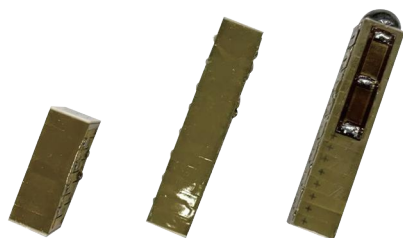# Square Piezoceramic Stack Actuator

Features

- Operating voltage: -20 to +150V
- 2 to 100μm travel range
- Vacuum compatible up to 10^{-6} Pa
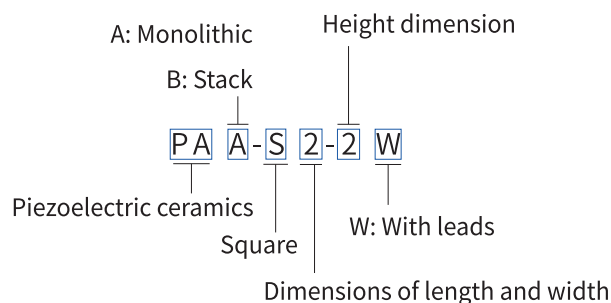- Sub-nanometer resolution
- Curie temperature: 230°C

Description

The stacked piezoelectric ceramic actuator adopts a structure formed by stacking piezoelectric ceramic plates. It achieves the superposition output of the displacement response of multiple ceramic layers under electrical signal excitation. It has a sub-millisecond response time and a maximum displacement exceeding 180μm.

Applications

- Scientific research
- Precision optical adjustment equipment
- Industrial automation
- Semiconductor equipment
- Precision motion control
- Precision inspection equipment

Model Interpretation

A: Monolithic
B: Stack
Height dimension

P A | A - S | 2 - 2 | W

Piezoelectric ceramics
Square
W: With leads
Dimensions of length and width

In the model number PAB-S7M-36, the "M" indicates a medium voltage level (120V), and the stack comes with wires by default.

Technical Specifications

	Dimensions	Displacement	Stiffness	Blocking force**	Electrical capacitance	Resonant frequency
Unit	mm×mm×mm	μm	N/μm	N	nF	kHz
Tolerance		±15%		Max. value	±15%	±15%
PAB-S3-5	3×3×5	5	64	350	120	250
PAB-S3-9	3×3×9	9	38	350	250	150
PAB-S5-5	5×5×5	5	187	1000	350	250
PAB-S5-9	5×5×9	10	104	1000	680	140
PAB-S5-18	5×5×18	20	52	1000	1300	70
PAB-S5-20	5×5×20	20	43	1000	1600	60
PAB-S5-36	5×5×36	40	26	1000	2800	35
PAB-S5-45	5×5×45	50	21	1000	3800	27
PAB-S5-60	5×5×60	68	16	1000	5000	21
PAB-S5-72	5×5×72	80	13	1000	6000	17
PAB-S7-9	7×7×9	10	191	1960	1500	140
PAB-S7-18	7×7×18	20	86	1960	2700	70
PAB-S7-20	7×7×20	20	57	1960	3000	70
PAB-S7-36	7×7×36	40	48	1960	6000	34
PAB-S7M-36	7×7×36	40	48	1960	9500	35
PAB-S7-45	7×7×45	50	38	1960	9000	27
PAB-S7-54	7×7×54	60	32	1960	9500	23
PAB-S7-60	7×7×60	66	29	1960	11000	21
PAB-S7-72	7×7×72	75	24	1960	12000	18
PAB-S7-90	7×7×90	100	19	1960	16000	14
PAB-S10-18	10×10×18	20	185	3900	6000	70
PAB-S10-30	10×10×30	33	105	3900	10000	41
PAB-S10-36	10×10×36	40	85	3900	13000	34

The cross-sectional dimensions within ±0.1mm tolerance, and the length dimension within standard tolerance of ±0.1mm.
Tolerance can be reduced to ±10μm for special request
Displacement dimensions within ±15% tolerance
Optional soldering of standard wiring harness available, length 75mm, AWG32, PTFE insulation, followed by 'W' in the product code

*Displacement test: drive voltage range 0 to 150V,another PAB-S7M-36 drive voltage 0~120V, tolerance ±15%
**Blocking force test:The force that compresses the ceramic elongation to zero at a driving voltage of 150v
***Capacitance test conditions: ambient temperature environment, 1Vpp, 1kHz, tolerance ±15%
Other specifications can be customized on request

Customization Information

■ **Drive Voltage:** YiNGUAN can flexibly customize the maximum drive voltage of the device. The common available options for the maximum drive voltage we provide are 50V, 75V, 100V, 120V, and 150V. Other special maximum drive voltages can also be customized flexibly according to customer requirements.

■ **Output Displacement:** The output displacement is primarily determined by the length of the device. YiNGUAN offers a maximum displacement range of up to 200μm.

■ **Operating Frequency:** The long-term operating frequency of the stack depends on factors such as the resonant frequency of the device and the drive voltage. YiNGUAN can flexibly design according to customer requirements. The maximum drive frequency for the stack can reach up to 30kHz.

■ **Dimensions:** The dimensions of the square stack-type actuator can be customized flexibly. For length and width, customization is available from a minimum of 3mm to a maximum of 10mm. For height, customization is available from a minimum of 9mm to a maximum of 180mm.

■ **Wiring Harness:** A wiring harness can be optionally equipped while meeting the AWG usage standards. The standard length of the harness is 7.5 cm of tinned wire, and both the length and orientation of the harness can be customized flexibly according to customer requirements. To facilitate the connection of positive and negative electrode wires, the soldering point position can be selected within the allowable error range of performance variation.

Performance Chart
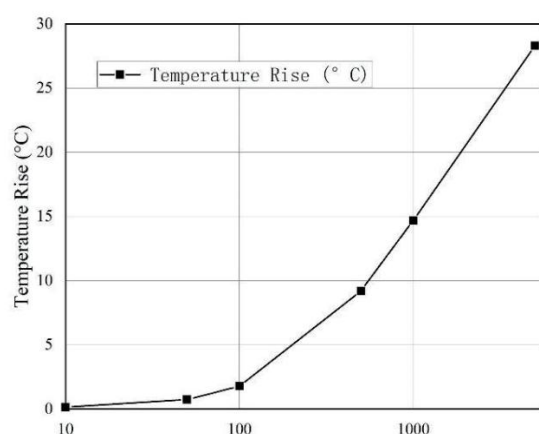
The figure above shows the relationship between temperature rise and drive voltage frequency of the PAB-S7-36. (Measured after applying a sinusoidal drive voltage ranging from 0 to 150V at the specified frequency for 10 minutes.)
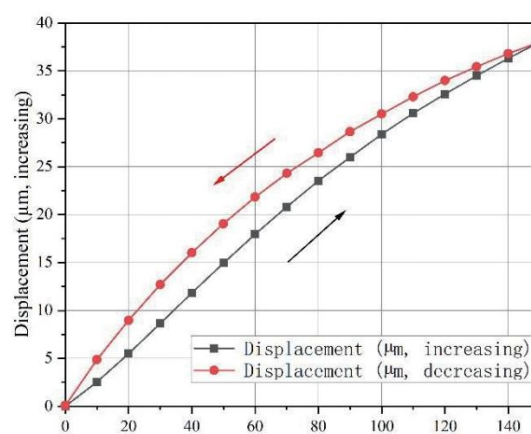
The figure above shows the displacement of the PAB-S7-36 at 25°C, under no load, and with a 150V drive voltage.

◆ Closed-loop Version

Interface Definition
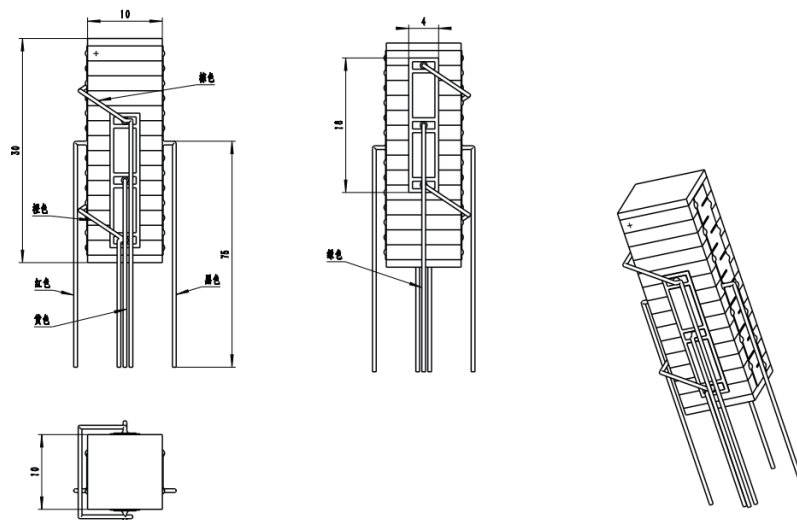
Model: PAB-S10-30W-S

Technical Specifications

	PAB-S5-36W-S	PAB-S7-36W-S	PAB-S10-36W-S	Unit	Tolerance
Active axes	Z	Z	Z		
Operating voltage	-20~150	-20~150	-20~150	V	
Max. displacement	40	40	40	μm	±15%
Push force	1000	1960	3900	N	Max. value
Electrical capacitance	2.8	6	13	μF	±15%
Resonant frequency	34	34	34	kHz	±15%
Strain gauge resistance	350	350	350	Ω	±3 Ω
Curie temperature	230	230	230	°C	
Electrode	Silver	Silver	Silver		
Dimensions					
A	5	7	10	mm	±0.1 mm
B	5	7	10	mm	±0.1 mm
H	36	36	36	mm	±0.1 mm

*Displacement test: drive voltage range 0 to 150V,tolerance ±15%.
**Thrust test: drive voltage range 0 to 150V
*** Capacitance Measurement Conditions: Room temperature environment, 1 Vpp, 1 kHz, tolerance ±15%.

![logo](YiNGUAN 隐冠半导体)

Customization Information

The tolerance for cross-sectional dimensions is ±0.1mm, and the standard tolerance for length dimensions is ±0.1mm; special requirements can be customized to ±10μm. The tolerance range for displacement dimensions is ±15%.

■ **Wiring Harness:** A wiring harness can be optionally equipped while meeting the AWG usage standards. To facilitate the connection of positive and negative electrode wires, the soldering point position can be selected within the allowable error range of performance variation.

■ **Shape and Dimensions:** Provided that the strain gauge resistance size requirements are met, the available length and width dimensions are 5×5mm, 7×7mm, and 10×10mm, with a height dimension of ≥18mm.

■ Other special requirements can be customized according to customer specifications.

Performance Chart

Comparison of Displacement Curves between Closed-Loop Stacks and Open-Loop Stacks
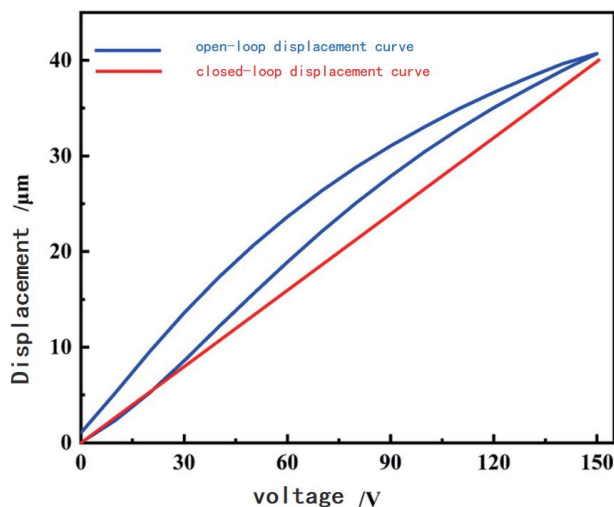
Different types of stacks (such as square with holes, circular rings, etc.) follow this pattern and can be represented by this diagram.