

Enabling nanometer positioning

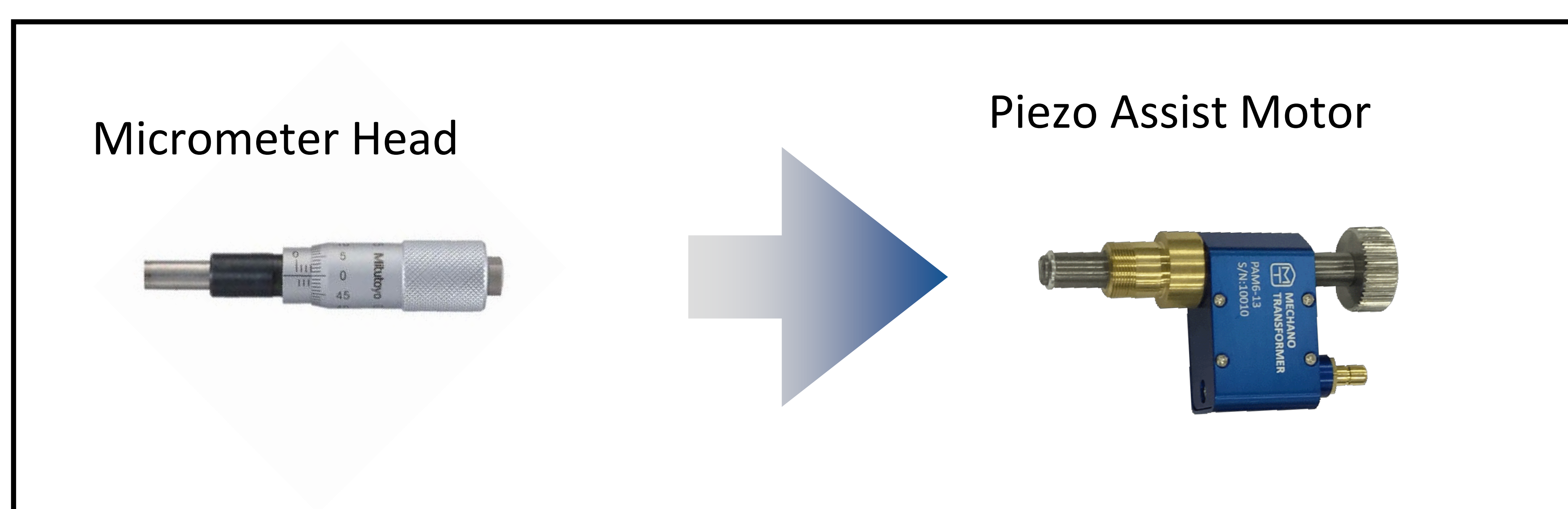
Piezo Actuator

Piezo Assist Motor®

Automate precision manual stage positioning
Towards a more rational manufacturing site

The Piezo Assist Motor® is a small piezo actuator with a positioning resolution which is less than 30 nanometers. By simply replacing the micrometer head of a manual precision stage with a Piezo Assist Motor®, nanometer order positioning can be realized.

Just replace it with a Piezo Assist Motor®

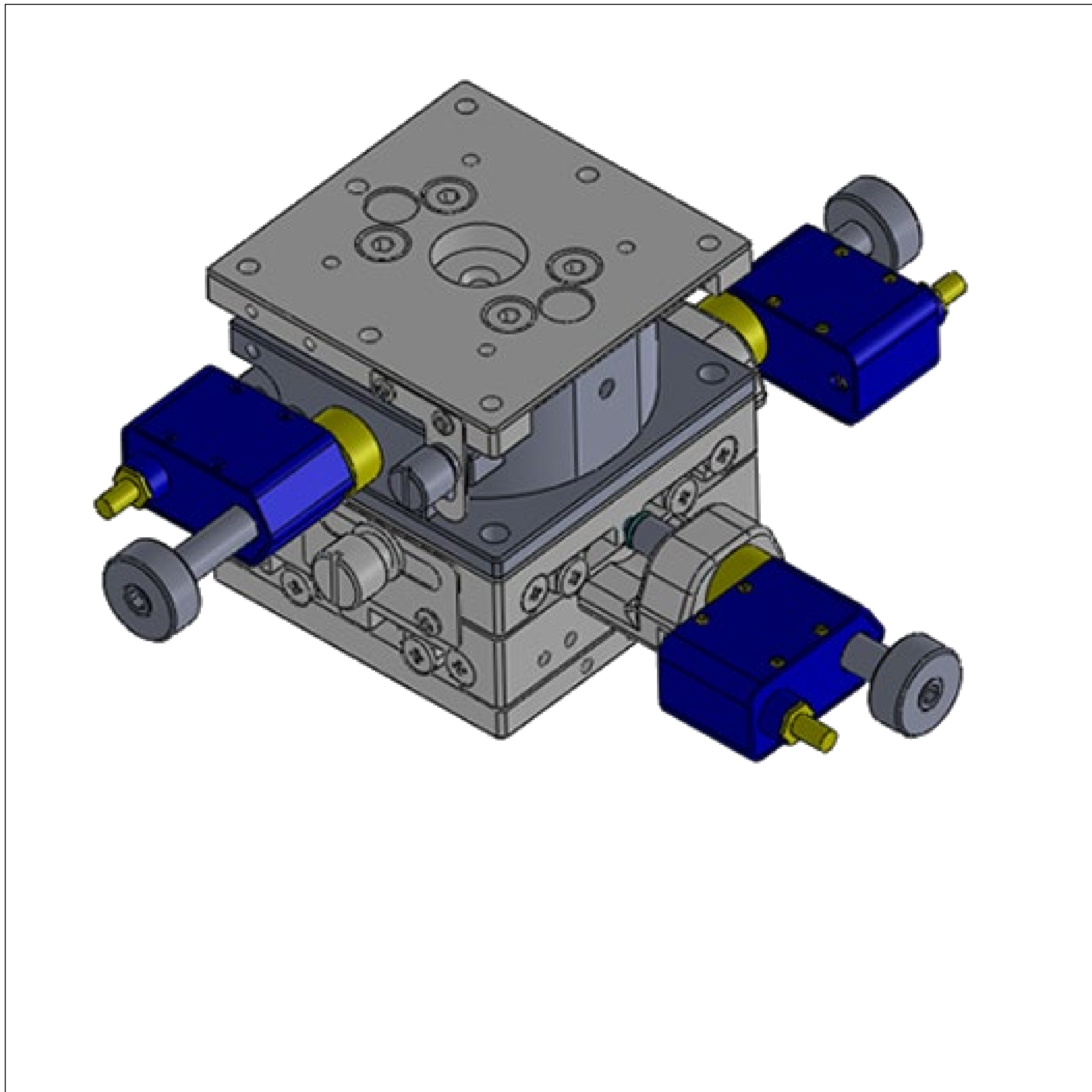


- ⦿ Electric driven and automation
- ⦿ Less than 30 nanometers positioning resolution
- ⦿ Positioning is maintained without power supply
- ⦿ Virtually no backlash

Use Cases

► Precision Stage

3-axis (X-axis, Y-axis, Z-axis) precision stage equipped with a Piezo Assist Motor[®]



Features

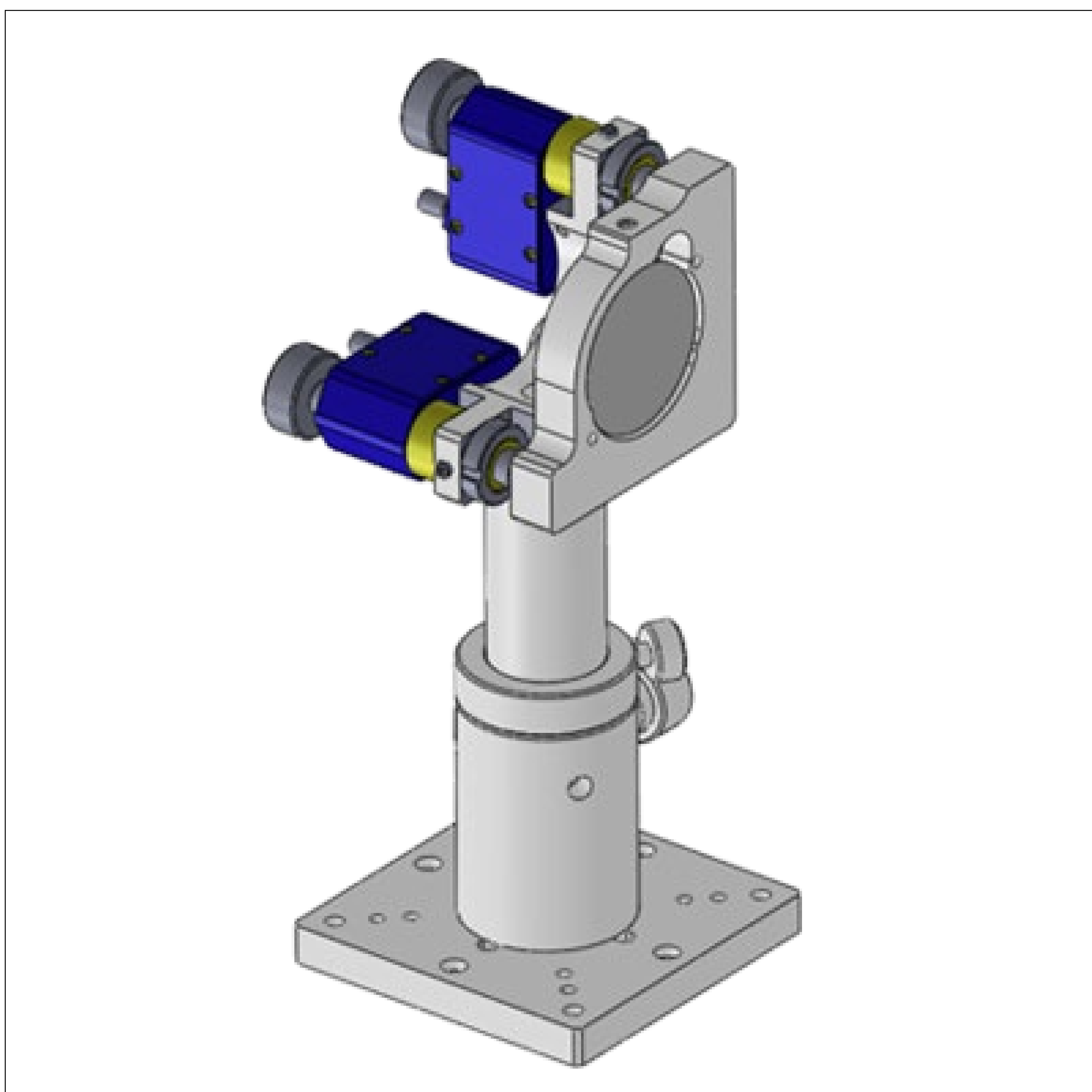
- ✓ Resolution below 30 nm
- ✓ Travel: 13mm
- ✓ No power supply required after positioning

Use Cases

- Micromanipulation
- Scanning Microscope
- High-resolution microscope

► Mirror mount

Two-axis (θ_1 -axis, θ_2 -axis) mirror mount equipped with a Piezo Assist Motor[®]



Features

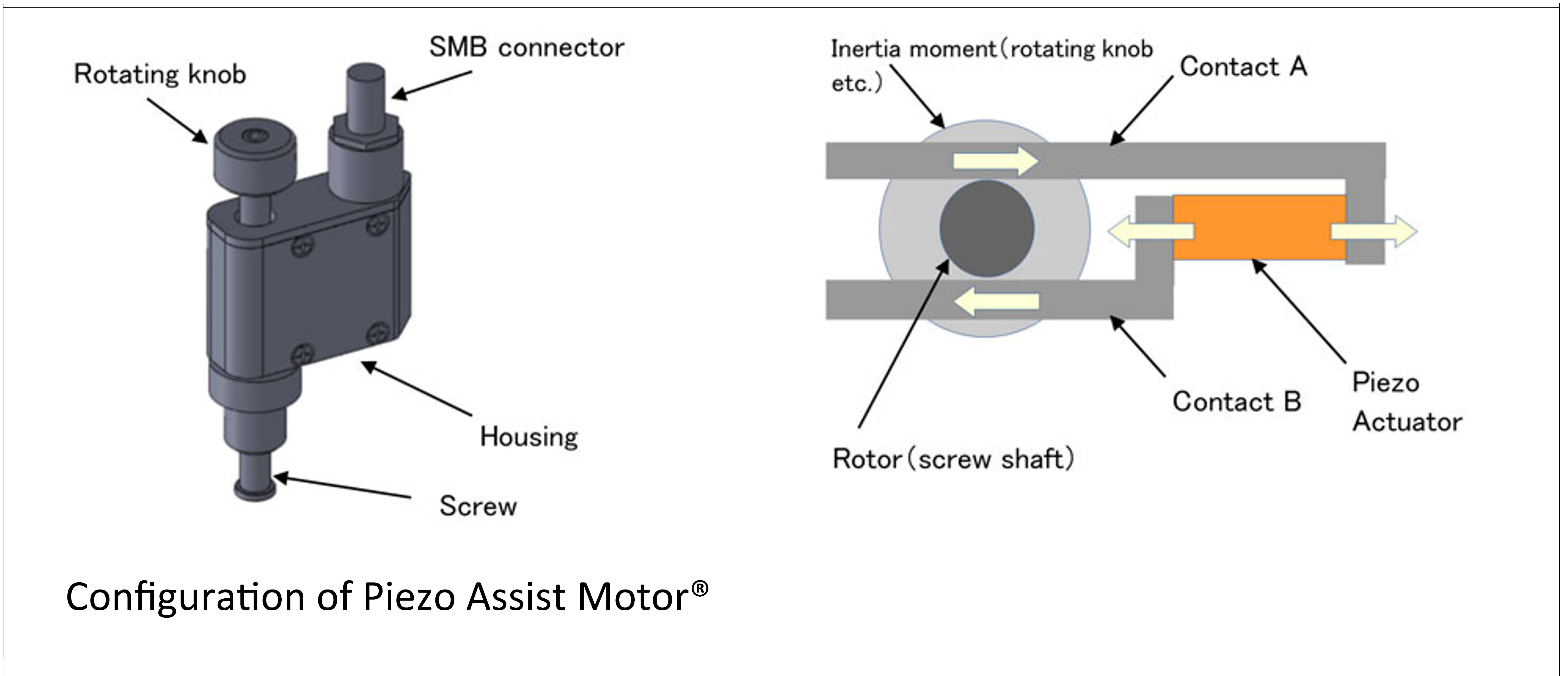
- ✓ Adjustable in the μ rad order
- ✓ Automation made easy
- ✓ No power supply required after positioning

Use Cases

- Building an interferometer
- Laser irradiation positioning
- Laser welding

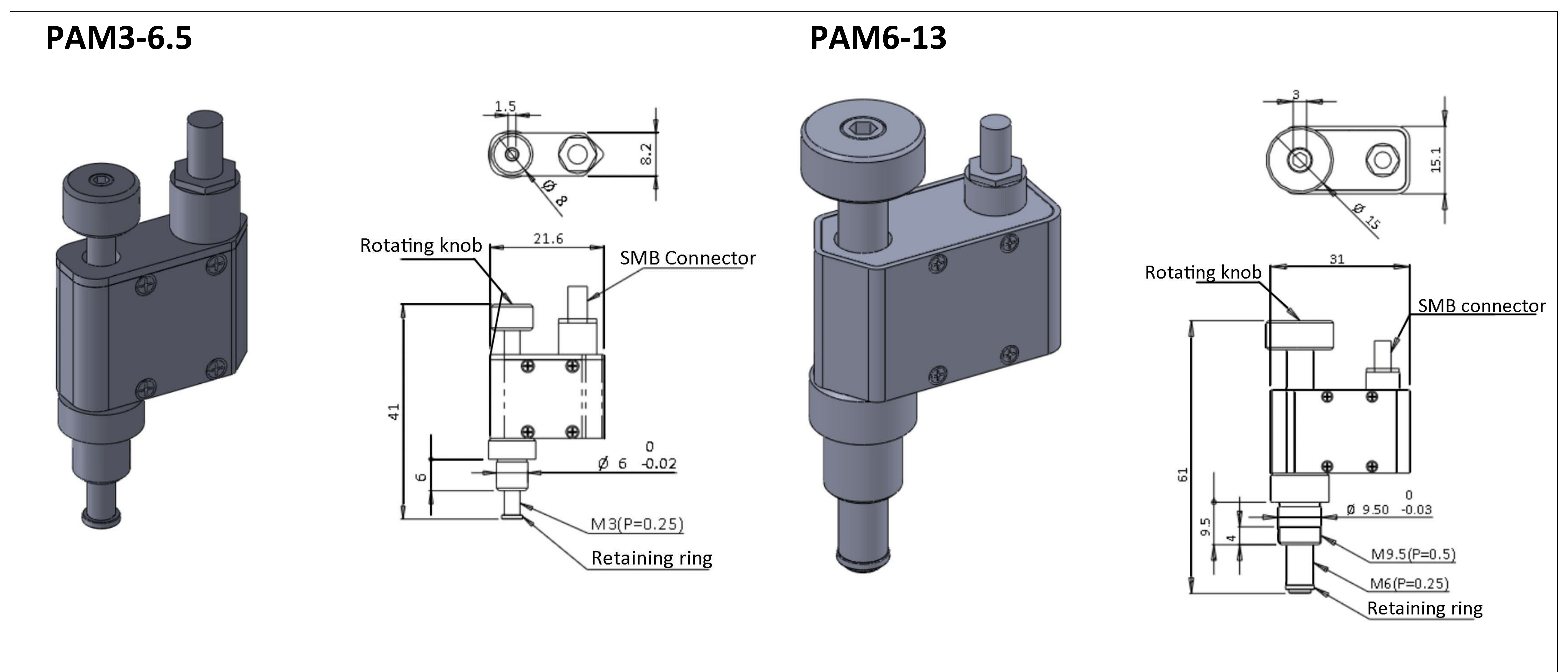
Configuration and operating principle

The Piezo Assist Motor[®] uses a piezoelectric inertia rotation mechanism inside the housing to rotate the screw shaft, generating thrust and displacement in the screw shaft direction.



The rotor is connected to the screw shaft as one body and to the moment of inertia (such as a rotating knob), and pressure (not shown) is applied between the rotor and the contacts to create the required static friction force (Figure 2). When the piezoelectric element expands, contacts A and B move relative to each other. If the force generated by the acceleration of the rotational motion caused in the moment of inertia by this acceleration is less than the static friction force between the rotor and the contacts, the rotor will rotate, and if it is greater than the static friction force, slippage will occur between the rotor and the contacts.

External dimensions



Produced and manufactured by



Specifications (Piezo Assist Motor[®])

| Model number | PAM3-6.5 | PAM6-13 |
|-------------------------------|------------------------------------|------------------------------------|
| Minimum movement (nm) | Under 30 | 25 or less |
| Maximum load capacity (N) | 15 or less | Under 30 |
| Maximum drive frequency (kHz) | 1.5 | 1.5 |
| Maximum speed (mm/min) | 1.5 or higher | 1.5 or higher |
| Movement (mm) | 6.5mm or more | 13mm |
| Mounting section (mm) | φ6 shank | M9x0.5 Screw |
| Dimensions (mm) | 41x 21.6 x 8.2 | 61 x 31 x 15.1 |
| Operating temperature (°C) | 10–40 | 10–40 |
| Storage temperature (°C) | 5–40 | 5–40 |
| Ambient humidity (%RH) | 10–80 (No condensation) | 10–80 (No condensation) |
| Connector | SMB Connector | SMB Connector |
| Lifespan | 1 x 10 ⁹ pulses or more | 1 x 10 ⁹ pulses or more |
| Mass (kg) | 0.02 | 0.05 |
| Price excluding tax (JPY) | 80,000 | 70,000 |

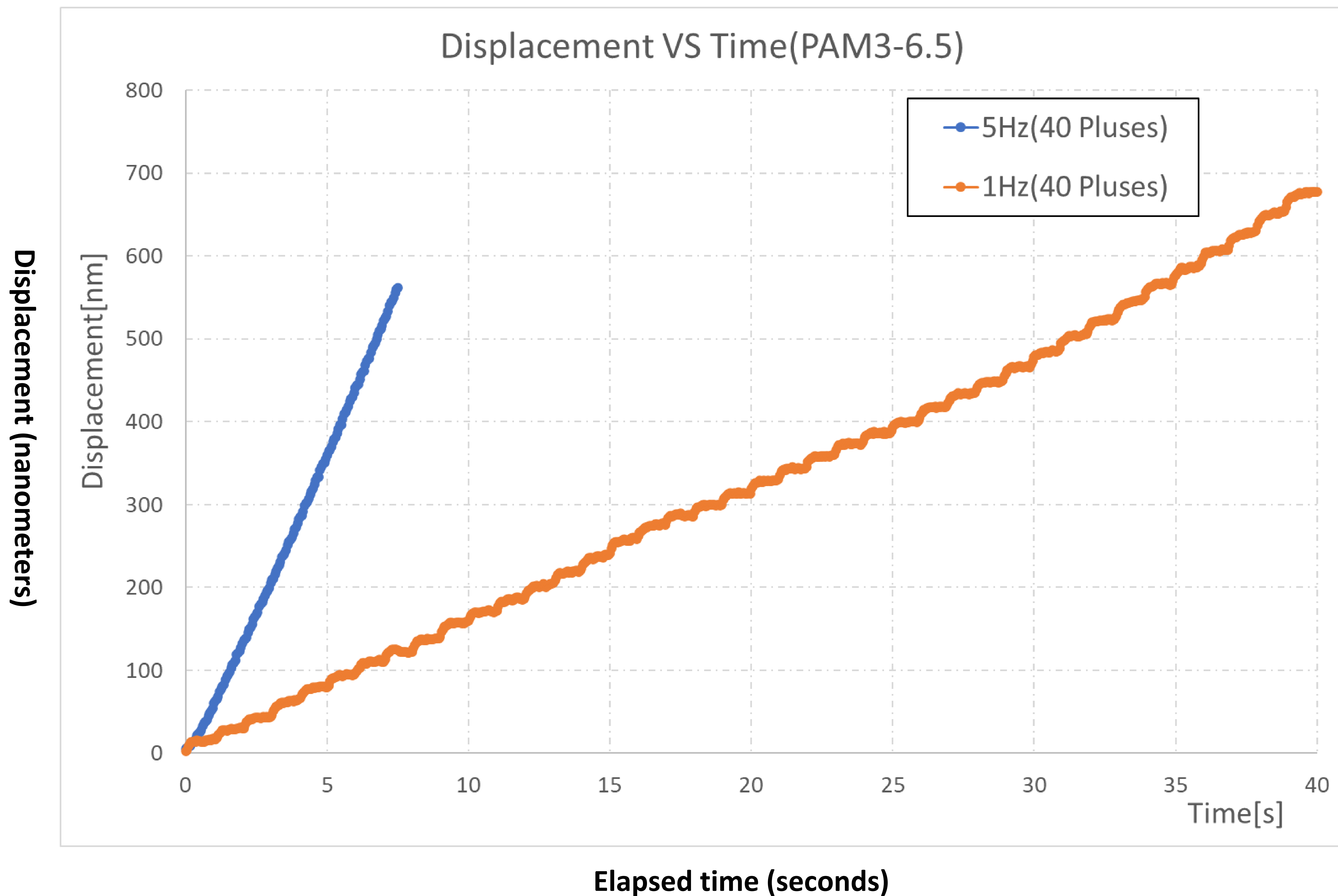
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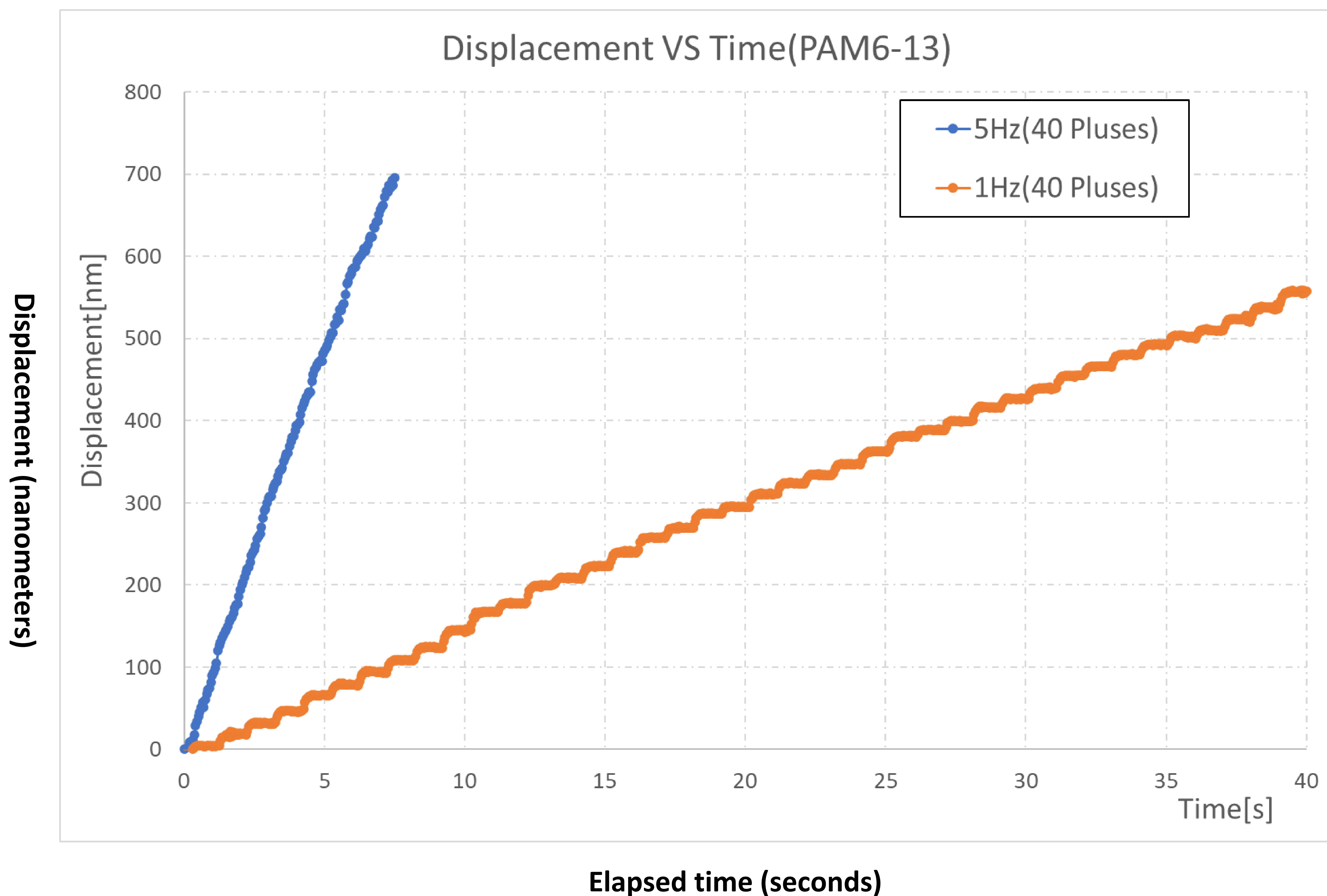
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Specialist of Precision Piezo-Actuators

Operating Waveform

► PAM3-6.5



► PAM6-13



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Notes

1. The Piezo Assist Motor® applies high voltage during operation. Please use only the dedicated controller such as PAMC-104 or PAMC4-485 to drive the motor.
2. When connecting or disconnecting the cable from the Piezo Assist Motor® or controller, be sure to turn off the power to the controller first.
3. Do not disassemble or modify the Piezo Assist Motor® or controller such as PAMC-104 or PAMC4-485.
4. Do not use the motor near flammable materials or in areas with high humidity or moisture.
5. If you detect any strange odors, strange noises, overheating, or heat dissipation, turn off the controller and check the situation.
6. Do not turn on the controller after it has been dropped or subjected to impact.
7. Do not touch the Piezo Assist Motor® while it is in operation as high voltage is applied .
8. the Piezo Assist Motor® moves to the end of the screw, you can manually adjust the position by turning the adjustment knob.
9. The Piezo Assist Motor® an is open loop device, if absolute position is required an external sensor must be attached to create a closed loop.
10. During operation, the Piezo Assist Motor® a makes high pitch noise.
11. Periodically turning the knob from one end to the other will help prevent the grease from hardening. If the grease hardens due to not using the motor for a long time, you may be able to fix the problem by manually turning the knob from one end to the other.
12. A Piezo Assist Motor® a to precision stage, it is recommended to use a C-type tightening method that surrounds the entire circumference of the shank. Also, fixing with excessive tightening torque may cause the shank to deform, resulting damage of the Piezo Assist Motor®. Please be careful not to exceed the maximum tightening torque specified for each model.

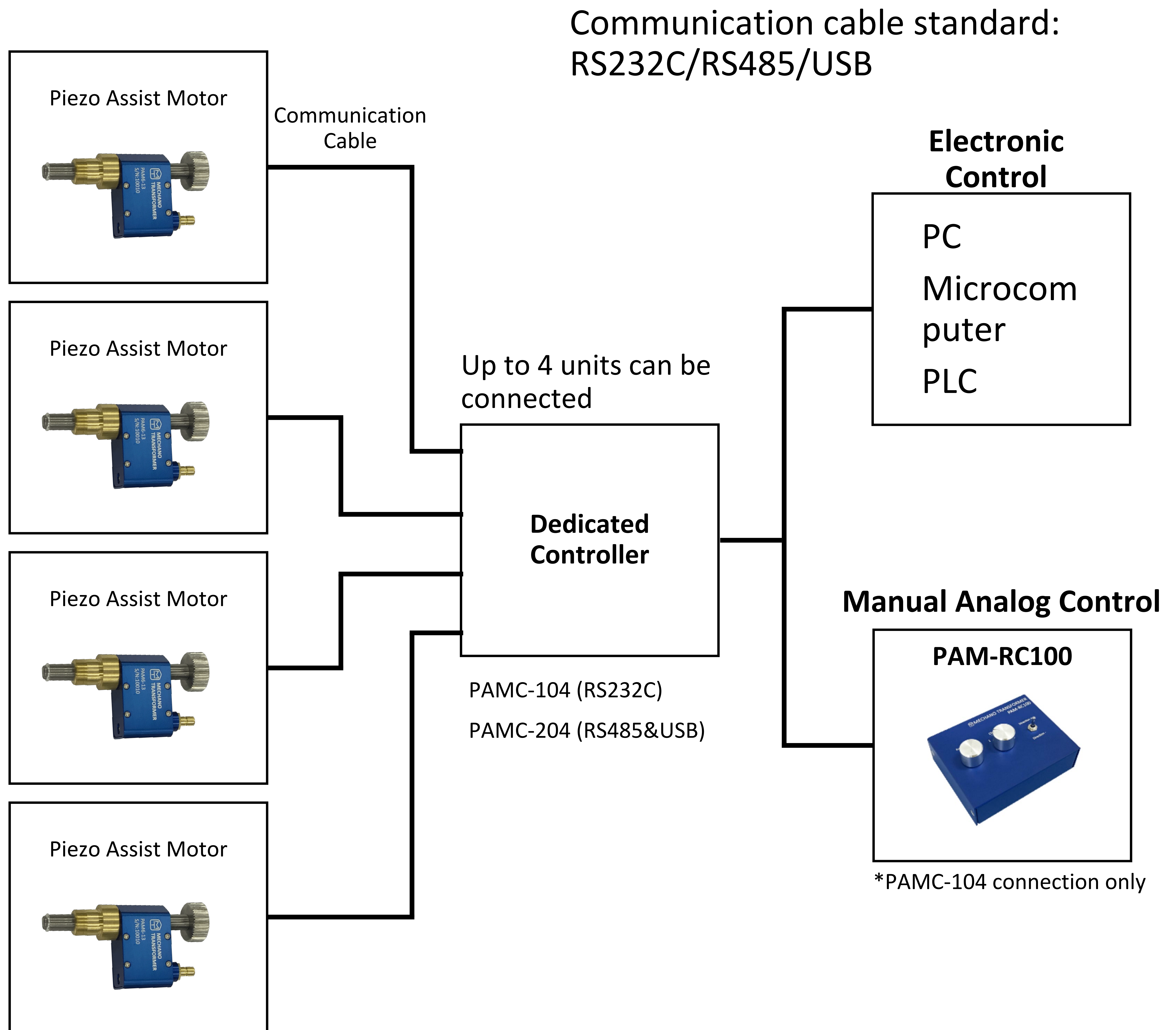
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Control System

Configuration diagram



When connecting five or more piezo-assisted motors

- ▶ PAMC-204 supports USB and RS485 interfaces, so you can connect multiple PAMC-204 together to increase the number of piezo-assisted motors that can be connected.
- ▶ The dedicated controller (PAMC-104) of the RS232C standard cannot be interconnected. If you wish to connect five or more Piezo Assist Motors, we will manufacture a dedicated controller according to the required number of connections on a made-to-order basis.

Specifications (dedicated controller)

► PAMC-204

Appearance (front)



Appearance (rear)



| | |
|--|----------------------------|
| Model number | PAMC-204 |
| Number of Control Axes | 4 |
| Maximum drive frequency (Hz) | 1500 |
| Interface | USB/ RS232C |
| Power supply voltage (V) | DC24 |
| Current consumption (A) | 0.5A Above |
| Dimensions (mm) (excluding protrusions) | 148.3 x 91.7 x 26.8 |
| Operating temperature (°C) | 5–40 |
| Storage temperature (°C) | 5–40 |
| Ambient humidity (%RH) | 10 to 80 (no condensation) |
| Mass (kg) | 0.35 kg |
| Price excluding tax (JPY) | Please contact us |

*Special software and communication cable included

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Specifications (dedicated controller)

▶ PAMC-104 (RS232C standard)

Appearance (front)



Appearance (rear)



| | |
|--|----------------------------|
| Model number | PAMC-104 |
| Number of Control Axes | 4 |
| Maximum drive frequency (Hz) | 1500 |
| Interface | RS232C |
| Power supply voltage (V) | DC24 |
| Current consumption (A) | - |
| Dimensions (mm) (excluding protrusions) | 200 x 162 x 50 |
| Operating temperature (°C) | 5–40 |
| Storage temperature (°C) | 5–40 |
| Ambient humidity (%RH) | 10 to 80 (no condensation) |
| Mass (kg) | 1.2 |
| Price excluding tax (JPY) | 120,000 |

*Special software and communication cable included

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Specifications (Analog controller)

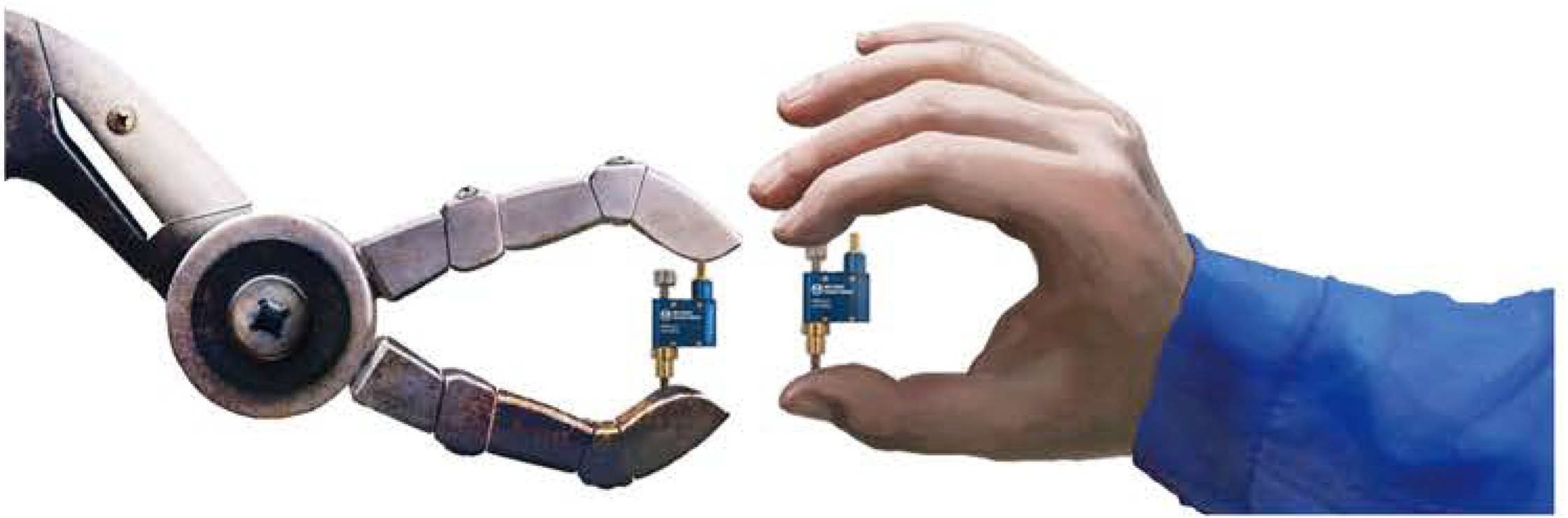
▶ PAM-RC100 (RS232C standard)

Appearance (top)



| | |
|--|----------------------------|
| Model number | PAM-RC100 |
| Maximum drive frequency (Hz) | 1500 |
| Number of channel switches | 4 |
| Interface | RS232C |
| Dimensions (mm) (excluding protrusions) | 102 x 78 x 30 |
| Operating temperature (°C) | 0–40 |
| Storage temperature (°C) | 0–40 |
| Ambient humidity (%RH) | 10 to 80 (no condensation) |
| Mass (kg) | 0.32 |
| Price excluding tax (JPY) | 50,000 |

*Communication cable included



About MechanoTransformer

Piezo Actuator Specialists

Our company was founded in May 2002 by the Higuchi Laboratory at the University of Tokyo. We provide a wide range of services, from design and prototyping to mass production of piezo actuators used in silicon photonics and laser communications.

Piezo actuators are excellent actuators with high nanometer resolution and response speeds shorter than 1 millisecond. We hope to use piezo actuator technology to bring innovation to many industries, including medicine, energy, and agriculture.



Piezo Assist Motor

Electric actuator with nanometer-order resolution

Application examples : Motorized micrometer heads/
linear stages/rotary stages

Piezo Assist Stage

Fine/coarse piezo stage with nm/ μ m order resolution

Application examples : Positioning the table or objective lens
under a microscope / Aligning optical
fibers



Piezo Fast Steering Mirror

3 axis (θ_x, θ_y, Z) reflector piezo stage

Application examples : Laser satellite communications /
optical resonators

Piezo Mirror

Z axis reflector piezo stage

Application examples : Optical resonator / Herriott cell for
multi-path spectroscopy

