

Smart Actuator Series : Piezo Assist Motor[®]

Nanometer level alignment

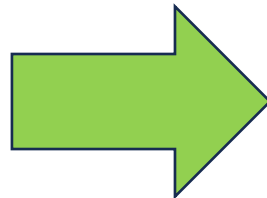
Precision stage enables nanometer positioning

Conventional



Micrometer Head

- Resolution : μm order
- Manual
- Big Back Crush



New Product



Piezo Assist Motor[®]

- Resolution : nm order
- Electronic
- Small Back Crush

Detail :

Just replace the micrometer head with the Piezo Assist Motor[®],

- Resolution increases to below 30 nanometers
- After positioning, the position can be maintained without power supply
- Easily electrify and automate precision stages

Produced and manufactured by



Benefits of using this product

⇒ Achieving automation and technological sophistication of your equipment

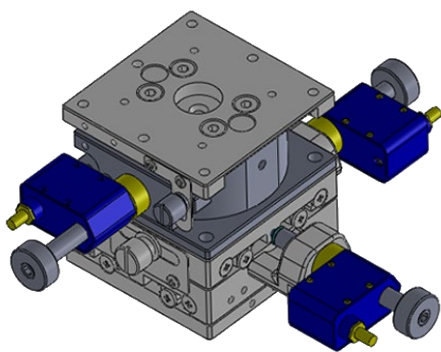
Piezo Assist Motor[®] is a small electric actuator with a resolution of less than 30 nanometers. Ultra-precise positioning can be automated simply by replacing the micrometer head of the precision stage with the Piezo Assist Motor[®]

- ✓ Easily realize automation using electric drive
- ✓ Easily achieves positioning of 30 nanometers or less
- ✓ Maintains adjusted position even without power supply
- ✓ Easily replaceable with micrometer head
- ✓ Easily visualize the amount of movement by attaching an external sensor

Example

1. Precision Stage

3-axis precision stage equipped with Piezo Assist Motor[®]



Precision stage equipped with piezo assist motor

Features ① Resolution within 30nm

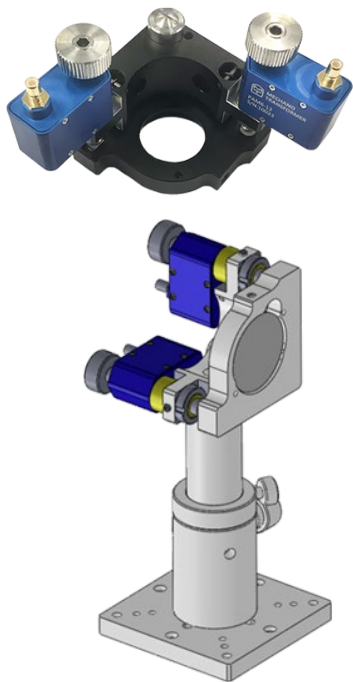
Features ② Travel amount 13mm

Feature ③ No need for power supply after positioning

Example : micromanipulation, scanning microscope, high resolution microscope 2.

Mirror Mount

2-axis mirror mount equipped with Piezo Assist Motor®



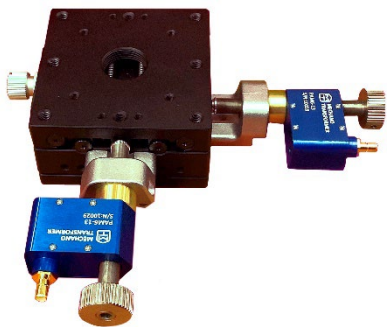
Feature① Adjustable in μ rad order

Feature② Easy automation

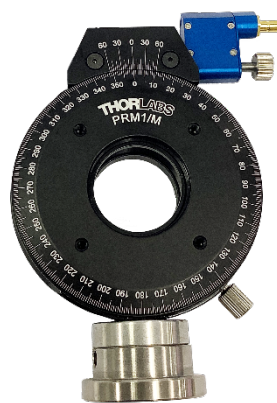
Feature③ No power required after positioning

Examples: interferometer construction, laser irradiation positioning, laser welding

Case photos

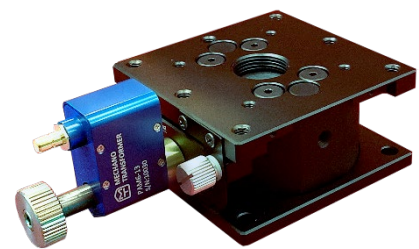


XY Precision Stage



Precision rotation mount

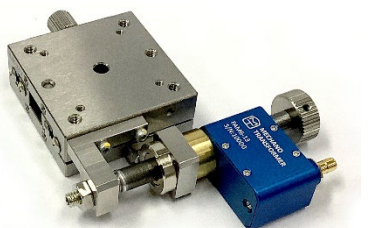
$\text{O}25\text{ mm} \sim \text{O}25.4\text{ mm}$
For optical elements (mm standard)



Z-axis precision stage



Rotating precision stage



Vacuum precision stage

Structure and operating principle of Piezo Assist Motor[®]

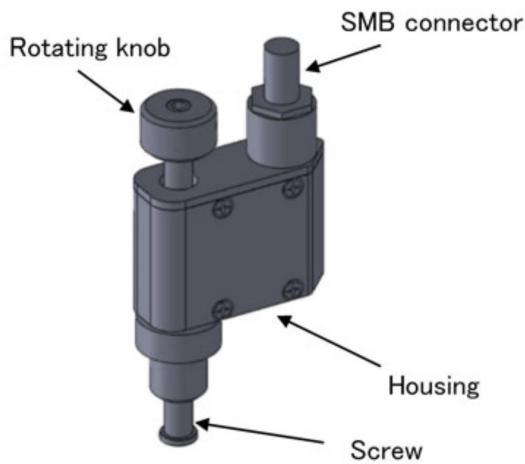


Fig. 1. Piezo Assist Motor outer view

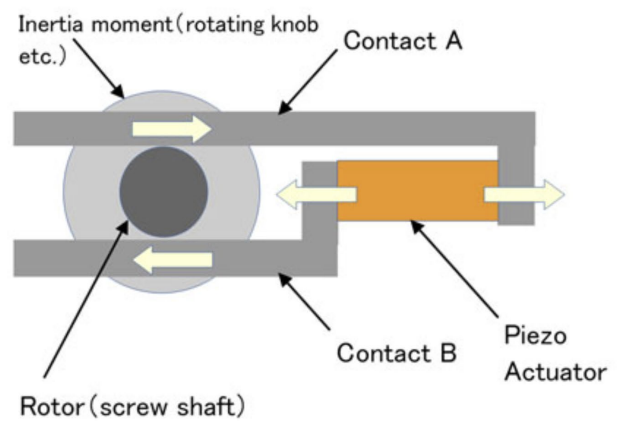


Fig. 2. Piezo assist motor rotation mechanism & principal diagram

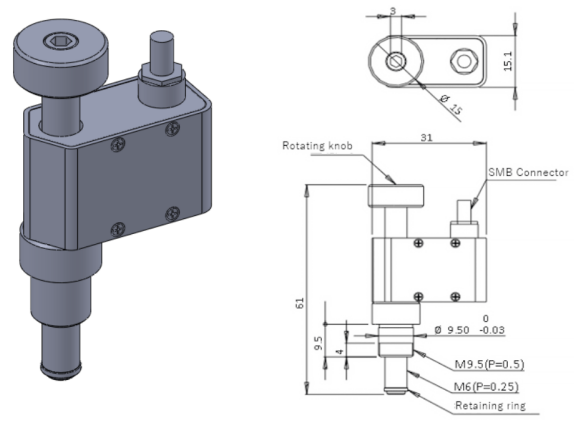
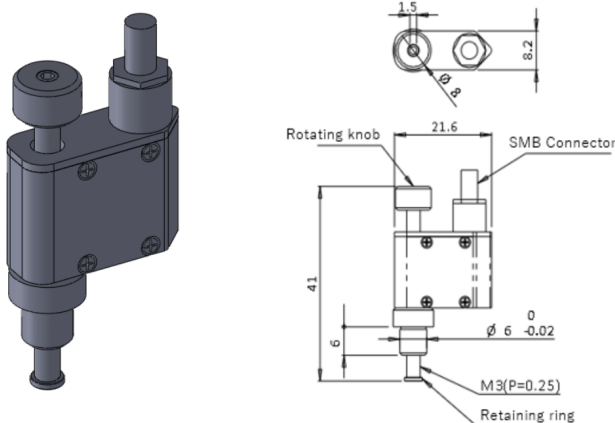
A piezo assist motor rotates the screw shaft using a piezo inertia rotation mechanism inside the housing, generating thrust and displacement in the direction of the screw shaft.

In the principal diagram of the piezo inertial rotation mechanism shown in Figure 2, the rotor is integrated with the screw shaft and connected to the moment of inertia (rotation knob, etc.), and the required static friction force is maintained between the rotor and the contact. Pressure (not shown) is applied to. When the piezoelectric element extends as shown in Figure 2, contacts A and B move relative to each other as shown in Figure 2. If the force generated by the acceleration of the rotational motion generated in the moment of inertia due to the acceleration of the relative motion of contacts A and B is less than the static friction force between the rotor and the contactor, the rotor will cause rotational motion and the static friction. If the force is greater than that, slippage will occur between the rotor and the contact.

Approximate dimensions of Piezo Assist Motor[®]

PAM3-6.5

PAM6-13

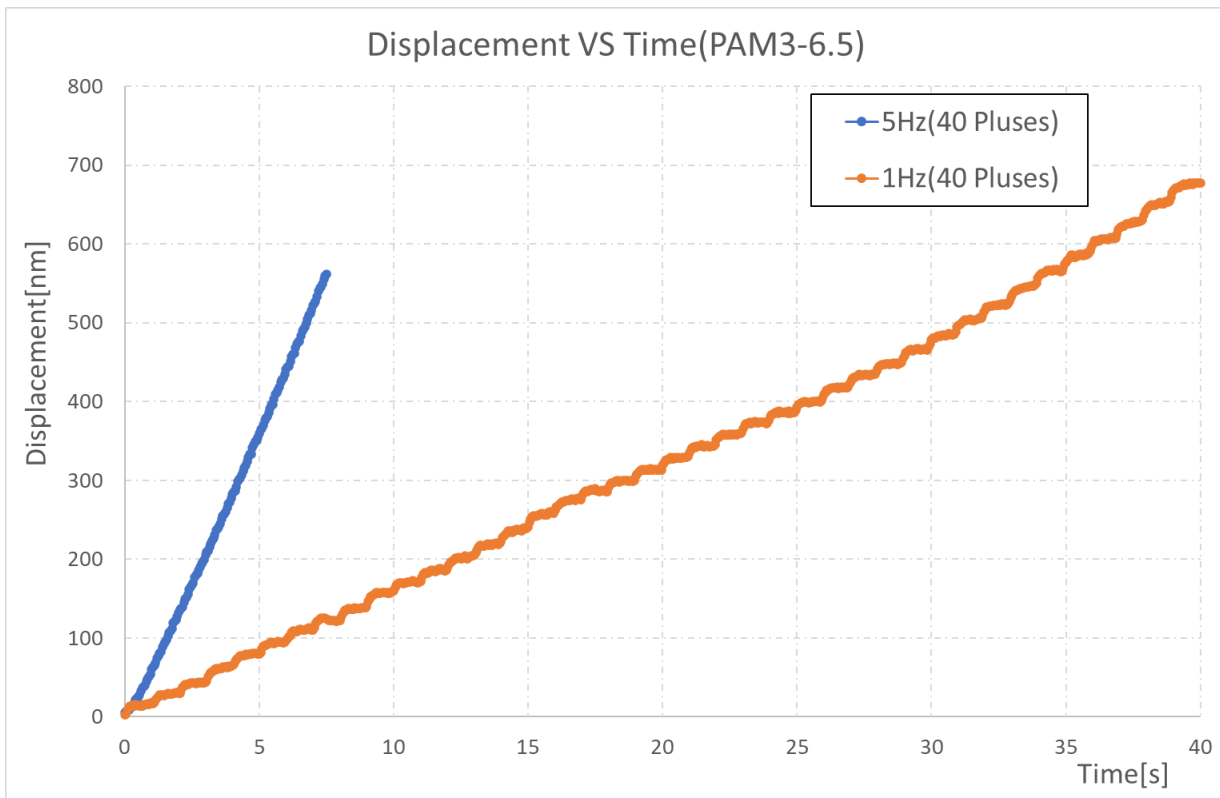


Piezo Assist Motor[®] Specification

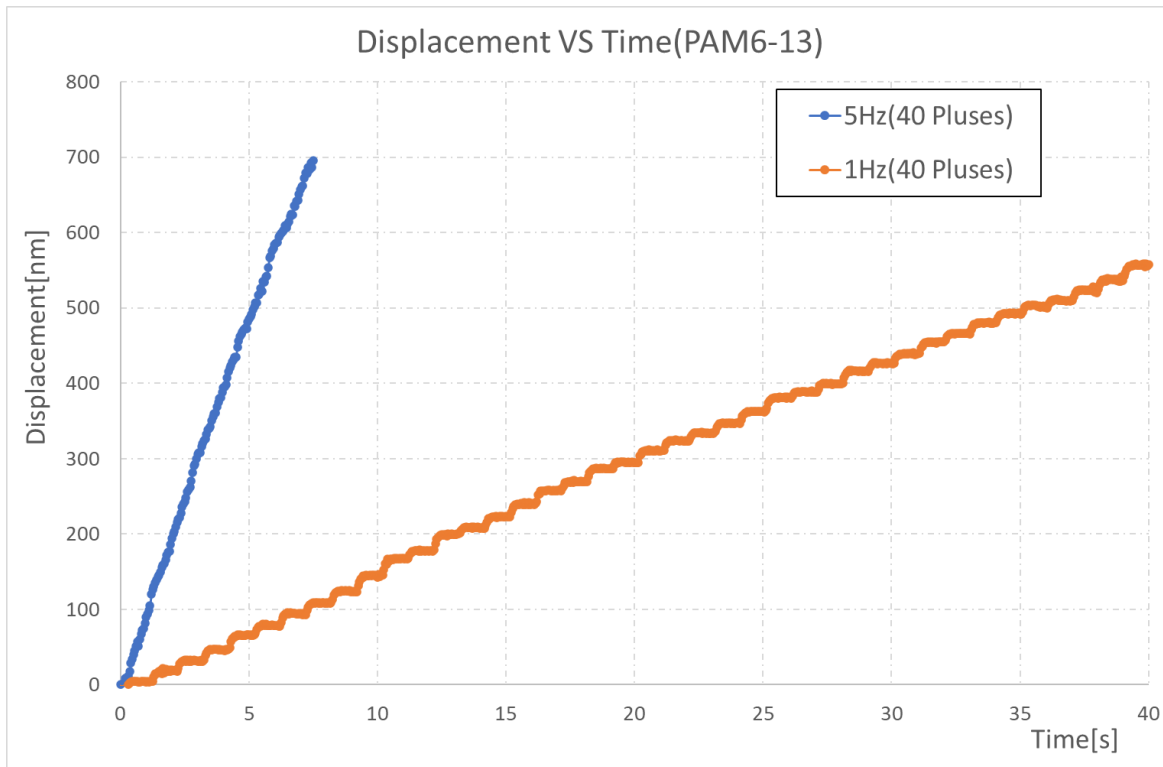
| Specifications | | |
|------------------------------|-------------------------------|-------------------------------|
| Product Name | PAM3-6.5 | PAM6-13 |
| Minimum Movement (nm) | Below 30 | Below 25 |
| Maximum Load Capacity (N) | Above 13 | Above 29.4 |
| Maximum Drive Frequency (Hz) | 2000 | 2000 |
| Moving Speed (mm/min) | 1.5 | 1.5 |
| Travel range (mm) | Above 6.5 (Maximum 9) | Above 13 (Maximum18) |
| Mounting Part (mm) | φ6 shank | M9x0.5 screw |
| Dimension (mm) | 41x21.6x8.2 | 61x31x15.1 |
| Operating Temperature | 0~40°C | 0~40°C |
| Storage Temperature | 0~40°C | 0~40°C |
| Ambient Humidity | 10~80%RH (No condensation) | 10~80%RH (No condensation) |
| Connector | SMB connector | SMB connector |
| Lifespan | Above 1x10 ⁹ pulse | Above 1x10 ⁹ pulse |
| Weight (kg) | 0.02 | 0.05 |

Operation waveform of Piezo Assist Motor[®]

PAM3-6.5

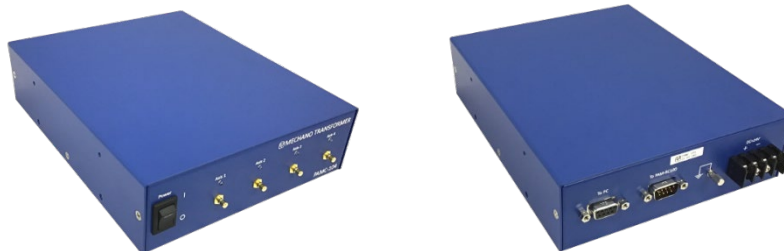


PAM6-13



Controller for Piezo Assist Motor®

PAMC-104



| Specifications | PAMC-104 |
|--|----------------------------|
| Number of Driving Axis | 4 |
| Maximum Driving Frequency (Hz) | 1500 |
| Interface | RS-232C |
| Switchable channel number | 4 |
| Power Supply Voltage (V) | DC24 |
| Current consumption (A) | — |
| Dimension(mm) (excluding protrusions) | 200x162x50 |
| Operating Temperature | 0~40°C |
| Storage Temperature | 0~40°C |
| Ambient Humidity | 10~80%RH (No condensation) |
| Weight (kg) | 1.2 |

PAM-RC100 (Option)



| | |
|---|----------------------------|
| Product Name | PAM-RC100 |
| Maximum Driving Frequency (Hz) | 1500 |
| Switchable channel number | 4 |
| Interface | RS-232C |
| Dimension (mm) (excluding protrusions) | 102x78x30 |
| Operating Temperature | 0~40°C |
| Storage Temperature | 0~40°C |
| Ambient Humidity | 10~80%RH (No condensation) |
| Weight (kg) | 0.32 |

PAMC4-485



| | |
|--|----------------------------|
| Specifications | PAMC4-485 |
| Number of Driving Axis | 4 |
| Maximum Driving Frequency (Hz) | 1500 |
| Interface | RS485 |
| Switchable channel number | 4 |
| Power Supply Voltage (V) | DC24 |
| Current consumption (A) | — |
| Dimension(mm) (excluding protrusions) | 200x162x50 |
| Operating Temperature | 0~40°C |
| Storage Temperature | 0~40°C |
| Ambient Humidity | 10~80%RH (No condensation) |
| Weight (kg) | 1.2 |

Operating precautions :

1. A high voltage is applied to the Piezo Assist Motor® during operation. Use only specified controllers such as PAMC-104 or PAMC4-485 to drive the motor.
2. If you need to disconnect or plug in the cable from the Piezo Assist Motor® or controller, turn off the power to the controller before doing so.
3. Do not disassemble or modify the piezo assist motor or controller PAMC-104 or PAMC4-485
4. Do not use the motor near flammable materials or damp or humid areas
5. If a strange odor, noise, overheating, or heat radiation is detected, please turn off the controller and check the situation.
6. Do not turn on the driver after dropping the controller or subjecting it to impact.
7. Do not touch the PAM during operation, as high voltages are applied during operation.
8. If the Piezo Assist Motor® moves to the threaded end, you can manually adjust the position by turning the adjustment knob.
9. Piezo Assist Motor® is an open loop device. If absolute position is required, a separate external sensor must be provided, and a closed loop must be configured.
10. During operation, the Piezo Assist Motor® produces high pitch noise.
11. You can prevent grease from sticking by moving the knob from one end to the other to redistribute the grease from time to time. If the motor is not used for a long time, the grease may become hard. In that case, you may be able to fix it by manually turning the knob from one end to the other.

Manufacturer :

Mechano Transformer Corporation
4F BUILDX No.3, 2-7-12, Iwamoto-cho,
Chiyoda-ku, Tokyo 101-0032 Japan