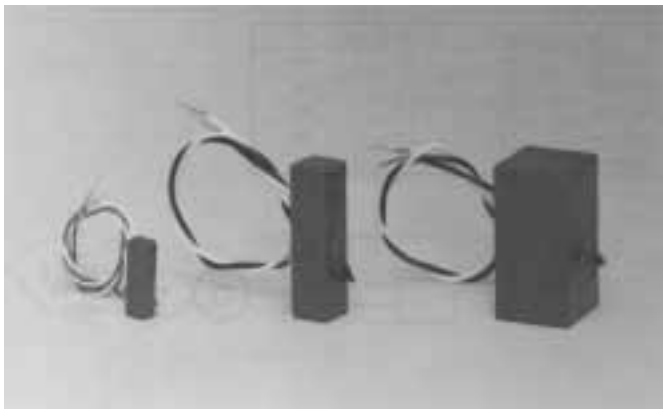


AE, AER Series (Resin coated type)

AE Series (Square rod type)



Outline

The multilayer piezoelectric actuator is a ceramic element for converting electrical energy into mechanical energy such as displacement or force utilizing the piezoelectric longitudinal effect.

By taking full advantage of its superior features such as ultrafine drive, high efficiency, and high power, for example, users can look forward to a drive source for finely positioning a variety of apparatuses with accuracy.

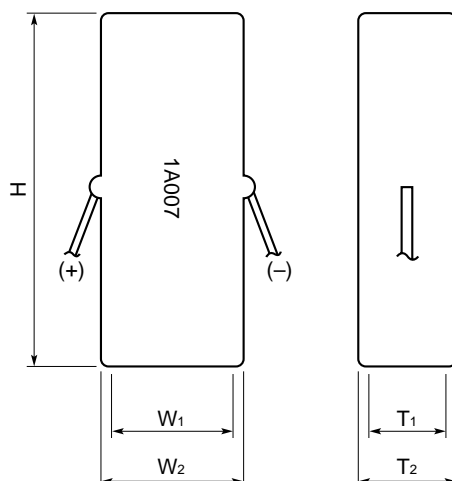
Features

- Large generated force : 350Kg/cm² (Typ.)
- High-speed response : Driving up to about 1/3 of self resonant frequency is possible
- Accurate positioning : Position control on the order of nanometers is possible
- Low power consumption : Electro-mechanical conversion efficiency of 65% (Typ.)
- Ultraminiature : 1/10 of a conventional multi-layer actuator (specific volume)
- Noiseless

Applications

Heads for dot printers and ink jet printers, auto-tracking of magnetic heads, valve drive, positioning of mirror prisms, linear motors for camera auto focusing, pumps, vibration of parts feeder, pressure sensors for touch panel input apparatus.

Outline and Marking



Note:

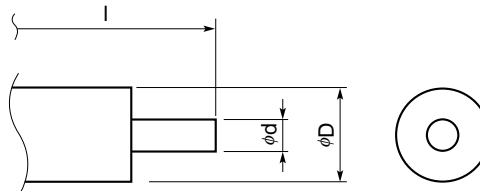
Factory-shipped polarization : Red lead wire = (+), white lead wire = (-)
Coating : Epoxy resin

Outer Dimensions

Model Number	T ₁	W ₁	H	T ₂	W ₂
AE0203D08	2±0.1	3±0.1	10±0.1	3.5max.	4.5max.
AE0203D16	2±0.1	3±0.1	20±0.1	3.5max.	4.5max.
AE0505D08	5±0.1	5±0.1	10±0.1	6.5max.	6.5max.
AE0505D16	5±0.1	5±0.1	20±0.1	6.5max.	6.5max.
AE1010D16	10±0.1	10±0.1	20±0.1	11.5max.	11.5max.
AE1414D16	14.2±0.1	14.2±0.1	20±0.1	15.7max.	15.7max.

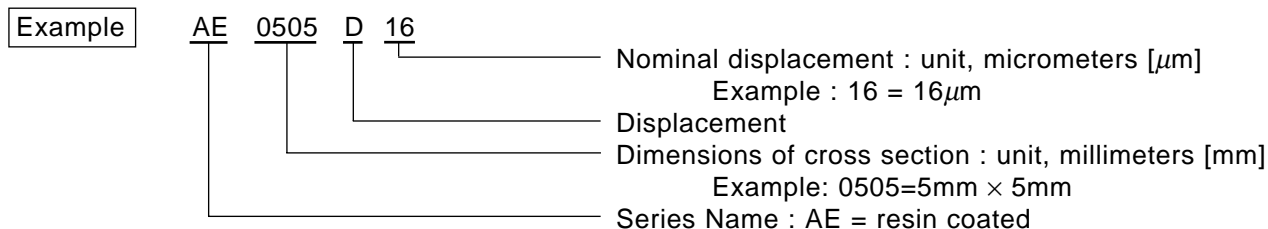
Model Number	φd*	φD*	ℓ*
AE0203D08	0.3	0.5	100
AE0203D16	0.3	0.5	100
AE0505D08	0.3	0.5	100
AE0505D16	0.5	0.8	100
AE1010D16	0.5	0.8	100
AE1414D16	0.5	0.8	100

* Typ.

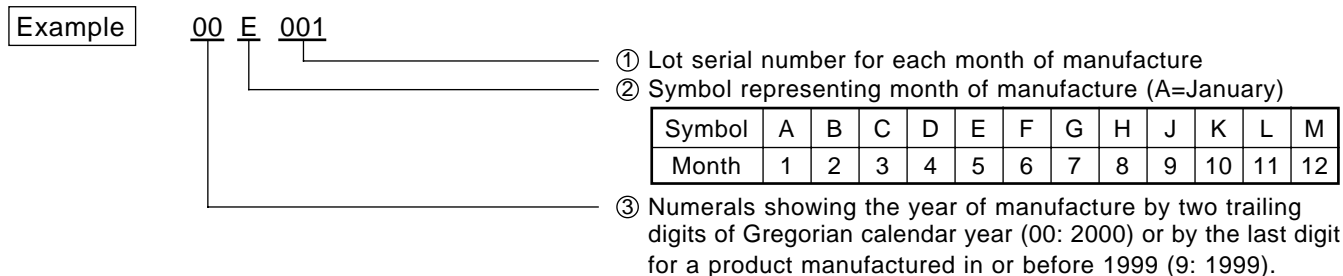


φd = Diameter of lead wire
 φD = Outer diameter including the thickness of coating
 l = Length of lead wire

Numbering System



Manufacturing Lot No.



Performance

Item	Part Number	AE0203D08	AE0203D16	AE0505D08	AE0505D16	AE1010D16	AE1414D16
Operating temperature range (Note 1) (°C)		-25~+85					
Maximum drive voltage (VDC)		150					
Recommended drive voltage (VDC)		100					
Displacement (Note 2) (μm)		9.1±1.5	17.4±2.0	9.1±1.5	17.4±2.0	18.4±3.5	18.4±3.5
Displacement (Note 3) (μm)		6.1±1.5	11.6±2.0	6.1±1.5	11.6±2.0	12.3±3.5	12.3±3.5
Insulation resistance (Note 4) (MΩ) min.		100	50	50	10	5	2
Capacitance (Note 5) (μF)		0.18±20%	0.35±20%	0.75±20%	1.4±20%	5.4±20%	10.8±20%
Dissipation factor (Note 5) max.		0.035	0.05	0.05	0.05	0.05	0.05

Note 1: The operating temperature is equal to the temperature of the actuator element when the element is driven with d.c. voltage. When the actuator element is driven with a.c. voltage, allow for a rise in temperature resulting from superimposed heat caused by dielectric loss to the operating temperature.

Note 2: Displacement resulting from applying the maximum drive voltage to the actuator element.

Note 3: Displacement resulting from applying a recommended drive voltage (100V) to the actuator element.

Note 4: DC150VDC obtained in 1 min

Note 5: f=1kHz, 1Vr.m.s.

Characteristics

Item	Model number	AE0203D08	AE0203D16	AE0505D08	AE0505D16	AE1010D16	AE1414D16
	Generated force (compression force) (N) ^(Note 1)		200	200	850	850	3500
Resonance frequency (kHz) ^(Note 2)		138	69	138	69	69	69
Tensile strength (N) ^(Note 3)		20	20	100	100	400	800
Young's modulus (N/m ²) ^(Note 3)		4.4×10 ¹⁰	4.4×10 ¹⁰	4.4×10 ¹⁰	4.4×10 ¹⁰	4.4×10 ¹⁰	4.4×10 ¹⁰

Note 1: See Fig. 3. In the drawing, F0 is called a generated force (compression resistance). The values are representative values obtained under the test conditions of TOKIN.

Note 2: The actuator element has both ends opened. The values are representative values obtained under the test conditions of TOKIN.

Note 3: The values are representative values obtained under the test conditions of TOKIN.

Note 4: See Fig. 3. The values are obtained by applying 150VDC to the actuator elements. These values are representative values obtained under the test conditions of TOKIN.

Fig. 1 Voltage and Generated Displacement vs Time Characteristics

Fig. 2 Voltage vs Generated Displacement Characteristics

Fig. 3 Generated Force vs Generated Displacement Characteristics (Hysteresis characteristics between generated displacement and generated force)

Fig. 4 Temperature Characteristics of Generated Displacement (Variations in displacement generated by the actuator element corresponding to variations in ambient temperature)

Fig. 5 Heat Development Characteristics (Variations in temperature of generated heat with time when a d.c. voltage having half the crest value of a sine waveform is superimposed on the sine waveform.)

Fig. 6 Heat Generation vs Frequency Characteristics

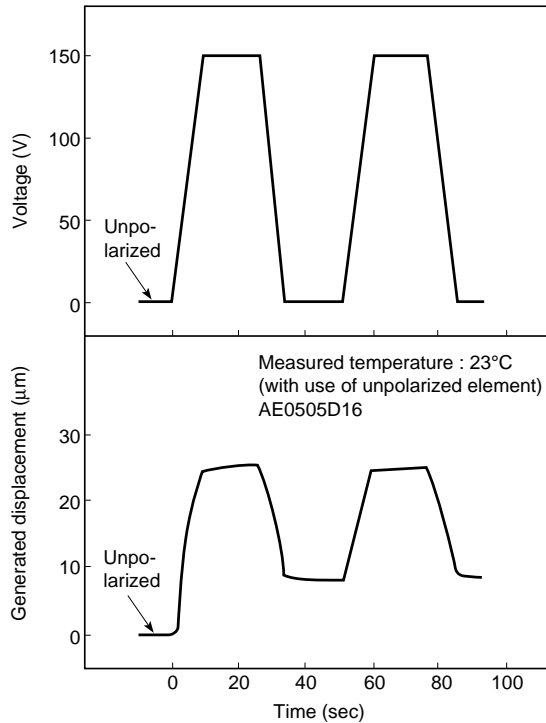


Fig. 1 Voltage and generated displacement vs time characteristics

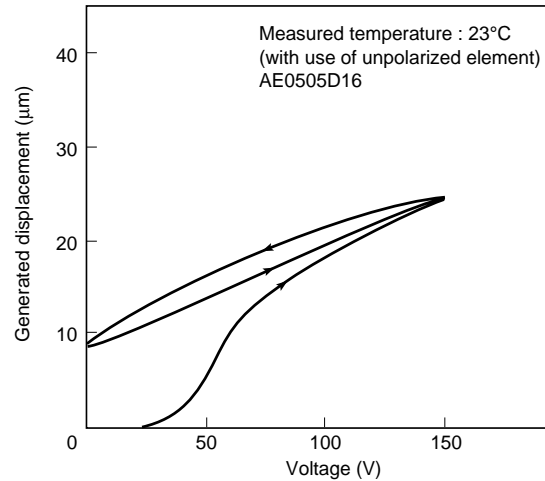


Fig. 2 Voltage vs generated displacement characteristics

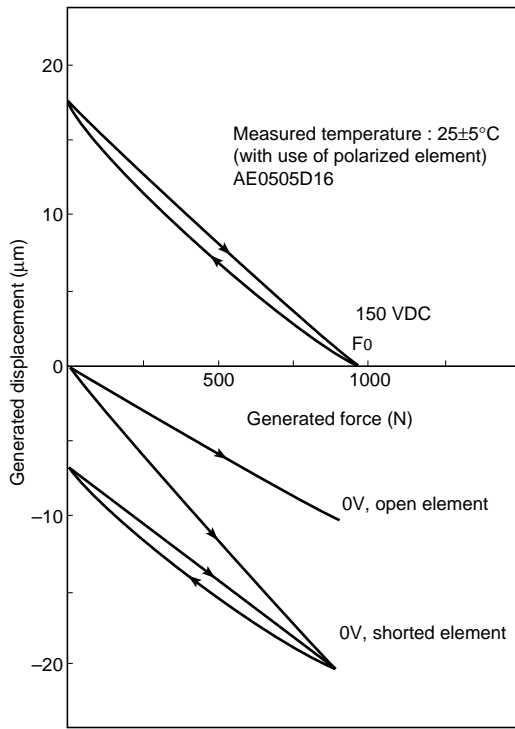


Fig. 3 Generated Force vs Generated Displacement Characteristics

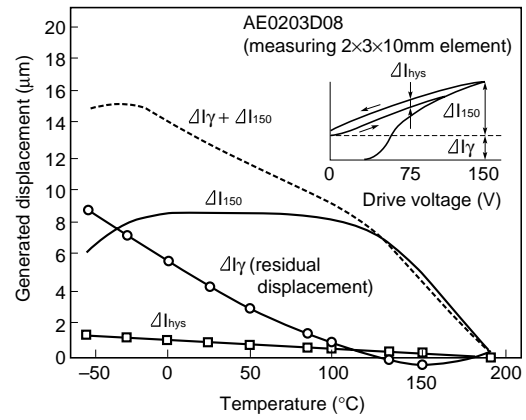


Fig. 4 Temperature characteristics of generated displacement

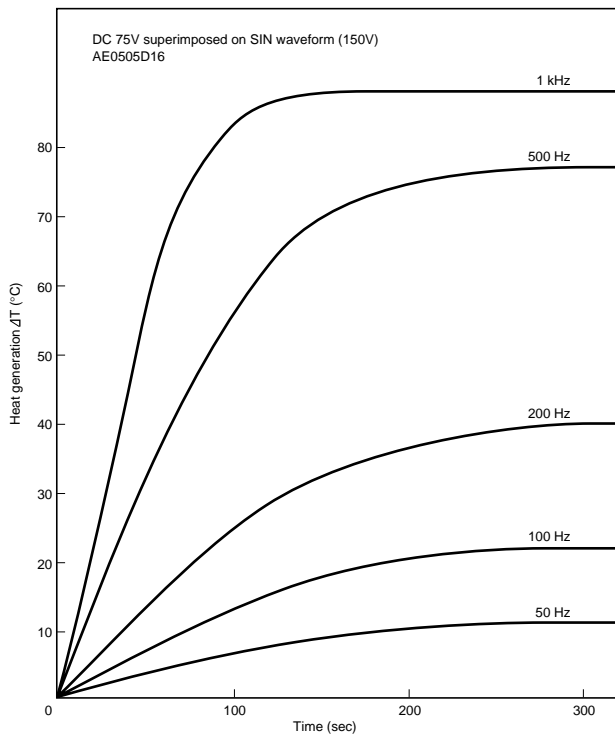


Fig. 5 Heat development characteristics

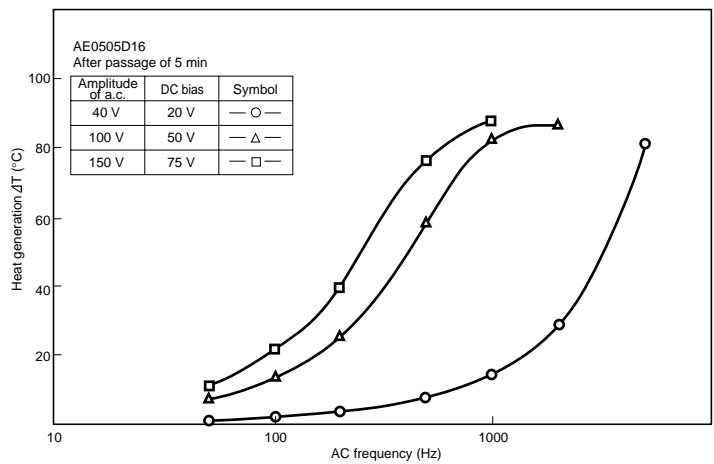


Fig. 6 Heat generation vs frequency characteristics

Environmental Performance

Item	Performance	Test Conditions
Temperature cycle test	a. Displacement : less than (initial value \pm 20%) b. Capacitance : less than (initial value \pm 30%) c. $\tan \delta$: less than initial rated value d. IR : more than 1M Ω e. Appearance : without noticeable defectiveness	Room temperature (3min) \rightleftarrows -25°C (30min) \rightleftarrows room temperature (3min) \rightleftarrows +85°C (30min) Number of cycle : 10 cycles

Note that the reliability of our products are dependent on the environment (particularly ambient humidity).

Note: Unless otherwise specified, tests are conducted in compliance with JIS C 5102 (method for testing fixed capacitor for use in electronic equipment).

AER Series (Ring type)

Ring type

Features

Internal space can be utilized

Specifications

Item	Part Number	AER13.6 × 10 × 20
Displacement (μm)		15.6 \pm 2 at 150V
Insulation Resistance (M Ω)		More than 5 DC150V (value per minute)
Capacitance (μF)		3.2 \pm 20%
Item (kg · f)		220 typ.

Because AER series are custom-made products, the product shown above is an example. Please consult us separately about size or data-sheet.