0—10000mmH₂ORange 0—1000mmH₂ORange 0—200mmH₂O

1-2 Vibration Test

Test Purpose

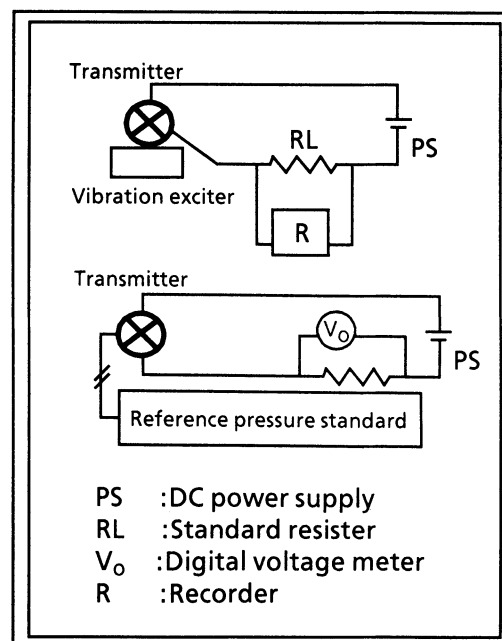
To verify the effect on the output signal before, during and after when vibration is applied to the transmitter.

Test method

Vibration of 5 to 150 Hz at acceleration of 2G is applied to the transmitter in the direction of up and down, left and right (horizontal plane), and forward and backward (also horizontal plane) with an input set to 0%.

The vibration shall be applied continuously in a degree of logarithmic change for two hours to each axis of moving direction. A total vibration duration for three axes is six hours.

The input/output characteristic test shall be carried out before and after this test. The outcome before the test shall be compared to the outcome after the test. The output signal during the test shall also be recorded, and changes of the output shall be observed.



Measured value

- There shall be no significant differences between the input/output characteristic before and after the test.
- There shall be no changes of the output signal while vibration is applied.
 (Range : 0 to 10000mmH₂O)

Explanation

There is no change in characteristics of the DPharp EJA A after six hours of vibration test. There is no change in the output signal while vibration is applied.

The vibration frequency (5 to 150 Hz) used for this test is considered to be within a range of the vibration frequency under normal environmental conditions where the transmitter is considered to be installed. Acceleration of 2G is high compared with the acceleration where the transmitter is considered to be operating.

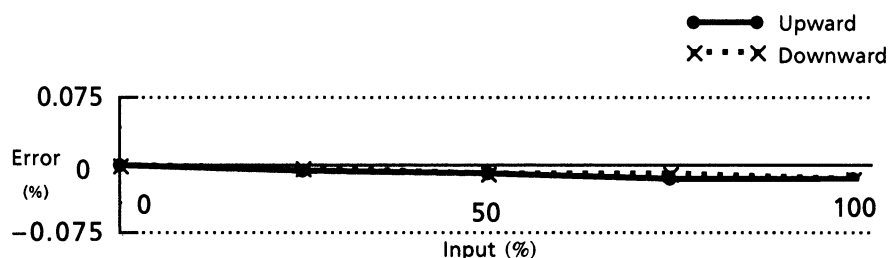
Because the DPharp employs a vibration type sensor, the effect of vibration is subject to consideration. As the test data shows, there is no effect on the transmitter caused by vibration. This is because the sensor of the DPharp utilizes a frequency of 100 kHz, and that frequency differs greatly from the vibration frequencies under normal environmental conditions. The transmitter may possibly receive the vibration frequency of 100 kHz when it receives a shock (collision with another object). However, there is no significant difference in the input/output characteristic before and after a hammer shock test of about 10G which is carried out using a rubber hammer.

- Measured value
- There shall be no significant differences between the input/output characteristic before and after the test.
 - There shall be no changes of the output signal while vibration is applied.

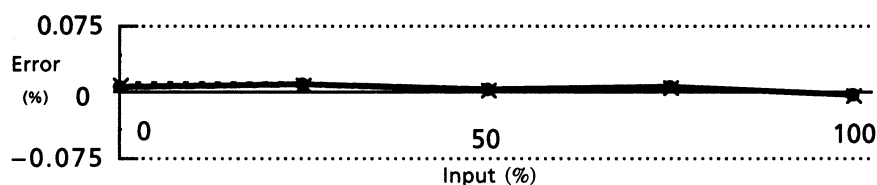
Range 0 — 10000mmH₂O Model EJA110A-DMS2A-80DA

◆The input/output characteristics before and after the test

Before the test



After the test

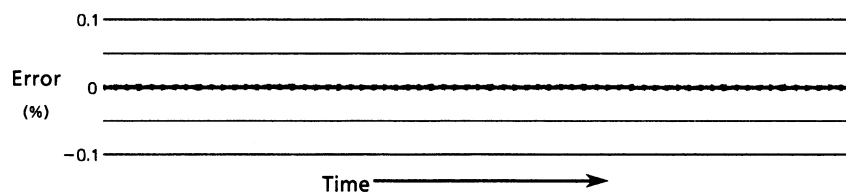
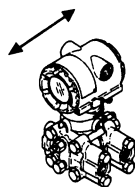


◆The output signal during excitation

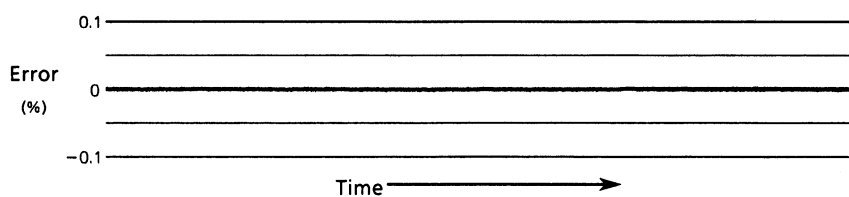
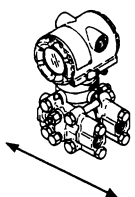
(Two hours of excitation while applying vibration of 5 to 150 Hz at acceleration 2G repeatedly)

Direction of vibration excitation

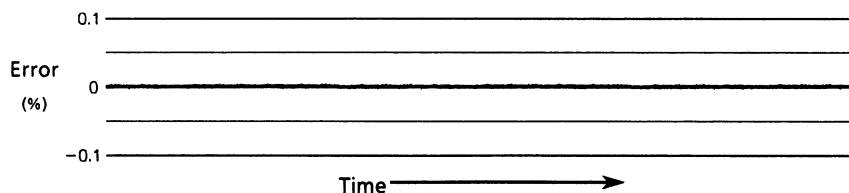
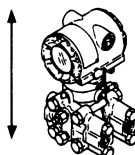
X-direction



Y-direction



Z-direction



1-3 Positioning Test

Test Purpose

To verify the effect (zero shift) on the output signal when the transmitter is tilted.

Test method

The shift from the zero point shall be measured by tilting the transmitter from the normal position by 15 degrees forward and backward, and then left and right. The changes from the zero point at each position (a total of four position) shall be measured.

Measured value

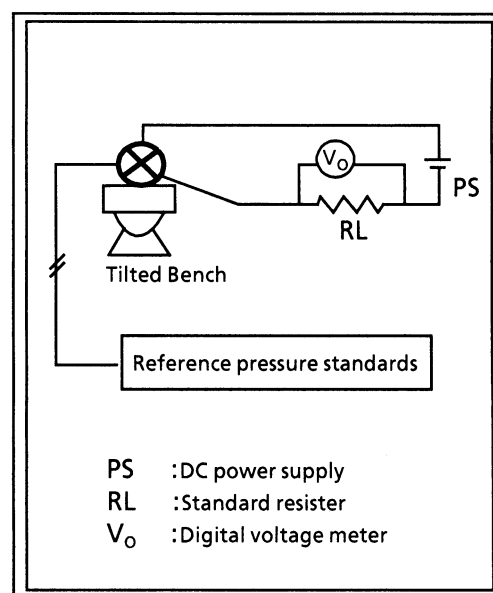
Zero shift (at 10000 mmH₂O of span)

To the right : -7.7 mmH₂O/15 degrees (-0.077%)

To the left : +7.7 mmH₂O/15 degrees (+0.077%)

To the backward : 0 mmH₂O/15 degrees

To the forward : 0 mmH₂O/15 degrees



Explanation

As the test data above shows, the effect on the shift of the output when the transmitter is tilted by 15 degrees is about ± 7.7 mmH₂O ($\pm 0.077\%$ at 10000 mmH₂O of span) to the left and right. This is because the sensor is affected by the head (head of fluid) pressure of the sealing liquid in the capsule when the transmitter is tilted to the cover flange side, resulting in a shift of the zero point. However, there is no shift from the zero point when the transmitter is tilted by 15 degrees forward and backward.

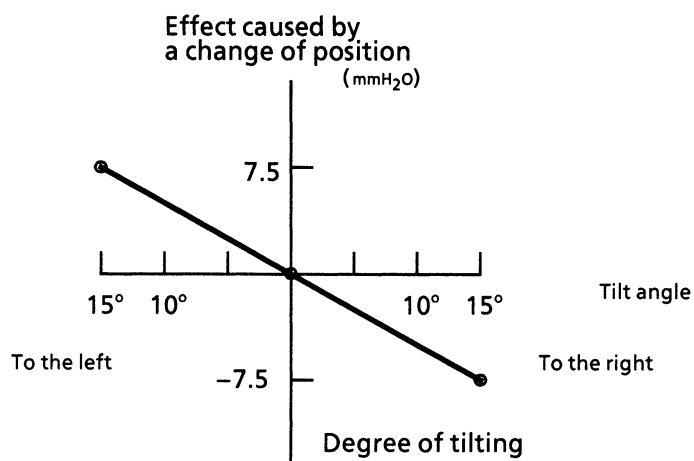
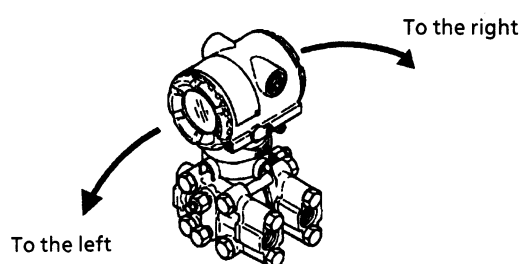
To use the DPharp after installation, be sure to adjust the zero point with the external zero point adjustment screw.

Measured value : Zero shift (at 10000 mmH₂O of span)
 To the right : -7.7 mmH₂O/15 degrees (-0.077%)
 To the left : +7.7 mmH₂O/15 degrees (+0.077%)
 To the backward : 0 mmH₂O/15 degrees
 To the forward : 0 mmH₂O/15 degrees

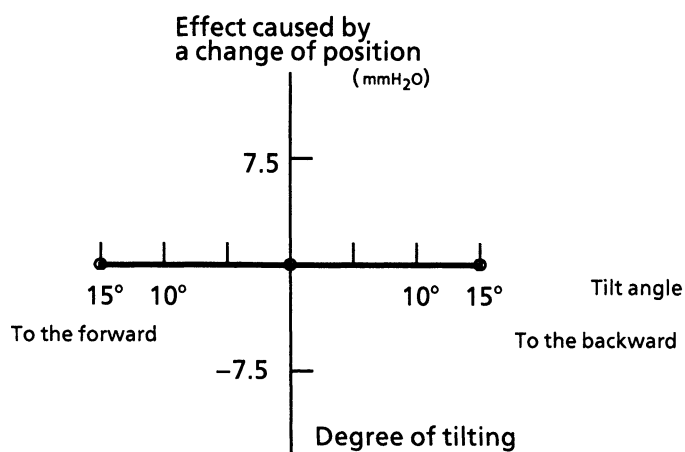
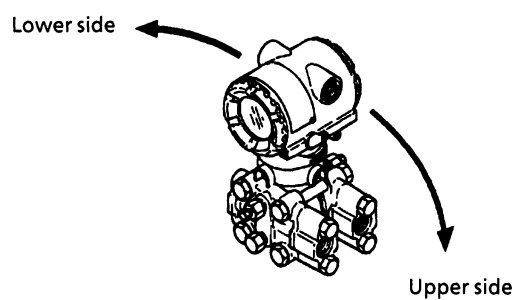
Model EJA110A-DMS2A-80DA Range 0—10000mmH₂O

◆ Zero point shift to the positioning

Left and right direction



Forward and backward direction



1-4 Static Pressure Effect (Zero shift)

Test Purpose

To verify the effect (zero shift) on the output signal when static pressure changes.

Test method

The output current (at 0%) shall be measured when the static pressure is set at 0, 50, 100, and 140 kgf/cm².

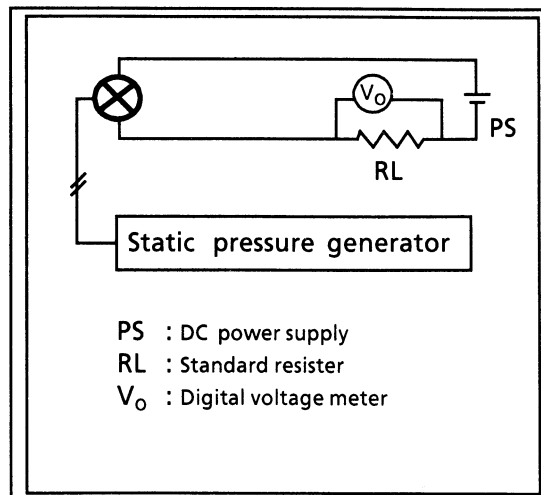
Design-base value

Zero shift

- ±0.019% at 50 kgf/cm²
- ±0.039% at 100 kgf/cm²
- ±0.055% at 140 kgf/cm²

Measured value

Static pressure (kgf/cm ²)	0	50	100	140
Zero shift (%)	0.000	0.003	-0.005	-0.016



Explanation

The zero point adjustment of the differential pressure transmitter shall be carried out normally with the process pressure applied to it by manipulating the 3-valve manifold. This operation is necessary because the zero point will be shifted normally a little bit by the static pressure applied to the differential pressure transmitter.

As the test data shows, there is almost no change of the zero point by the static pressure applied to the DPharp EJA A. Therefore, while filling fully the connecting tube with liquid, the zero point can be adjusted in practice without process pressure applied to the differential pressure transmitter.

Zero shift [GSvalue] (M capsule)

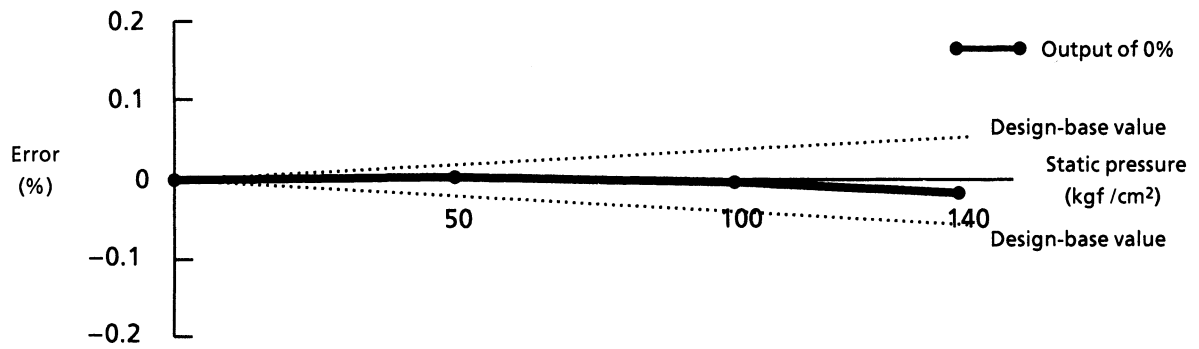
±0.028% of URL per 6.9 MPa

Design-base value
 Zero shift
 ±0.019% at 50 kgf/cm²
 ±0.039% at 100 kgf/cm²
 ±0.055% at 140 kgf/cm²

Measured value		0	50	100	140
Static pressure (kgf/cm ²)					
Zero shift (%)		0.000	0.003	-0.005	-0.016

Model EJA110A-DMS1A-20DN Range 0 — 10000mmH₂O

◆ Input/output characteristic under static pressure



1-5 Static Pressure Effect (Total shift)

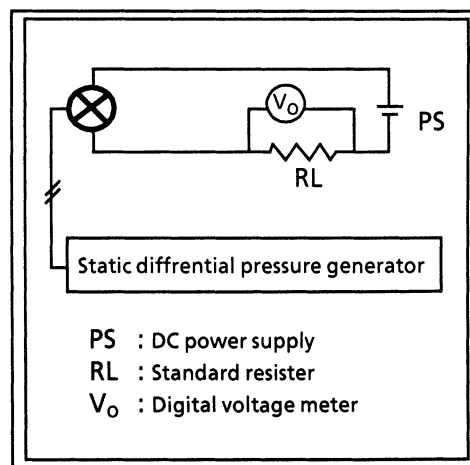
Test Purpose

To verify the change (general shift) of the output signal when static pressure changes.

Test method

First, adjustment shall be carried out at atmospheric pressure (static pressure of 0 kgf/cm²), and then under static pressures of 50 kgf/cm² and 100 kgf/cm², the output current (0%) shall be measured by applying the differential pressure inputs of 0%, 25%, 50%, 75%, and 100%.

Design-base value	General (zero and span) shift
	±0.090% at 50 kgf/cm ²
	±0.181% at 100 kgf/cm ²



Measured value

Static pressure (kgf/cm ²)	0	50	100
Zero shift (%)	-0.007	0.033	0.087

Explanation

As the test data shows, there is almost no effect on the output signal (general shift) of the DPharp EJA A caused by static pressure.

This superior static pressure characteristics* are a typical feature of the DPharp EJA A.

- * Static pressure characteristics are:
- Static pressure zero characteristic,
 - Static pressure span characteristic, and
 - Static pressure input/output characteristic

General Shift (GS value)

±(0.1% span + 0.028% URL) per 6.9 MPa

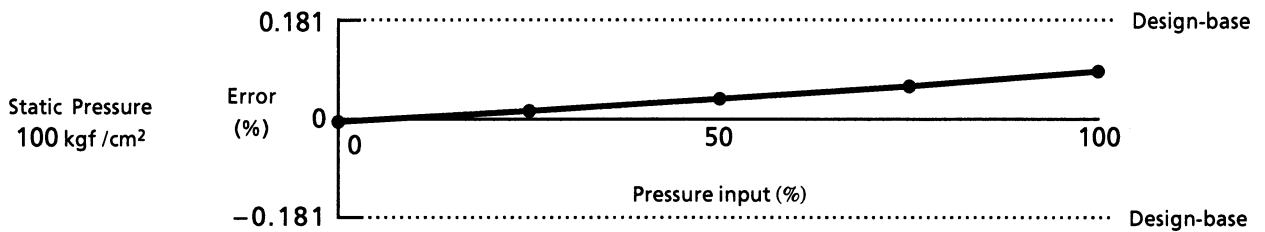
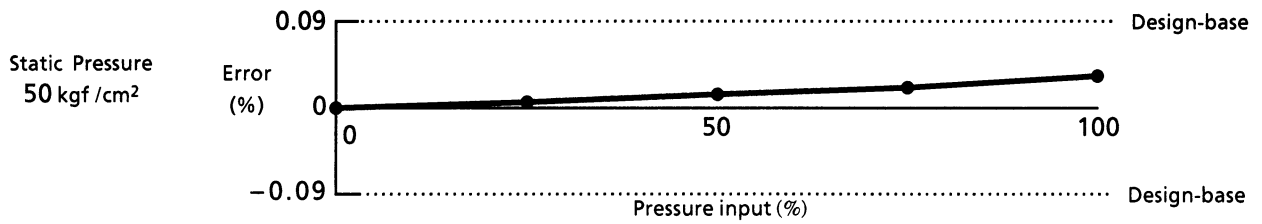
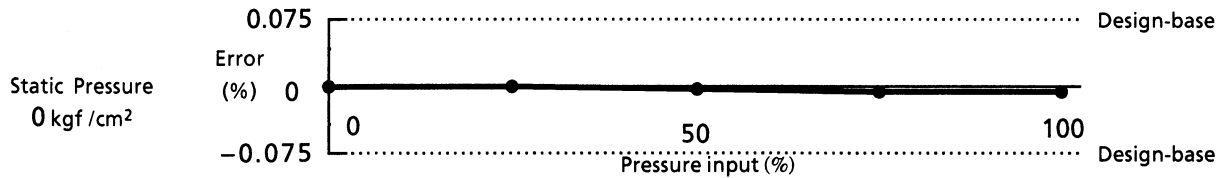
Design base value :
 Total (Zero+Span) shift
 ±0.090%50 kgf/cm²
 ±0.181%100 kgf/cm²

Measured value

Static pressure (kgf/cm ²)	0	50	100
Zero shift (%)	-0.007	0.033	0.087

Model EJA110A-DMS1A-20DN Range 0 — 10000mmH₂O

◆ Input/output characteristic under static pressure



1-6 Overpressure Test at High and Low Pressure Side

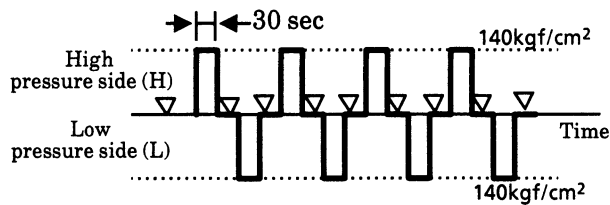
Test Purpose

To verify the amount of zero point shift after a specified pressure is applied to the high or low pressure side.

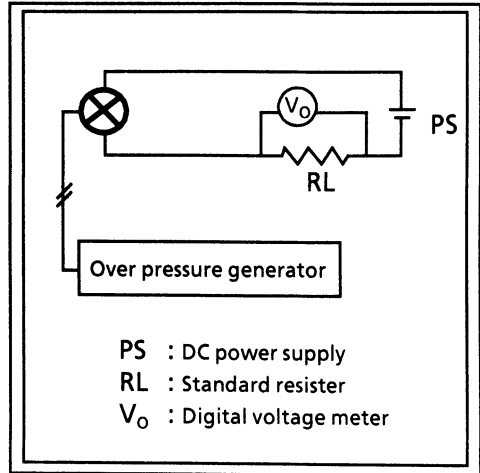
Test method

The amount of zero point shift shall be measured after applying alternatively the specified pressure to the high pressure side and to the low pressure side.

Pressure: 140 kgf/cm²,
Duration: 30 seconds for each



▽ : Measuring point of the output current



Measured value

Zero shift

+0.040% (Range: 0 to 2000 mmH₂O)
+0.008% (Range: 0 to 10000 mmH₂O)

Design-base value

Zero shift

±0.15% (Range: 0 to 2000 mmH₂O)
±0.03% (Range: 0 to 10000 mmH₂O)

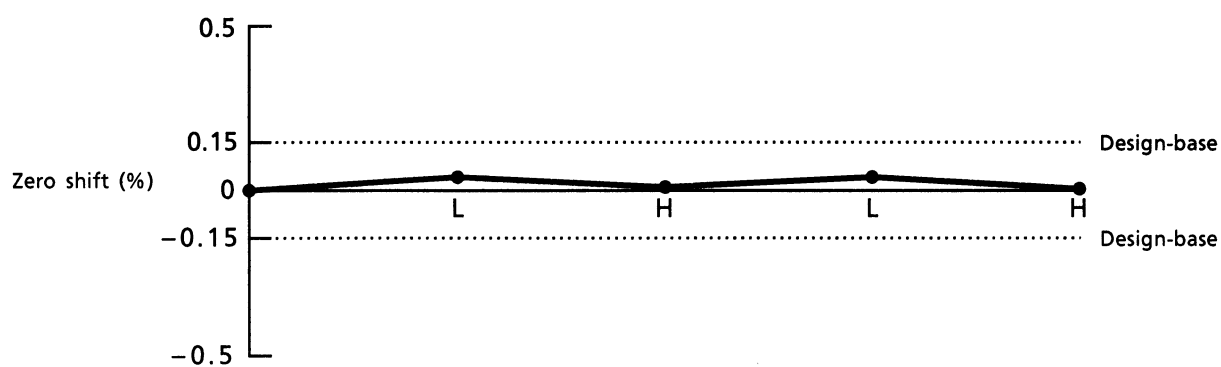
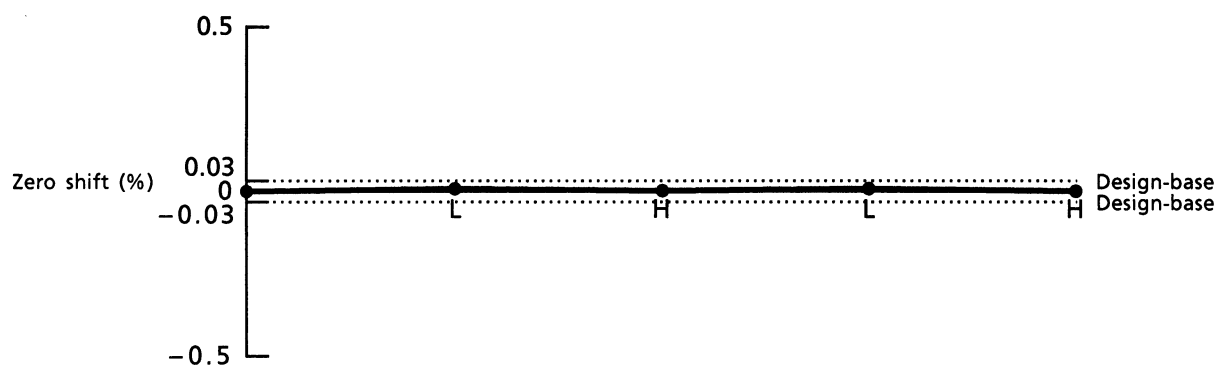
Explanation

There is almost no change of the zero point when applying overpressure alternatively to the high pressure side and then to the low pressure side. The DPharp EJA A has a superior characteristic, and there is almost no change of the zero point. Therefore, readjustment of the zero point is not required for the DPharp EJA A even when an overpressure is applied to only one (high or low) pressure side by mistake.

Range	Design-base value	Measured value
0 — 2000 mmH ₂ O	±0.15%	+0.040%
0 — 10000 mmH ₂ O	±0.03%	+0.008%

Model EJA110A-DMS2A-80DN

◆Effect by the overpressure

Measuring range 0—2000 mmH₂OMeasuring range 0—10000 mmH₂O

1-7 Step Response Test

Test Purpose

To verify the time constant at normal temperature.

Test method

The output signal at a level of 63.4% which responds to the step input signal shall be measured. The damping constant of the amplifier shall be set (set with BT200) at 0.2 seconds.

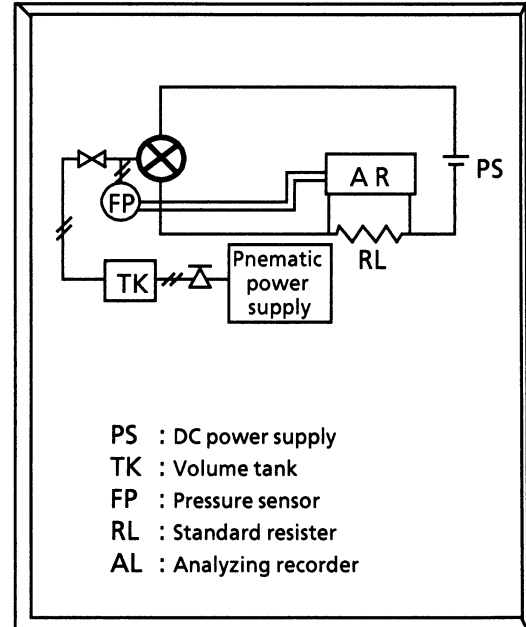
Step input signal : 100% to 0%

Design-base value

Time constant: Approximately 0.8 seconds

Measured value

Step signal input	Time constant
100 → 0 %	0.56



Explanation

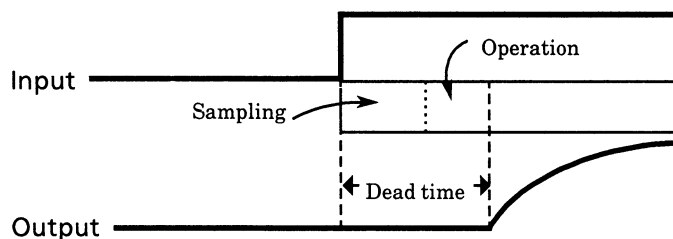
As the test data shows, the measured values are within the specifications.

The response characteristics of digital equipment which use microprocessors differs from those of conventional analog equipment.

Digital equipment using microprocessors samples and holds the process input periodically. Then, the output values are obtained by applying an operation process to the sampled values. Therefore, there is a dead time (or delay in time) until the output is obtained after inputting the step signal. (See the figure below.)

The dead time is inherent not only in the DPharp but also in any equipment using microprocessors.

Because the differential pressure transmitter uses a damping time of 1 second or longer, there is no problem for the transmitter under the normal use.



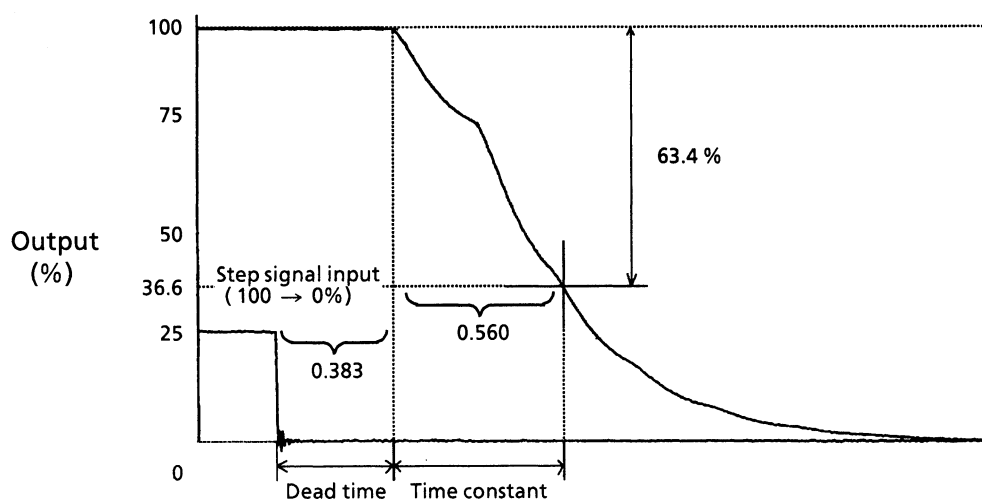
Design-base value : Time constant ... Approximately 0.8 seconds

Measured value :

Step signal input	Time constant
100 → 0 %	0.56

Model EJA110A-DMS2A-40DN Range 0 — 10000mmH₂O
Damping : 0.2 sec.

◆The output signal with respect to the step input signal



1-8 Water Hammer Test

Test Purpose

To check the resistance to water hammer.

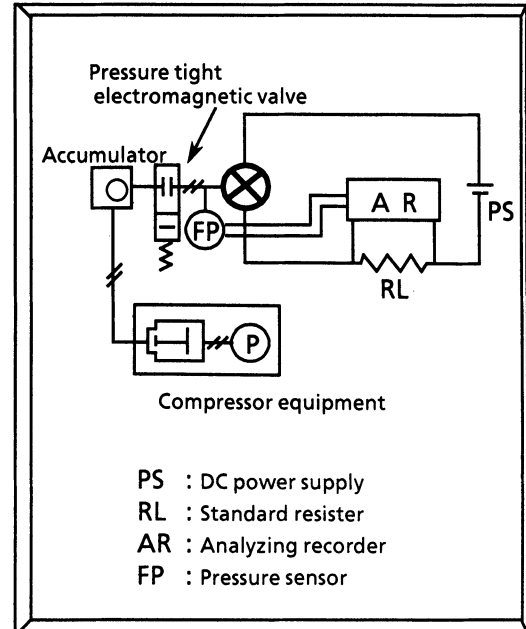
Test method

Change of the condition of the differential pressure transmitter shall be checked by applying a surge pressure simultaneously to the high and low pressure sides.

Condition : Change of pressure from 0 to 210 kgf/cm² within 10 ms

Measured value

No faults.



Explanation

The purpose of the water hammer test is to check changes of characteristics and mechanical damages to the transmitter which may be caused when a flow of liquid stops suddenly (water hammer).

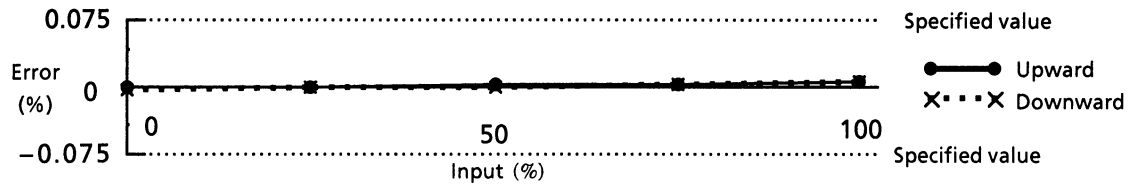
As the test data shows, the DPharp EJA A is able to withstand a sudden rise of pressure which is from 0 to 210 kgf/cm² within 10 ms, and there is no change in characteristics after the water hammer test.

Measured value : No faults

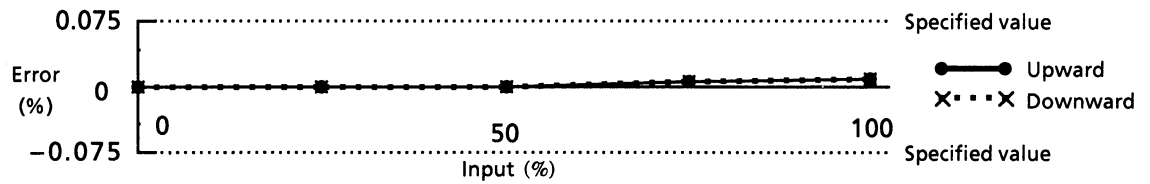
Model EJA110A-DMS2A-80DA Range 0—10000 mmH₂O

◆ Input/output characteristics before and after the test

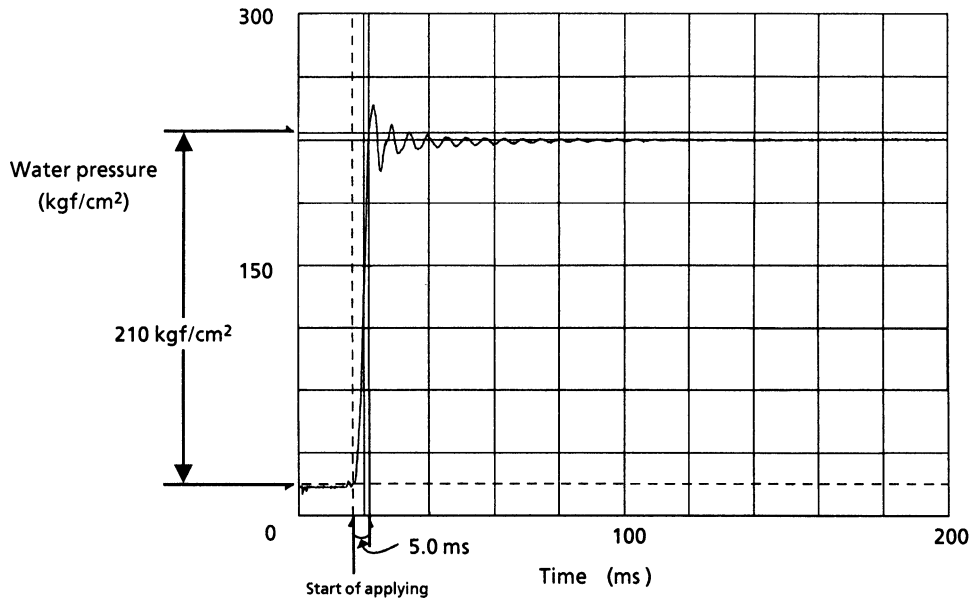
Before the water hammer test



After the water hammer test



◆ Change of water pressure



1-9 Temperature/Humidity Test

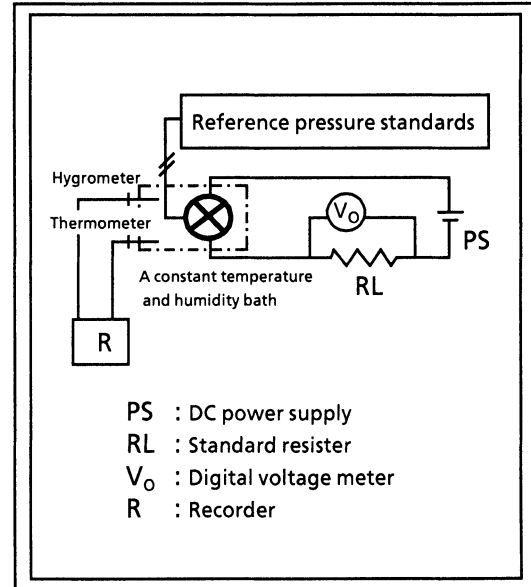
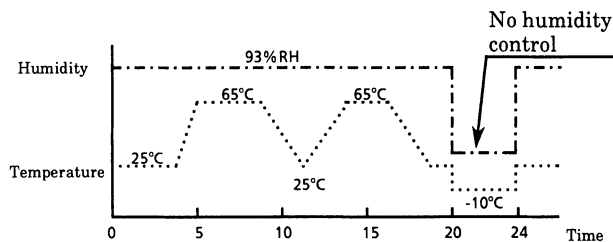
Test Purpose

To verify the effect on the transmitter when ambient temperature changes periodically.

Test method

In a constant temperature and humidity bath, change the ambient temperature and humidity in five cycles (24 hours for 1 cycle) as shown in the figure below, and record the change of the zero point during that time period.

Also check and compare the input/output characteristics with those before and after the test.



Measured value

Zero shift : 0.015%
 (Range 0 to 10000mmH₂O)

Explanation

The temperature and humidity cycle test is an acceleration test to check the stability of the zero point under actual use. It is evident that if the zero point shift by temperature and humidity change is small, and if the zero point does not change after the temperature and humidity cycle test, that the zero point is stable for long period of time.

As the test data shows, with the DPharp, there is almost no shift of the zero point caused by changing the temperature and humidity, and there is almost no change of the zero point before and after the test.

To check the long term stability of the zero point, the following points are to be examined.

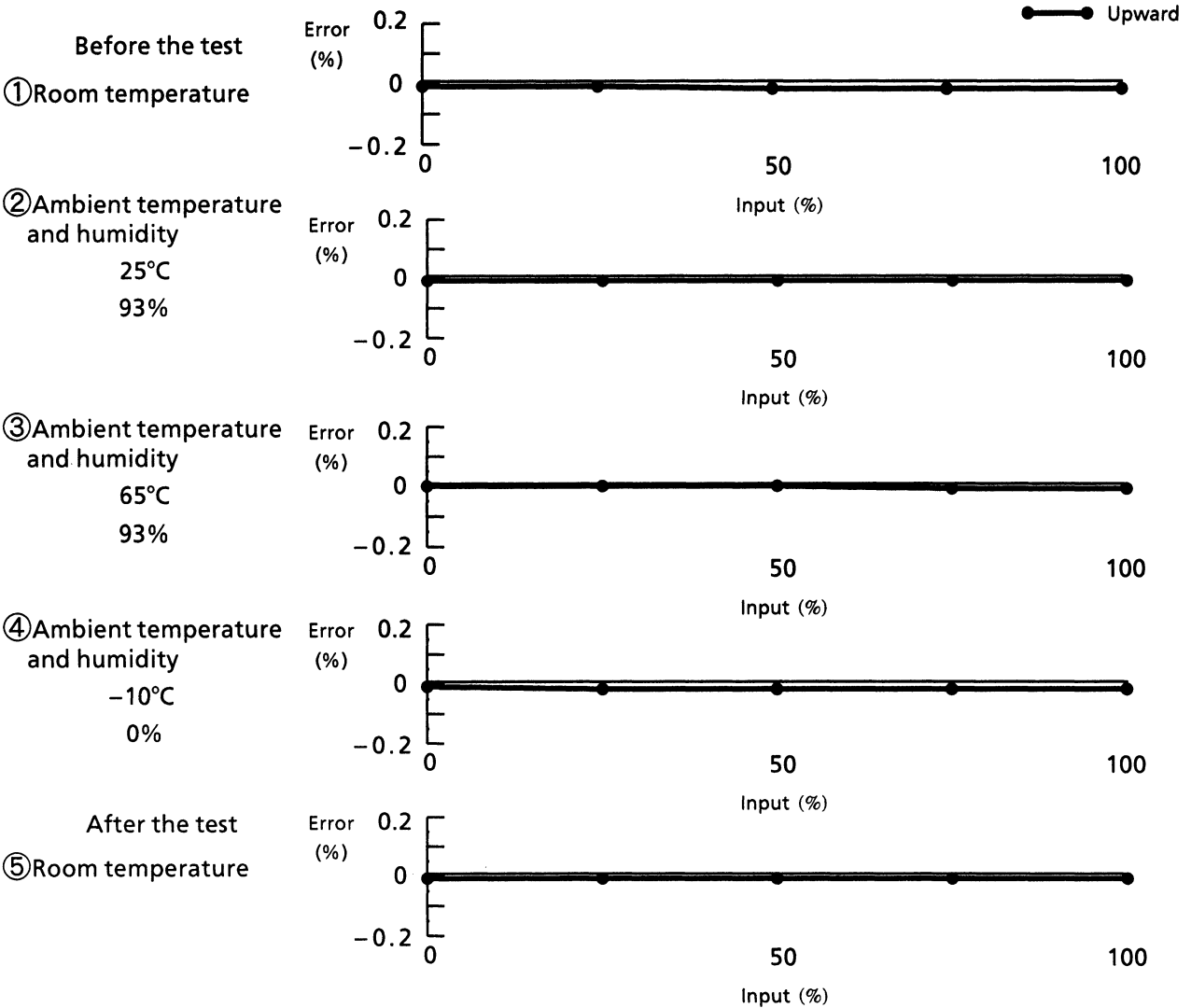
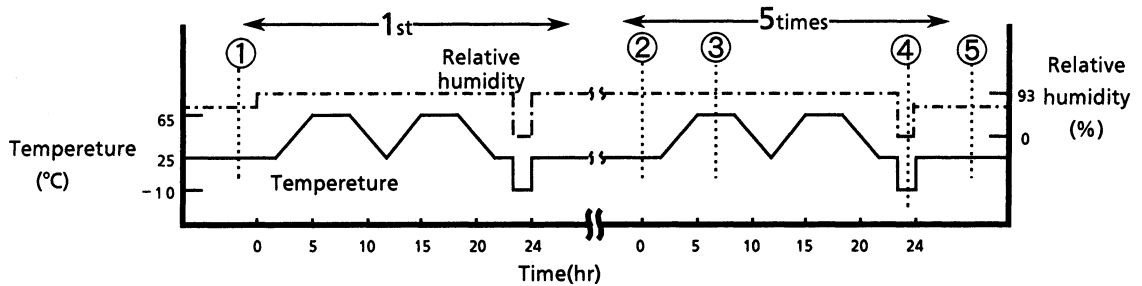
- ① Zero point shift caused by static pressure
- ② Zero point shift caused by overpressure applied to only one pressure side
- ③ Zero point shift caused by temperature and humidity change

The shift of the zero point caused by the above three items is very small with the DPharp, and therefore, the DPharp can be used for a prolonged period without readjusting the zero point.

Measured value : Zero shift : 0.015%

Model EJA110A-DMS2A-80DA Range 0 — 10000mmH₂O

◆ Input/output characteristics before and after the test (① and ⑤), and input/output characteristics during one cycle of time (②, ③, and ④).



A-1 Supply Voltage Test

Test Purpose

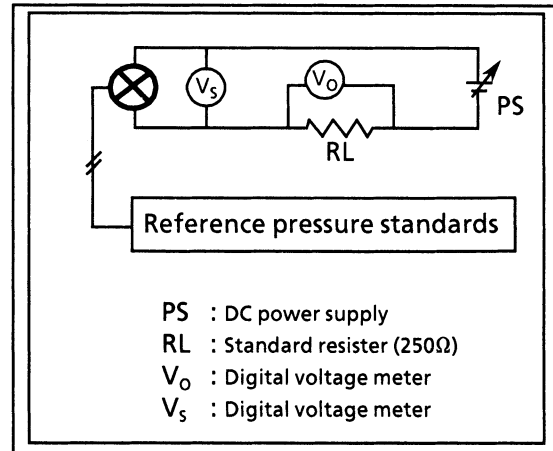
To verify the effect on the output signal when the power supply voltage changes.

Test method

The signal of 0% and 100% shall be applied to the transmitter, and the output current when the power supply voltage to the transmitter is set at 24 V DC +20% and 24 V DC -20% shall be measured. (Load resistance : 250 Ω)

Design-base value

$\pm 0.005\%/V$
(Range: 0 to 10000 mmH₂O)



Measured value

Change of output : +0.00031%/V
(Supply voltage : 19.2 to 28.8 V)

Explanation

As the test data shows, the change of the output is very small, and there is almost no effect on the output signal caused by the change of the power supply voltage.

There is no change of the output current when the power supply voltage is set in a range between 19.2 V DC and 28.8 V DC. This range covers appropriately the output voltage from the distributor supplied by YOKOGAWA. (See Table 1 and the figure below.)

Table 1. The power supply voltage of the distributor to the transmitter

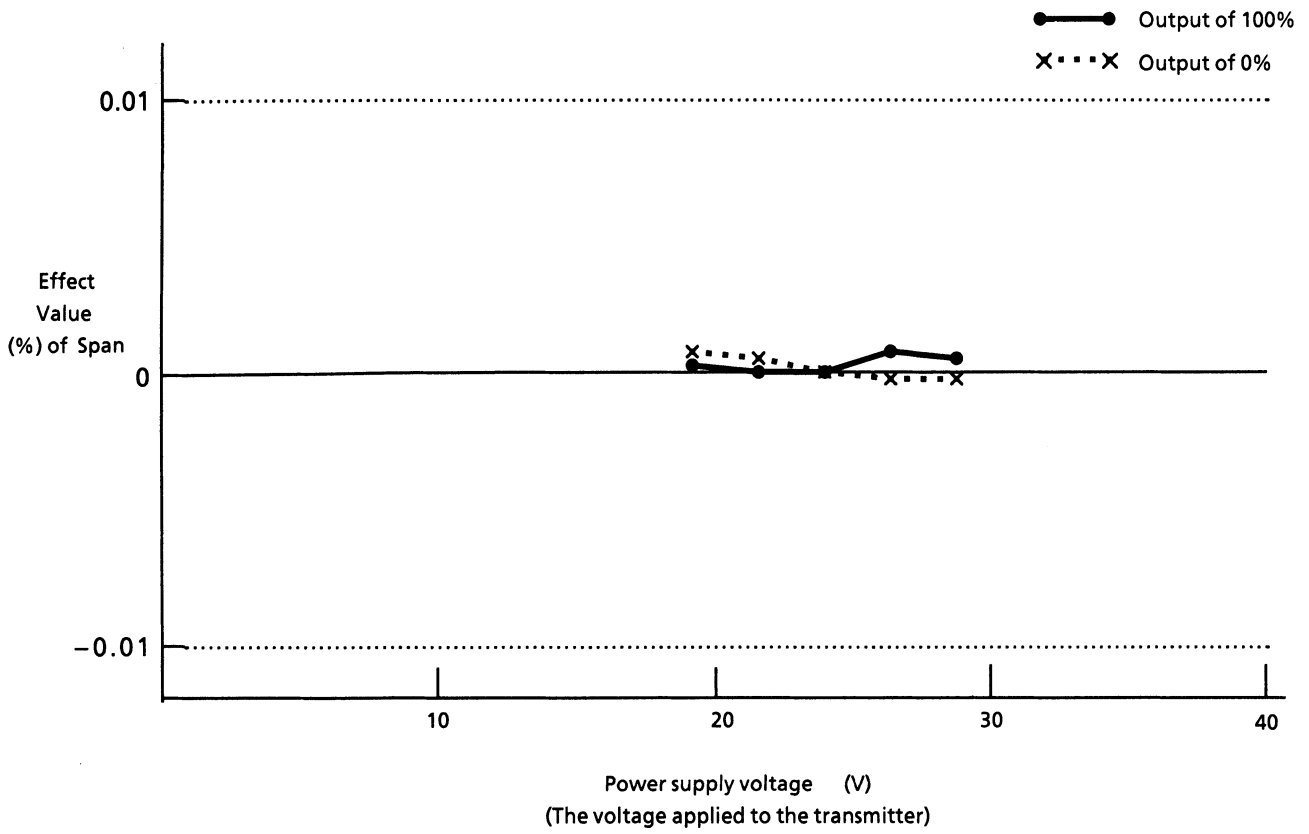
Products of YOKOGAWA	Power supply voltage to the transmitter
Distributor SDBT, SDBS	26.5 \pm 1.5 V DC
Signal conditioner cards EA1, EA2, EA5	25 to 28 V DC

Design-base value : $\pm 0.005\%/V$

Measured value : Change of output : $+ 0.00031\%/V$

Model EJA110A-DMS2A-80DN Range 0 — 10000mmH₂O

◆Effect by the change of the power supply voltage



A-2 Load Resistance Test

Test Purpose

To verify the effect on the output signal when the load resistance changes.

Test method

The signal of 0% and 100% shall be applied to the transmitter, and the output current when the load resistance is changed from 250 Ω to 600 Ω shall be measured.

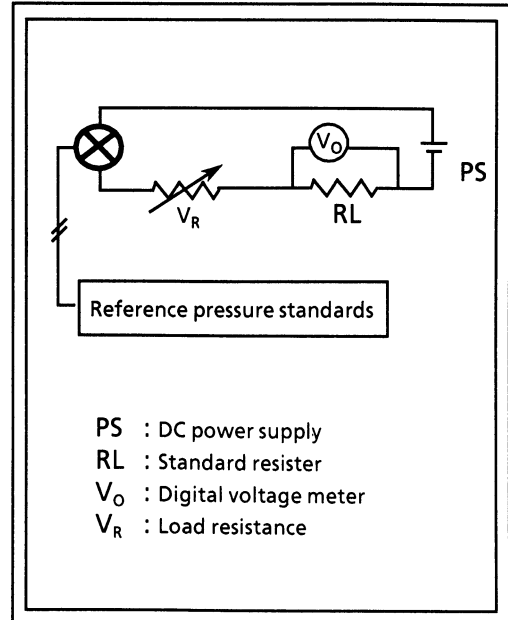
(Power supply voltage : 24 V DC)

Measured value

Change of the output

Output of 0%: No effect from 250 Ω to 850 Ω

Output of 100%: No effect from 250 Ω to 750 Ω



Explanation

The 4 to 20mA output of the DPharp EJA A is supplied from a constant current circuit. Therefore, the output does not change even when the load resistance changes. As the test data shows, there is no change of the output current when the load resistance changes.

However, with the load resistance of 750 Ω or more, the power consumption in the resistor increases, and then the supply voltage drops below the minimum operating voltage, resulting in a decrease of the output.

Measured value Change of the output

Output of 0% : No effect from 250 Ω to 850 Ω

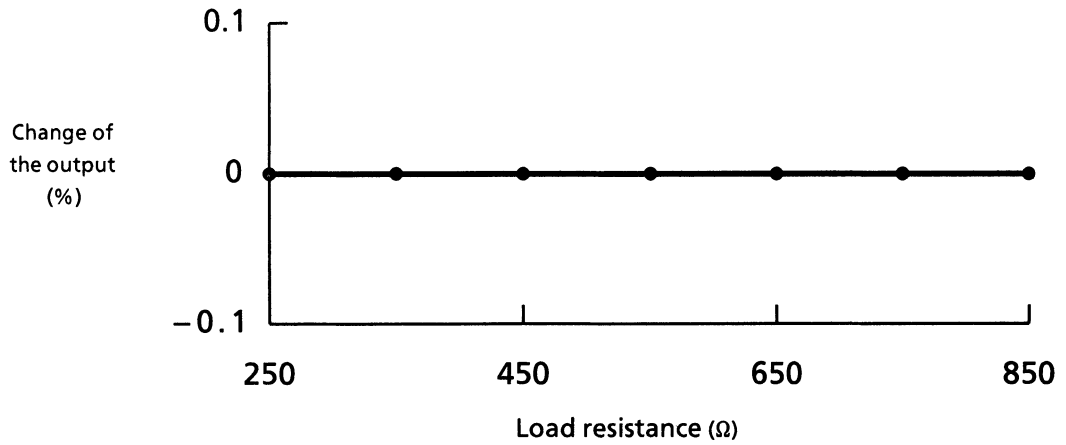
Output of 100% : No effect from 250 Ω to 750 Ω

Model EJA110A-DMS2A-80DN Range 0 — 10000mmH₂O

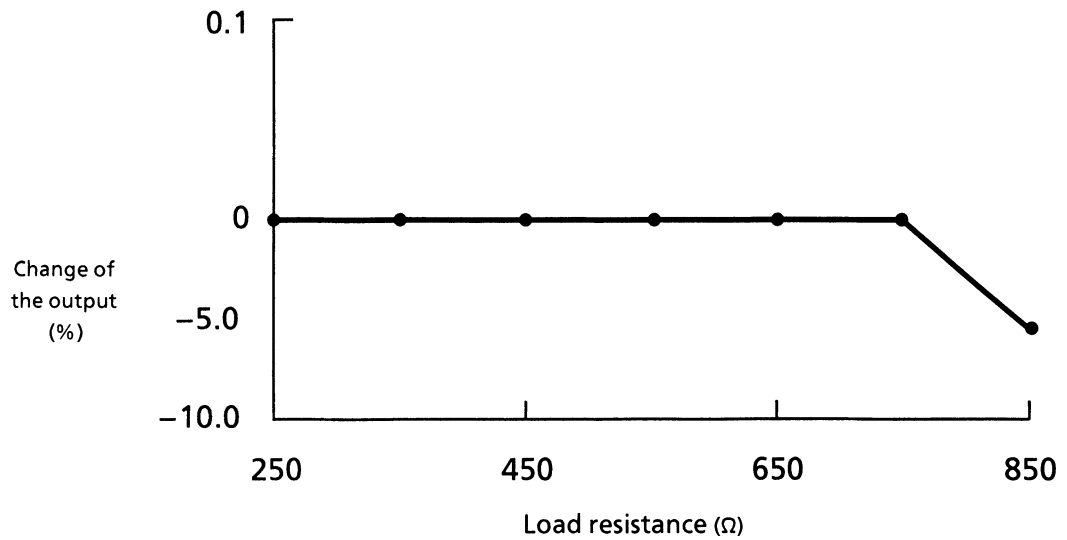
◆The change of the output with respect to the change of the load resistance

Power supply voltage 24V DC

At output of 0%



At output of 100%



A-3 External Magnetic Field Test

Test Purpose

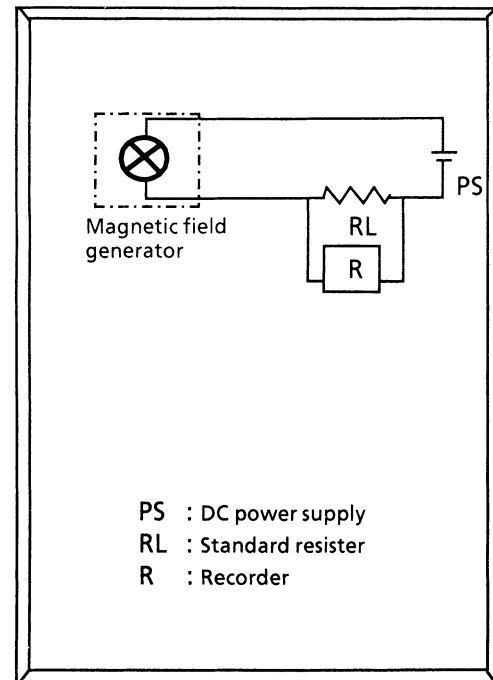
To verify the effect on the output signal caused by an external magnetic field.

Test method

An alternating magnetic field of 400 A/m at 50 Hz shall be applied to the transmitter from the above and below, from the left and right, and from the front and back, and the output current at each condition shall be measured.

Measured value

Direction of magnetic field	Zero shift (%)
Above and below	± 0.015 or less
Left and right	± 0.015 or less
Front and back	± 0.015 or less



Explanation

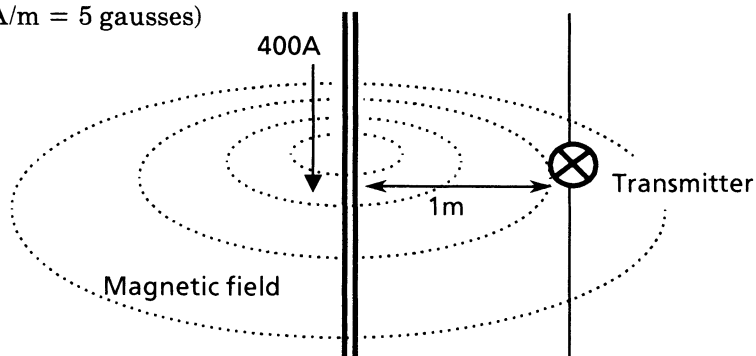
Because the vibration type sensor of the DPharp utilizes magnetic field for detection, the effect of other magnetic fields is subject to consideration. As the test data shows, there is no effect on the DPharp caused by external magnetic fields.

Although, the magnetic field is utilized for generating vibration of the DPharp, the external magnetic fields have no effect on the vibration frequency of the vibrator, and there is no effect from the external magnetic fields.

Alternating magnetic field

A magnetic field of 400 A/m is equivalent to the magnetic field generated when a current of 400 A flows through a power line placed 1 m away from the DPharp EJA A.

(400 A/m = 5 gauss)

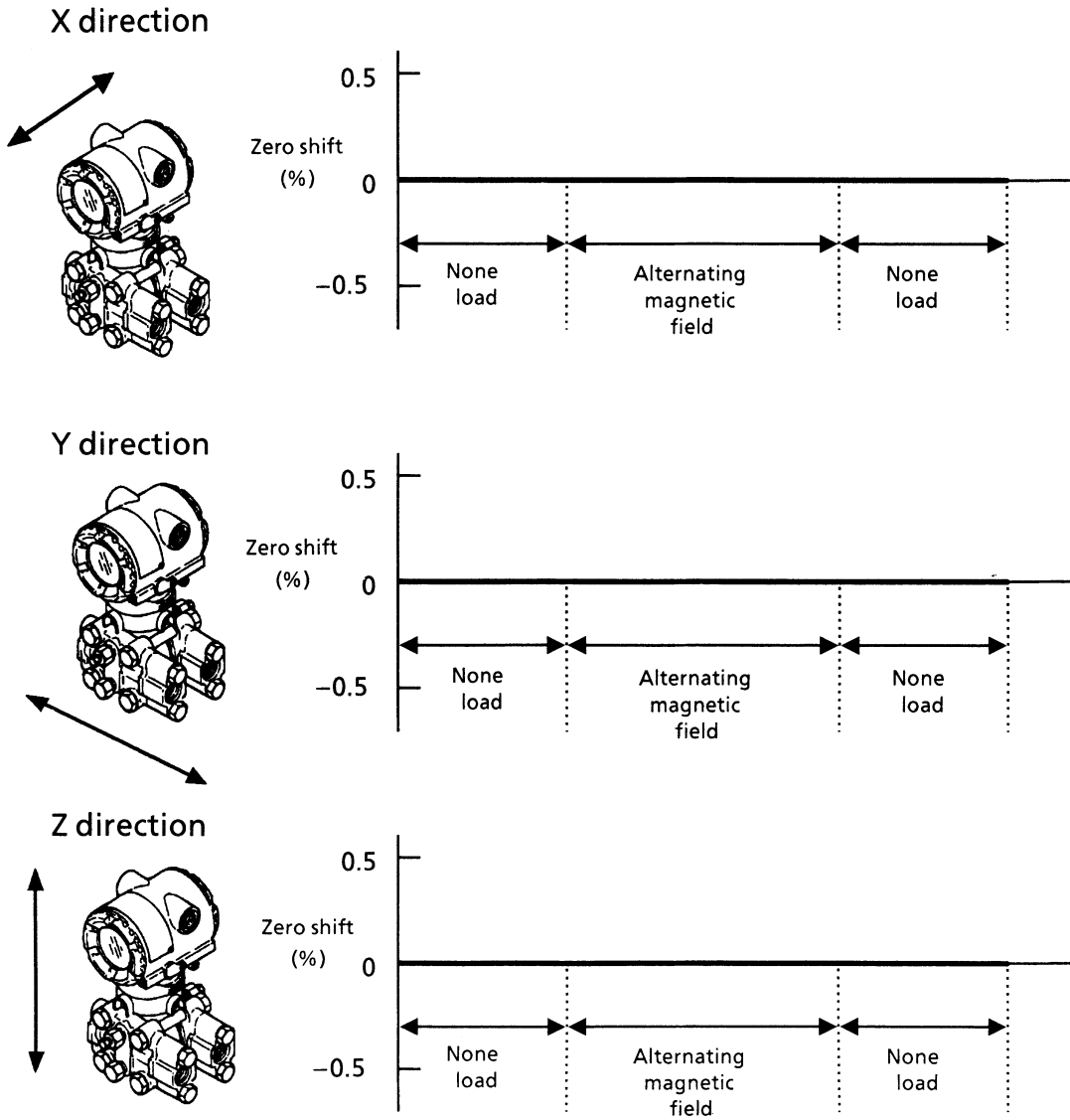


Measured value :

Direction of magnetic field	Zero shift (%)
Above and below	±0.015 or less
Left and right	±0.015 or less
Front and back	±0.015 or less

Model EJA110A-DMS2A-80DN Range 0 — 10000mmH₂O
Damping : 2 sec.

◆Zero shift under an external electromagnetic field



A-4 Noise Voltage Test in Series Mode

Test Purpose

To verify the effect on the output signal caused by series mode noise.

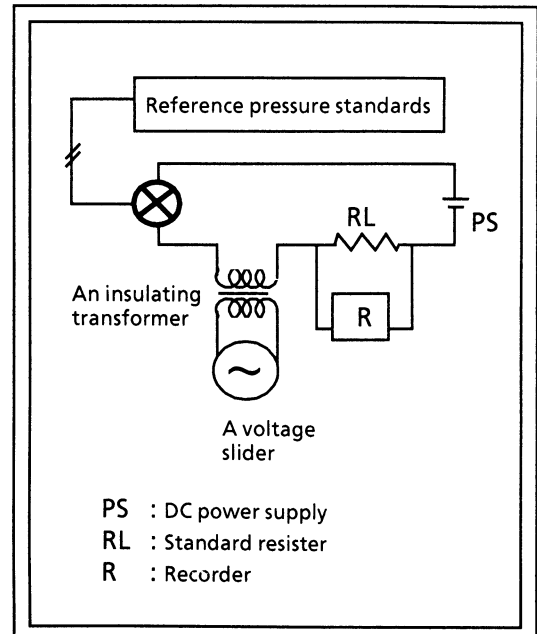
Test method

The output current shall be measured by applying an alternating voltage in series with the output signal.

Frequency: 50 Hz, Voltage: 10 Vp-p

Measured value

Output	Change of output (%)
0%	0.0125% or less
100%	0.0125% or less



Explanation

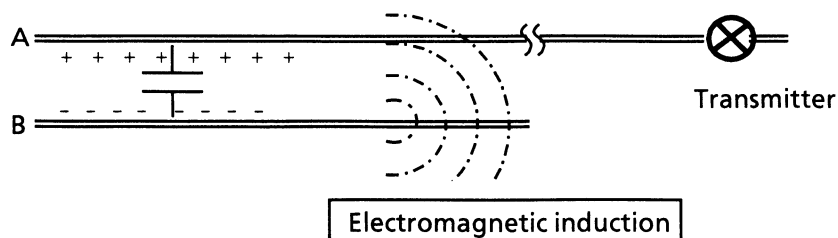
As the test data shows, there is almost no effect on the output signal caused by series mode noise.

The series mode noise is generated when the transmission cable of the transmitter is installed close to the power cable over a long distance.

The load resistance of the transmission cable of the DPharp is about 250 to 500 Ω . In a low impedance circuitry like this, an induced voltage of 1 V or higher would not be expected. However, the test is carried out with a relatively high voltage of 10 Vp-p.

Generation of series mode noise voltage

A noise is generated in the transmission cable when transmission cable (A) is placed close to power cable (B) as shown in the figure below. This noise is generated from electromagnetic induction caused by the magnetic field of (B) and from electrostatic induction between (A) and (B) which are placed closely to each other. The induced noise is called a series mode noise (or a normal mode noise).



Measured value :

Output	Change of output (%)
0%	0.0125% or less
100%	0.0125% or less

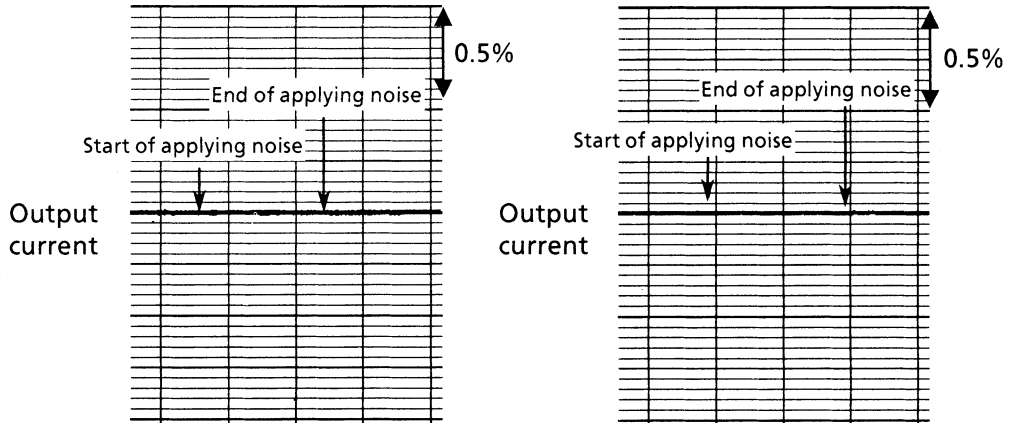
Model EJA110A-DMS2A-80DN

◆The output signal when noise is applied

Range 0 – 10000 mmH₂O

Output of 0%

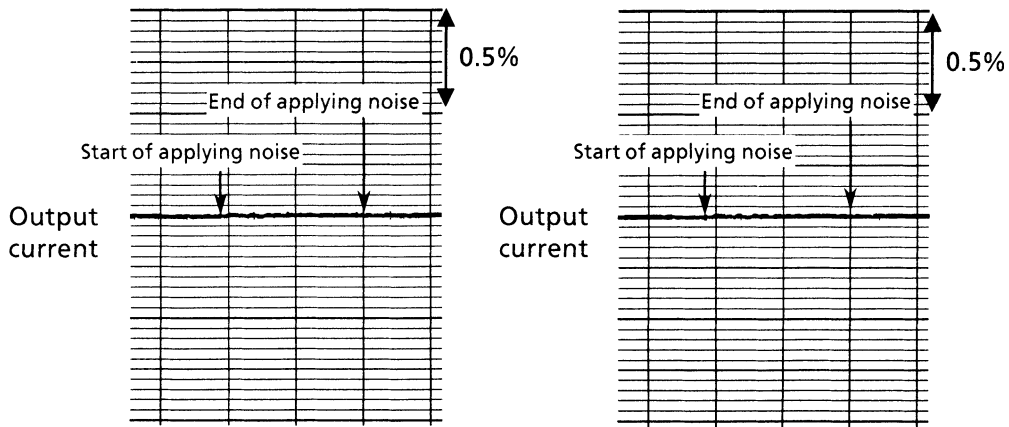
Output of 100%



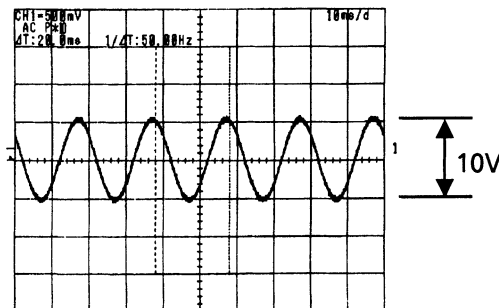
Range 0 – 1000 mmH₂O

Output of 0%

Output of 100%



Waveform of noise
 Frequency : 50 Hz
 Voltage : 10Vp-p



A-5 Noise Voltage Test in Common Mode

Test Purpose

To verify the effect on the output signal caused by common mode noise.

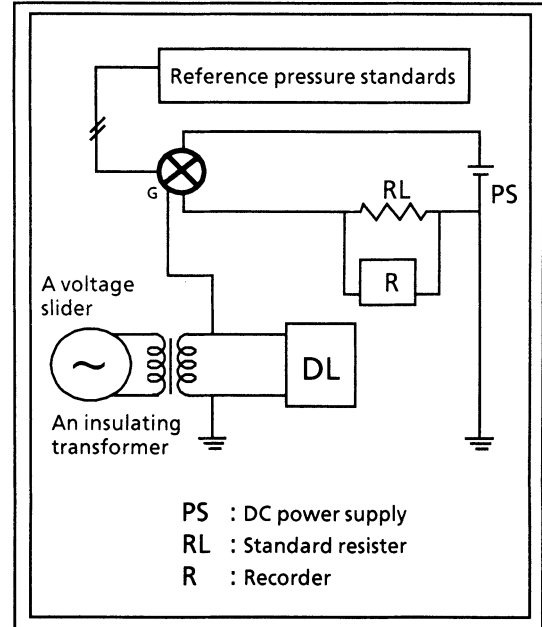
Test method

The output current shall be measured by applying an alternating voltage between the output connector and the ground.

Frequency : 50 Hz Voltage : 100 Vrms

Measured value

Output	Change of output (%)
0%	-0.038
100%	-0.044



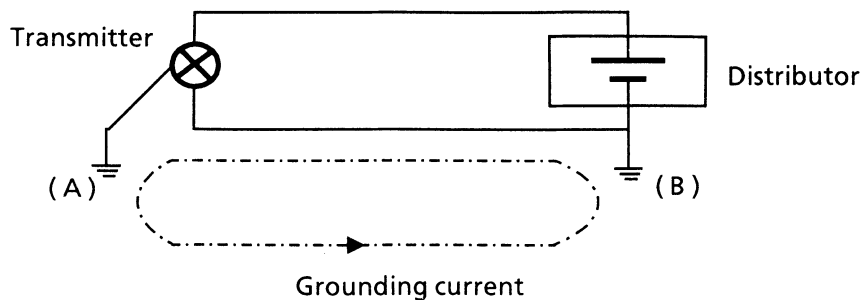
Explanation

As the test data shows, there is a minimum effect on the output signal caused by common mode noise.

The common mode noise is generated when a current flows through the ground conductor of the transmission cable connected to the transmitter. The voltage (100 Vrms) used for this test is externally high and is more than the transmitter can be expected to receive in use under normal conditions.

Generation of common mode noise voltage

A ground current flows in the conductor of the transmission cable when there is a difference of voltages between the ground potentials at points (A) and (B). The noise generated by this current is called common mode noise.



Measured value :

Output	Change of output (%)
0%	-0.038
100%	-0.044

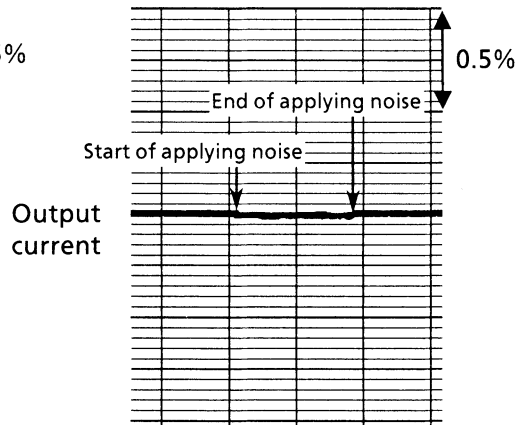
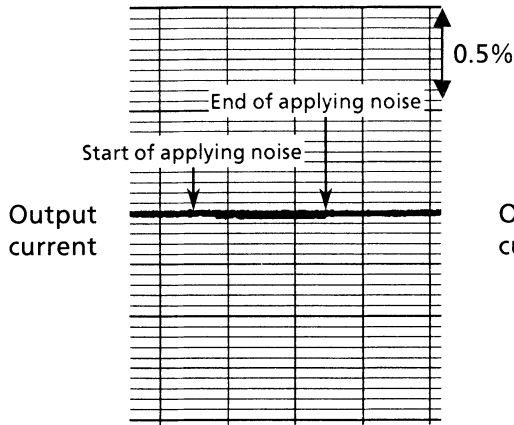
Model EJA110A-DMS2A-80DN

◆The output signal when noise is applied

Range 0 — 10000 mmH₂O

Output of 0%

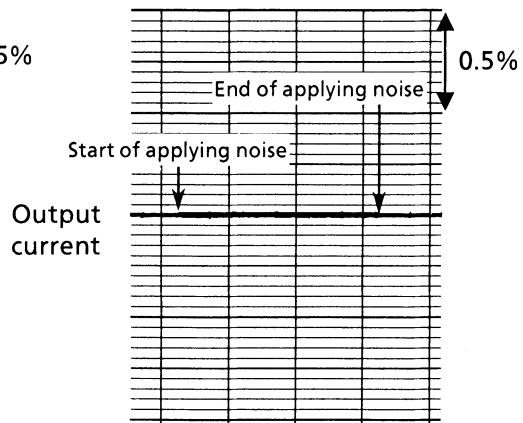
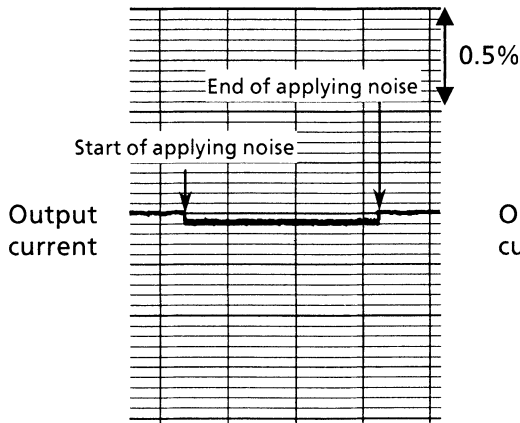
Output of 100%



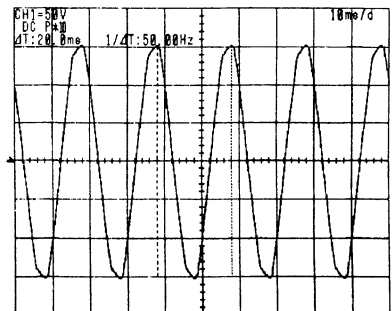
Range 0 — 1000 mmH₂O

Output of 0%

Output of 100%



Waveform of noise
 Frequency : 50Hz
 Voltage : 100Vrms



A-6 Electromagnetic Susceptibility Test

Test Purpose

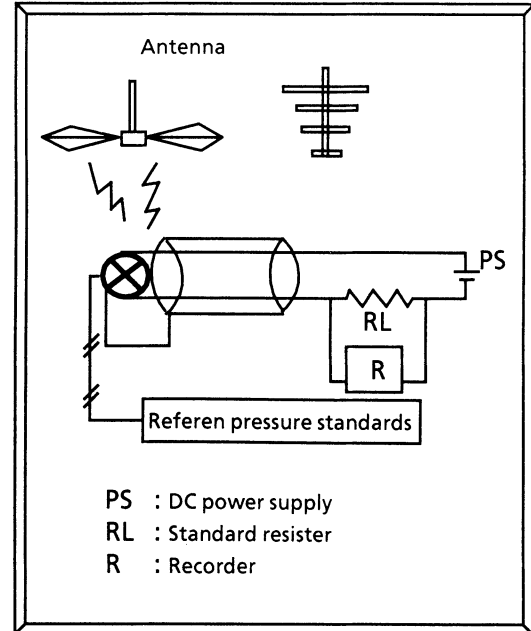
To verify the effect on the output signal caused by electromagnetic wave.

Test method

The output current shall be measured while operating the antenna located 1 m away from the transmitter.

Measured value

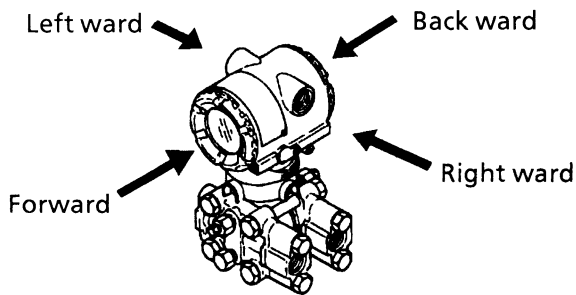
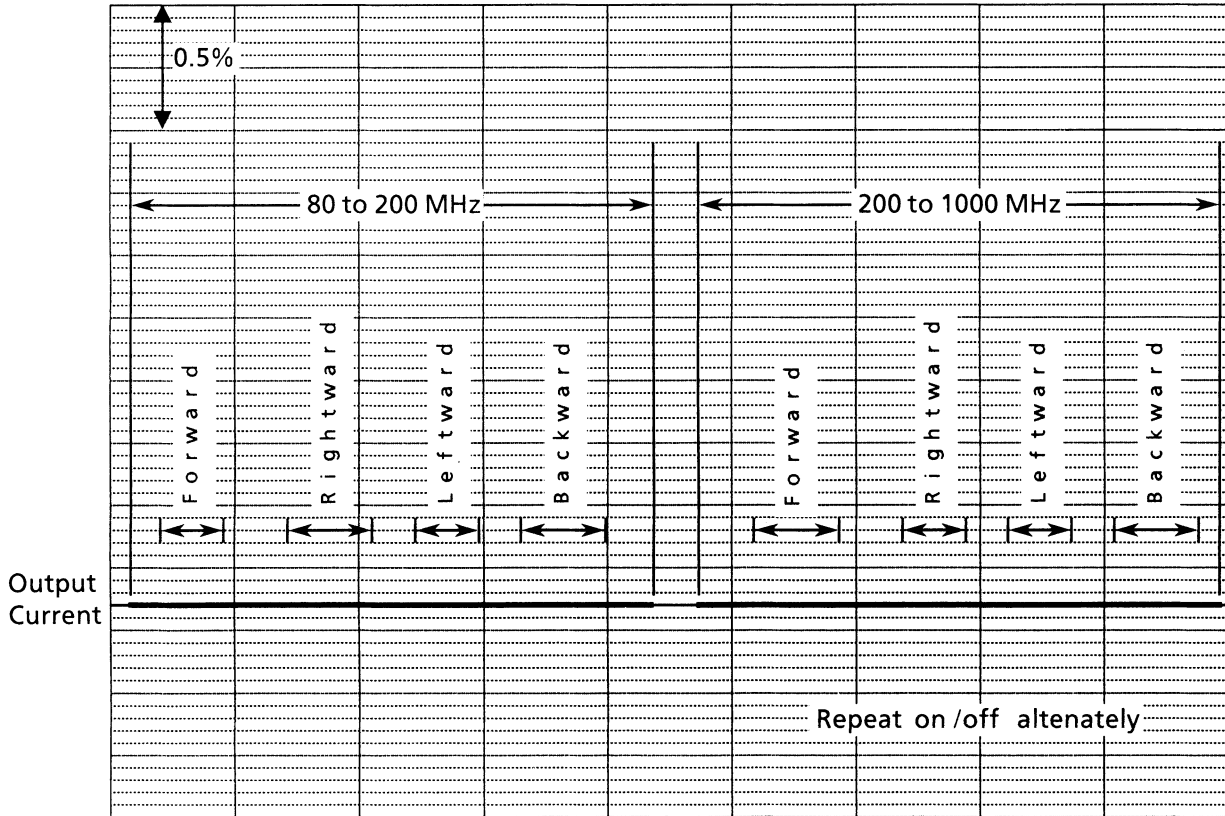
Change of the output
0.01% or less at range 0 to 1000 mmH₂O
(Electromagnetic wave : 80MHz to 1GHz, 10V/m)



Electromagnetic wave : 80MHz to 1GHz, 10 V/m
 Output drift : 0.01% or less

Model EJA110A-DMS2A-80DN Range 0—10000 mmH₂O
 Damping : 2 sec.

◆Output drift under RF Noise



A-7 Impulse Insulation Withstanding Test

Test Purpose

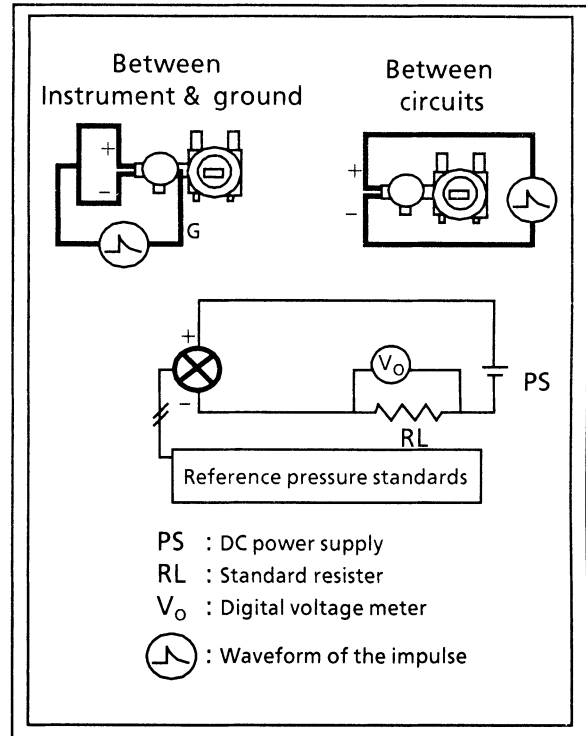
To verify the effect on the transmitter caused by the surge voltage of lightning.

Test method

For the transmitter with a lightning protector installed, the changes of the characteristics shall be checked by applying an impulse of 10 kV whose duration is $10 * 200 \mu\text{s}$ between conductors in addition to the ground, with normal and reverse polarities and 10 times for each.

Measured value

- There is no significant changes to the input/output characteristics before and after the test.
- There is also no effect on the electrical performance of the transmitter.



Explanation

As the test data shows, there is no change in characteristics before and after the test.

The lightning arrester protects the DPharp from the surge voltage of lightning. Although the lightning arrester is installed to protect the DPharp from the surge voltage of lightning, the lightning arrester cannot protect the DPharp when it receives a surge of high levels. It is effective only below a certain surge level.

For this test, an impulse of 10 kV (a set of $200 \mu\text{s}$ duration * 10 pulses) is applied with normal and reverse polarities, and 10 times for each polarity.

[Lightning protector]

Transmitter power supply voltage : 10.5 to 32 V DC

Allowable current : Max. 6000 A ($1 \times 40 \mu\text{s}$), repeating 1000 A ($1 \times 40 \mu\text{s}$) 100 times

Measured value

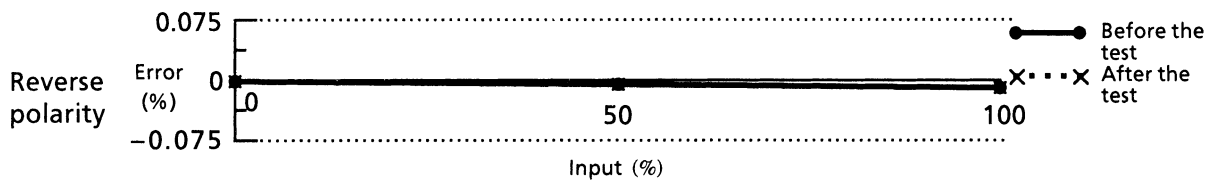
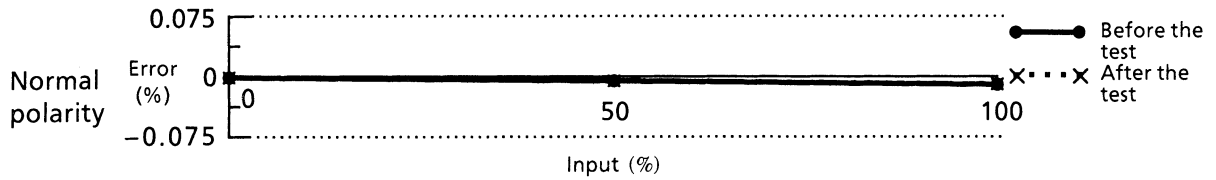
- There are no significant changes to the input/output characteristics before and after the test.
- There is also no effect on the electrical performance of the transmitter.

Model EJA110A-DMS2A-80DN/A

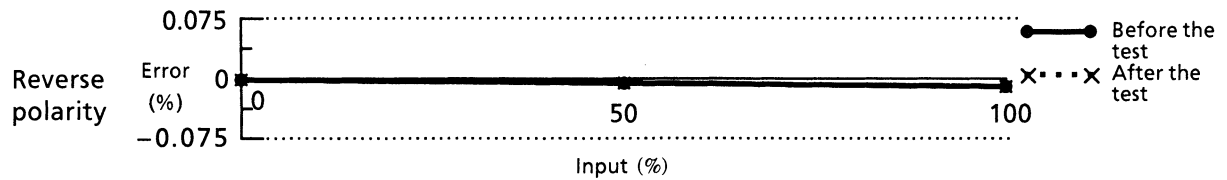
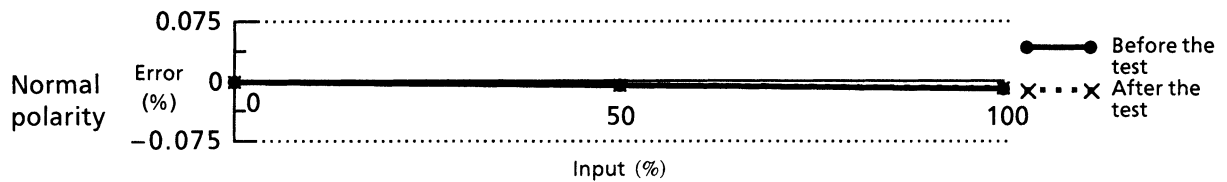
Range 0 — 1000 mmH₂O
Damping : 2 sec.

◆ Input/output characteristics before and after the test

Between Instrument & ground



Between circuits



● Waveform of the impulse

10kV, 10 × 200μsec

