ASQ-D Servo Acceleration Transducer INSTRUCTION MANUAL

Thank you for purchasing this KYOWA's product.
Before using it, please read this instruction manual carefully. Also, keep the manual within easy reach so that you can refer to it whenever necessary.

1. Safety precautions

⚠ Caution!	Improper handling may cause deleterious effects to the operator's body. To avoid harm, be sure to observe the accompanying instructions.
● To install the transducer to a revolving, moving or vibration object, use bolts of specified size as well as the specified bolt tightening torque. Lesser tightening torque applied may cause the transducer to disconnect and fly away.	

2. Outline

The ASQ-D outputs a voltage proportionate to given acceleration.
The ASQ-D is a servo type transducer designed to detect displacement of a pendulum (incorporated in the acceleration sensor) caused by an external force, generate an electromagnetic force to balance the pendulum, and the magnitude of acceleration from the feedback current.

3. Handling precautions

3.1 Use "VAQ-700A" or "VAQ-500A M35" signal conditioner dedicated to ASQ together. Do not use "VAQ-500A" or the latter may be damaged when it is switched on after connection two.
3.2 Do not drop to the ground or floor or hit on the cabinet or throw the transducer. Or excessively large impact may be applied to cause irreparable damage. To avoid harm, handle it very carefully.
3.3 Do not detach the connector cap from the transducer except while connecting the cable. Or the connector (receptacle)'s waterproof capability may deteriorate.
3.4 For installation to a revolving, moving or vibrating object, be sure to fix the cable. Or the cable wires may be damaged.
3.5 Use the transducer within the rated capacity range. Overloading may cause damage.
3.6 When the transducer's sensing direction is aligned with the direction of gravity acceleration, since the transducer is already applied with +9.807m/s^2 acceleration (reference value; 1G). The measuring range is narrowed by 9.807m/s^2 at the "+" side. In this cause, use the 1G cancellation cable N-45 to expand the measuring range.
3.7 Before connecting the power to the transducer, check to be sure that the power voltage meets the specification. Excessive voltage or erroneous connection may damage the transducer. Do not use switching type power supply since it is difficult to avoid high-frequency noise.
3.8 The mainframe case is connected to E terminal of the connector (receptacle) or to the shield wire of the cable. Connect it to COMMON of the power supply on the measuring instrument, or larger noise may result.

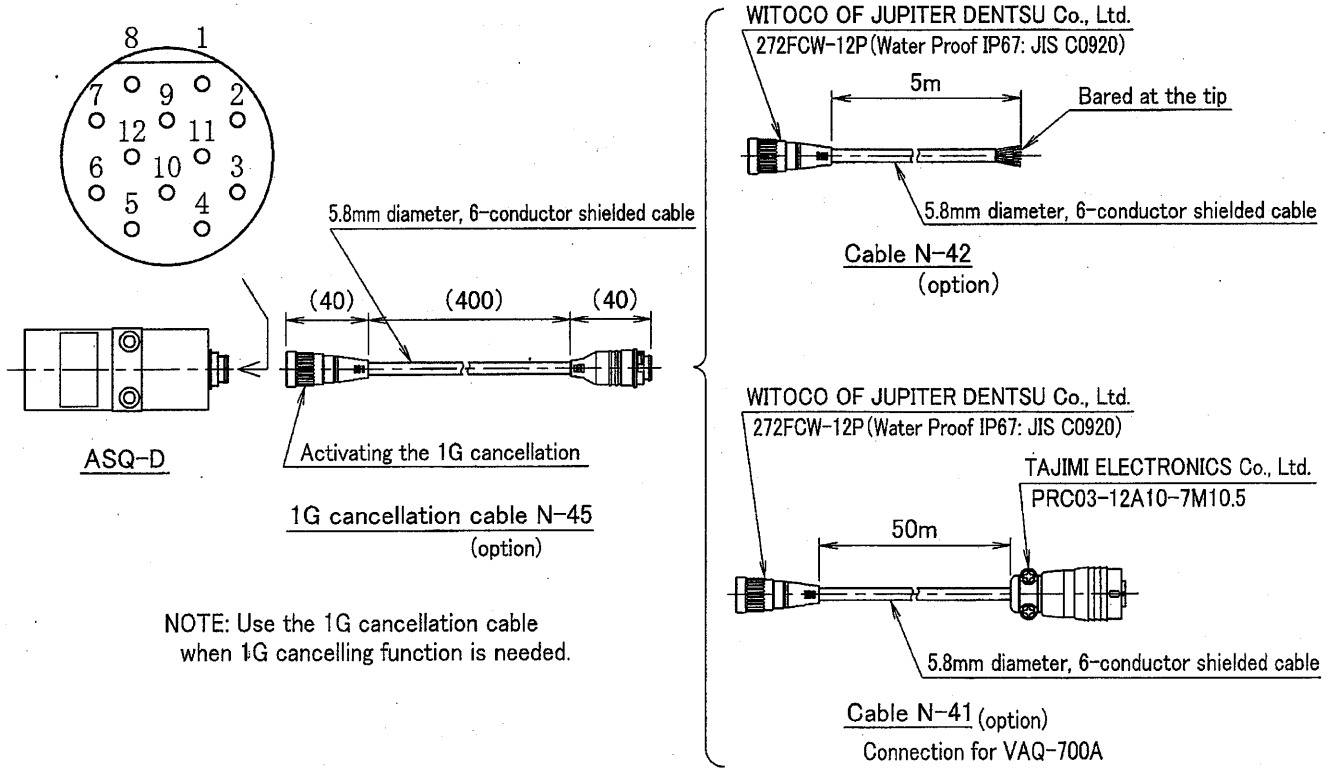

Fig.1 Outline

4. Installation

To install the transducer, align the sensing direction with the direction of acceleration to be measured. Use 2 accessory hexagon socket head cap screws and observing the illustration bellow. Tightening torque should be from 2.5 to 3N・m (reference value: 25 to 30kgf・cm)

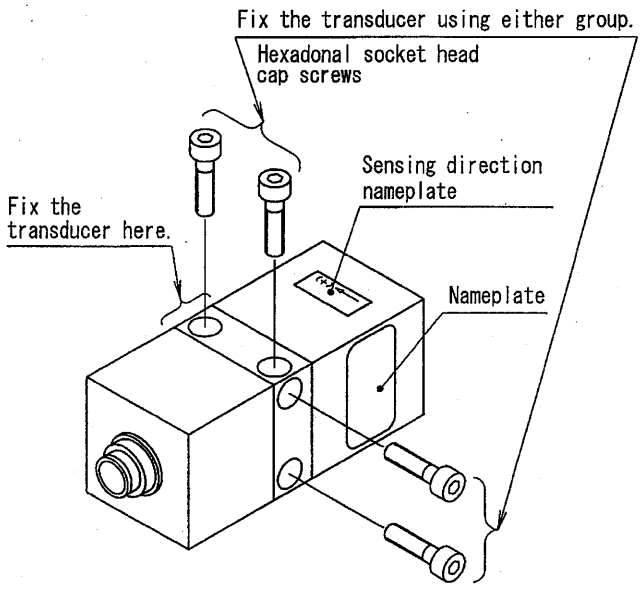

Fig.2 Installation

5. Connection

5.1 Wiring is shown below.

5.2 Signal conditioners VAQ-700A and VAQ-500AM35 are equipped with built-in power supply.

5.3 When using an amplifier of other type or a recorder, connect a power supply and measuring instrument to the transducer. Required power supply is ±power in a range of ±11V to ±16V. Recommended is ±12V. Also required is the series (dropper) system power, whose ripple is below 5mV_{P-P}.

Signal name	Connector pin assignment (see Fig.1)	Wiring color code
Positive power (+12V)	A	Red
Output COMMON	B	White
Negative power (-12V)	C	Black
Signal output	D	Green
Case	E	Shield
Test signal input	F	Yellow
Input COMMON	G	Brown
Applicable connector	272FCW-12P	—

The Input COMMON is connected with the Output COMMON in the transducer.

6. Measurement

6.1 As shown on Fig.2, sensing direction of the transducer is specified by the sensing direction mark on the acceleration transducer.

6.2 A Positive polarity output is obtained by installing the transducer with its the sensing direction arrow mark points to the center of the earth (i.e. that the arrow marks aligns with the direction of gravity acceleration).

6.3 Measuring vibrations whose sensing direction aligns with the direction of gravity acceleration, the gravity of acceleration is always applied on the transducer. This effect can be eliminated by using the 1G cancellation cable to cancel the offset output which the gravity acceleration to have the transducer output to nearly zero.

7. Self-test function

Set the transducer with its sensing direction horizontal to no acceleration affected. Apply 20Hz sine wave between the test signal input terminal and input COMMON, using an oscillator. If the output voltage reads approximately 10V_{p-p}, it is the proof of the proper transducer performance. In addition, if a self-test is performed when the 1G cancellation cable is in use, an output voltage will be found having been shifted by approximately 2.452m/s² (reference value: 0.25G). Be sure to observe the test signals listed below. An excessively large voltage may damage the transducer.

Model	Test signal(Approx.V_{P-P})
ASQ-D-1	3.94
ASQ-D-2	7.86
ASQ-D-5	19.7

8. Sensitivity check

Sensitivity checking is available using the gravity of acceleration. This check is made on the transducer whose sensing axis is aligned with the direction of gravity acceleration.

8.1 Set the transducer on horizontal table.

8.2 Tilt the transducer by 90° into the positive sensitivity direction and read a V_{+1G} output.

8.3 Tilt the transducer by 90° into the negative sensitivity direction and read a V_{-1G} output.

8.4 The difference between the two outputs divided by 2 shall be the sensitivity per 9.807m/s² (reference value; 1G) acceleration.

$$\text{Sensitivity } K\,[\,V / 9.807 m/s^2\,] = (V_{+1G} - V_{-1G}) / 2$$

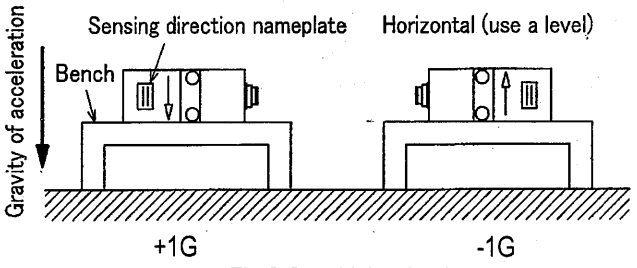

Fig.3 Sensitivity check

9. Using as an inclinometer

The transducer is provided with high-accuracy DC characteristics. It is designed to obtain an inclination angle affected on the transducer by detecting force component of the gravity acceleration.

Where output per 9.807m/s² is K [V/9.807m/s²], output when sensing direction horizontal is E_{ini}[V] and error in the sensing axis direction is β [deg], the relation between the output E [V] and inclination angle Θ [deg] is expressed by the following equations.

$$E = K \cdot \cos(\theta) \cdot \sin(\theta) + E_{ini}$$
$$\Theta = \sin^{-1}[\,(E - E_{ini}) / (K \cdot \cos(\beta))\,]$$

10. Specifications

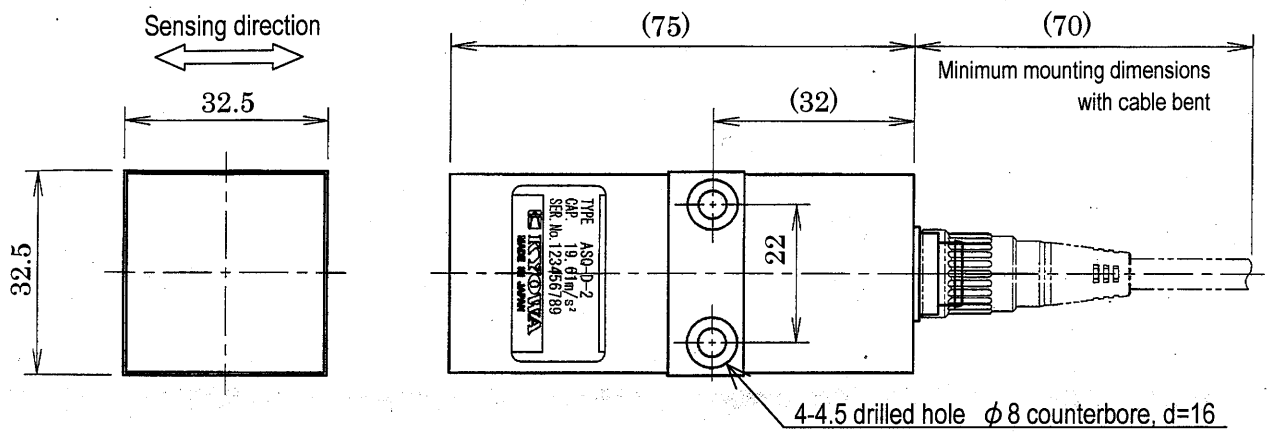

Fig.4 Dimensions

Model	Rated capacity (reference value)
ASQ-D-1	9.807m/s² (1G)
ASQ-D-2	19.61m/s² (2G)
ASQ-D-5	49.03m/s² (5G)

Rated output: ±5V (10V) ±5%
Non-linearity: within ±0.03%RO
Hysteresis: within ±0.05%RO
Frequency response range: DC to 100Hz (Sensitivity deviation: ±10%)
Safe temperature range: -20 to 80℃
Compensated temperature range: -10 to 60℃
Thermal effect on zero balance: ±0.05%RO/℃
Thermal effect on output: ±0.05%/℃
Power supply: DC ±11 to ±16V, 40mA max.
Mass: Approx. 220g
Structure: IP67(JIS C0920)

■Accessories : Hexagon socket head cap screws (M4x25) 2
Test data sheet 1
Guarantee 1
Instruction manual 1