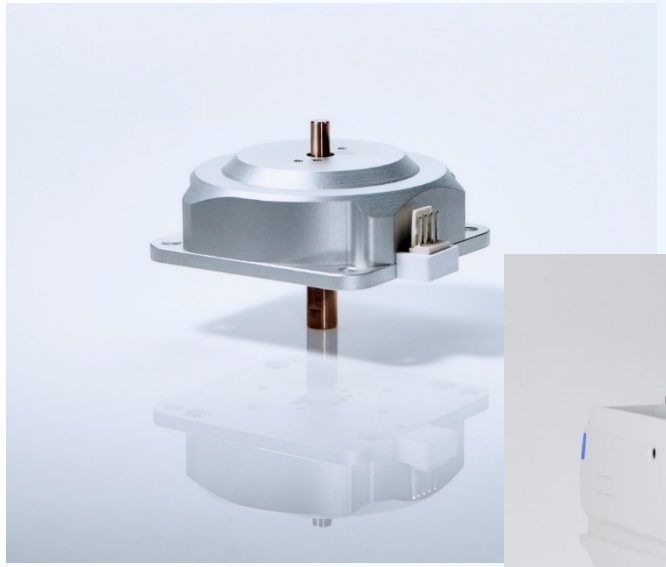
Piezo Sonic

Turning Physical AI into Real-World Action

Reinventing Motion for the AI Era

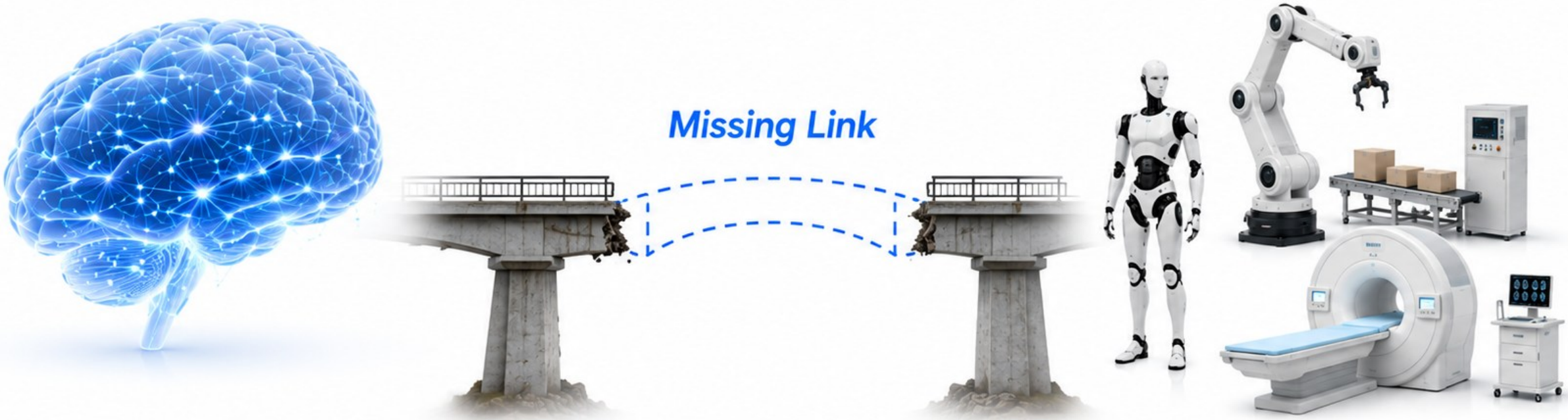






Piezo Sonic Corporation
President Kouhei Tada

There is a Gap Between Advancing AI and Real-World Motion



AI
(Brain)

Motion Technology
(Turns AI into Action)

Real-World Action
(Physical World)

AI = Brain, Motion = Muscle

Physical AI Requires Precise, Smooth, and Versatile Motion

AI makes decisions in the digital world. To create value, Need 3 items.



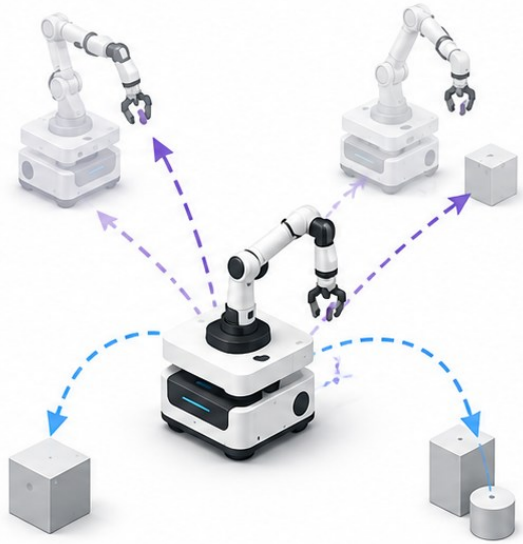
PRECISE



SMOOTH



FREEDOM



Piezo Sonic Motors Deliver the Motion Physical AI Needs

Conventional Motor



0.01°

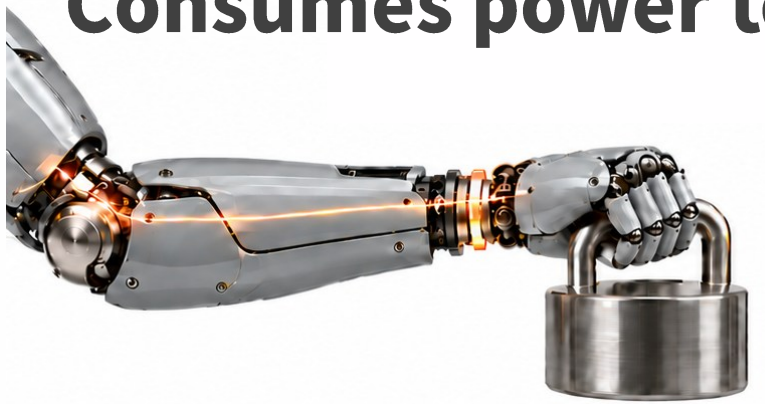
1,000 X
More Precise

Piezo Sonic Motor

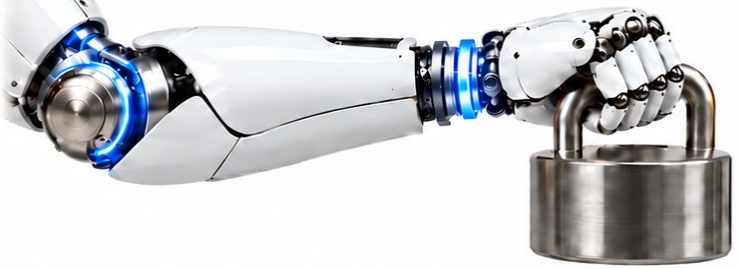


0.00001°

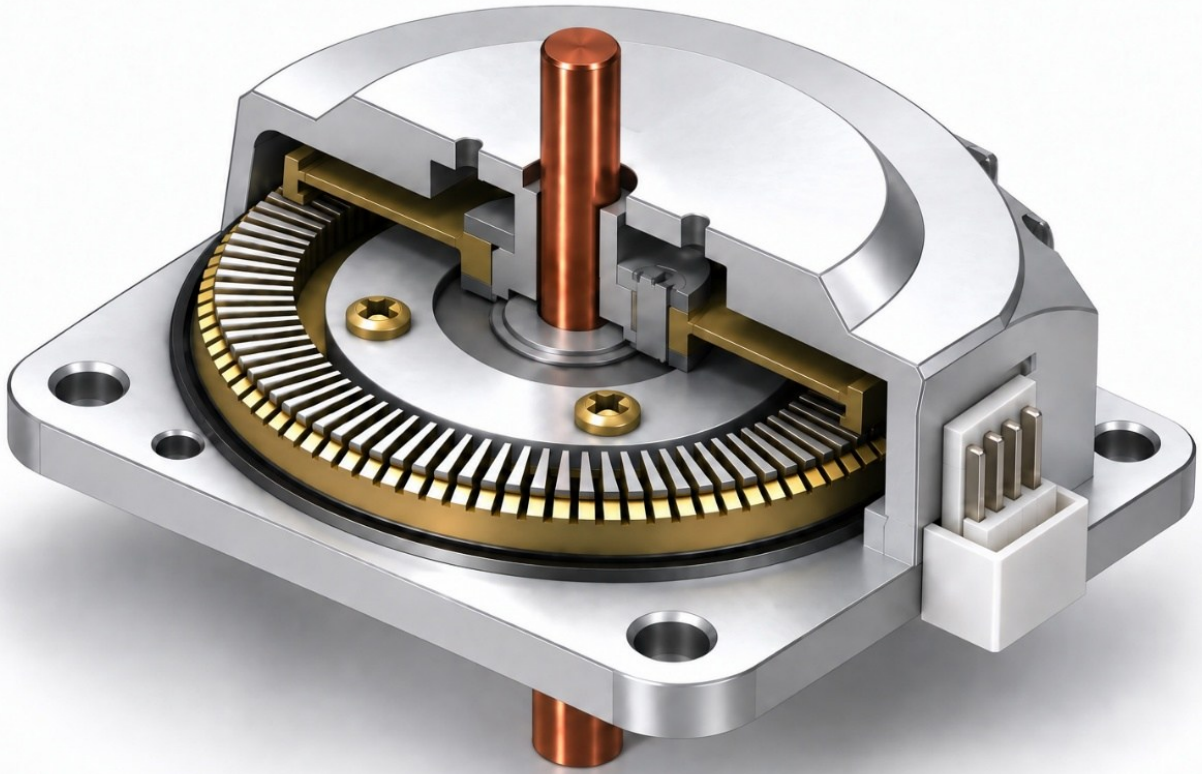
Consumes power to hold



0W **Holding Position**



Unique Motion Technology Without Electromagnetic Force



- High Torque
- Zero-Power Holding
- Quiete
  Low Vibration
- Precise Control
- Non-Magnetic

Our Core Technology Delivers the Motion You Need

Piezo Sonic Motion Technology

NOW — Motor System



For Precise Application

Precision Equipment& Medical Devices

NOW — Precision Stage



For Semiconductor & Optical Equipment

High-Precision Positioning

NOW — AMR : Mighty



Physical AI Platform

Autonomous Mobility for Real-World

NEXT — Actuator Unit



For Humanoid Robots

Precise Motion and Holding for Robotic Arms and Wrists

Hard to Replicate, Built on 28 Years of Expertise

28 Years R & D



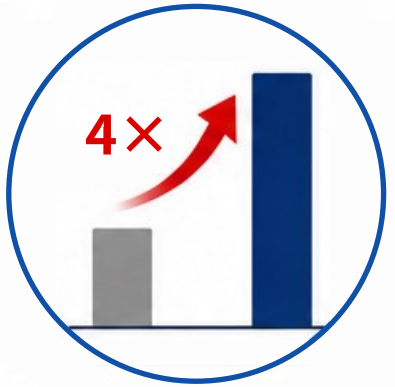
1998～
Basic Research
Begins

Friction Control Know-How



Advanced Control of Vibration and Friction

Over 4× the Service Life



Overcoming the Limitations of Ultrasonic Motors

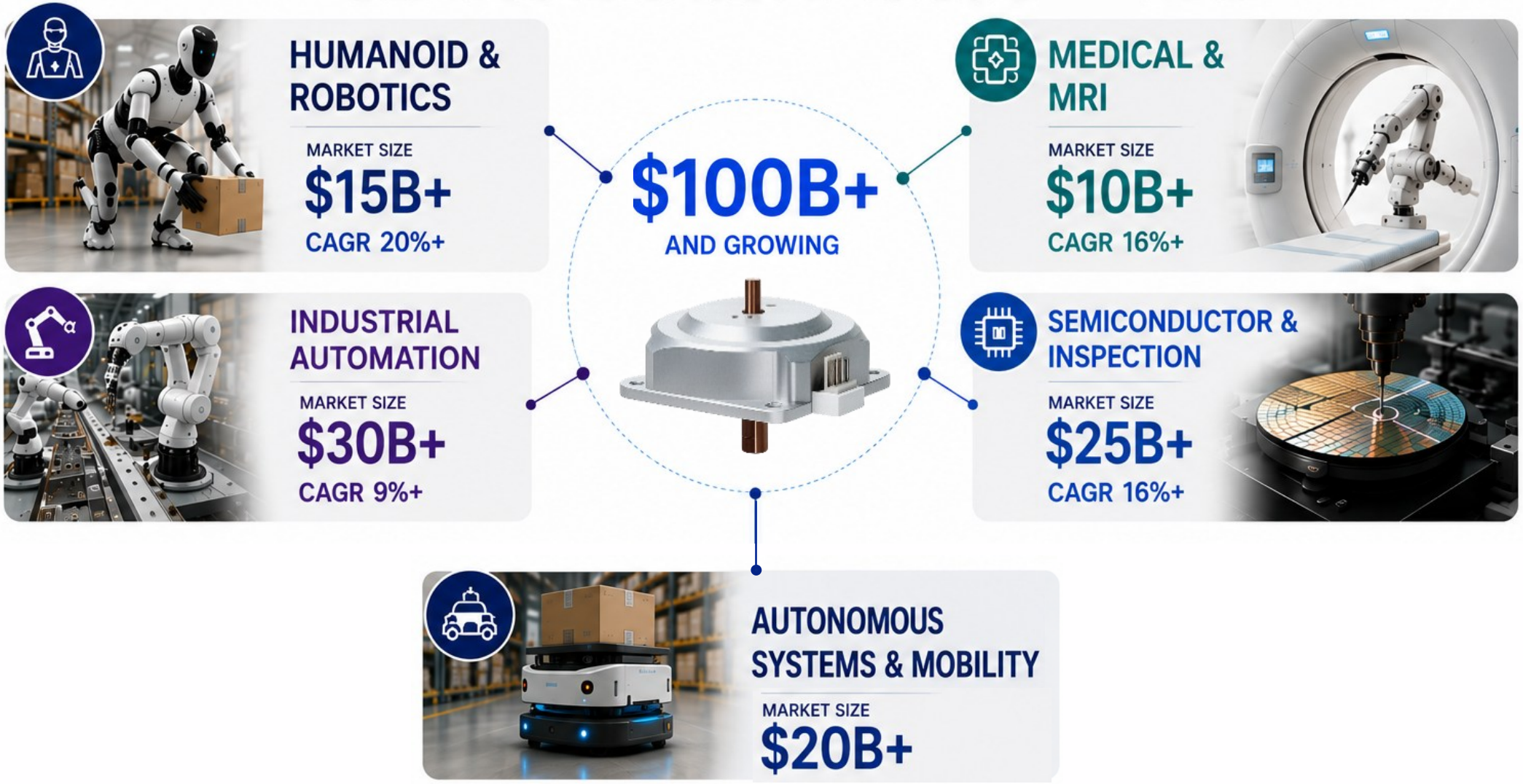
IP Protection



Technology Protected by Numerous Patents

One Motion Technology. Over $100B Opportunity.

Our Motor unlocks massive markets across the Physical AI Era.



Our Technology is already creating values in Global Markets



220+
MOTOR USERS

Adopted Worldwide | Global Presence | Diverse Applications

12
MIGHTY USERS

Deployed | Multiple Industries | Real-World Use



Representative Commercial Traction





150+ / YEAR

- Annual Supply
- Entering Year 3
- Long-term Partnership





10 → 40

Delivered — Additional Order

- 10 Units Delivered
- 40 Units Additional Order

Becoming the Global Standard in Motion Technology for Physical AI

Medical Robotics



Semiconductor Equipment



Global Robotics

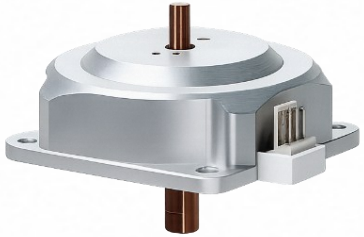


Humanoid Robots



Optics & Measurement





Piezo Sonic

Interactive Robots



Exceptional Precision | Smooth Motion | Freedom of Movement | Energy Efficiency | Safety | Scalability

Motion Technology Company



Piezo Sonic

WEB： https://www.piezo-sonic.com, https://www.piezo-sonic.co.jp
E-mail： info@piezo-sonic.com

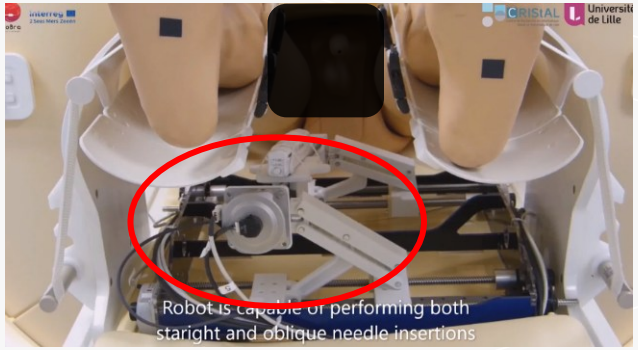
Piezo Sonic's Business

Ultrasonic Motor Business





Innovative motor that does not use coils for driving





Used for precise control of medical devices and cameras inside MRI machines

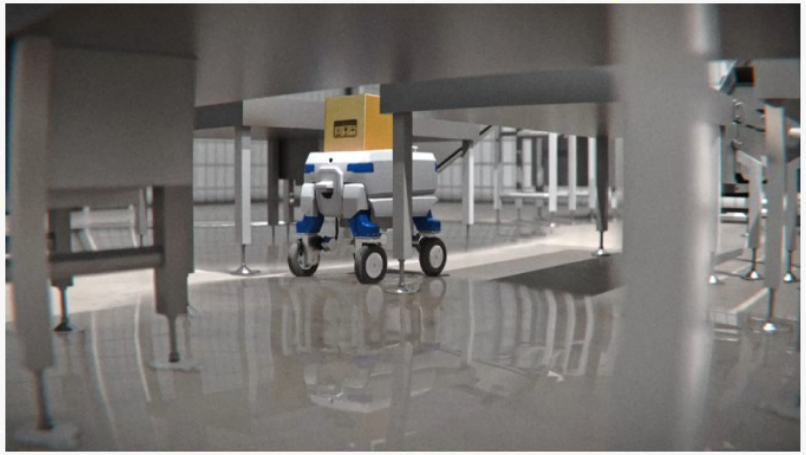
Robot Development Business







Mighty-D4



AMR capable of indoor/outdoor transport and inspection

Core Technology: What is the Piezo Sonic Motor?

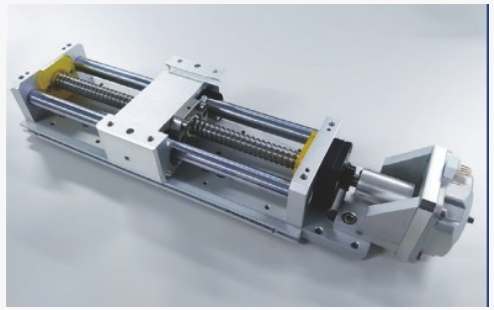
An Innovative Motor "that does not use electromagnetic force"

- Rotation via piezoelectric ceramics and frictional force. -

- **No power or control required for posture maintenance (holding position).**
- **Exhibits 5 times or more the force of a DC motor of the same size.**



Selected for JAXA Development Project

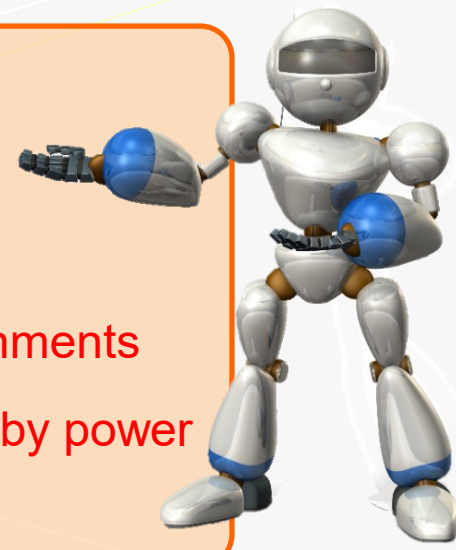


Position Control /
Precision Transport

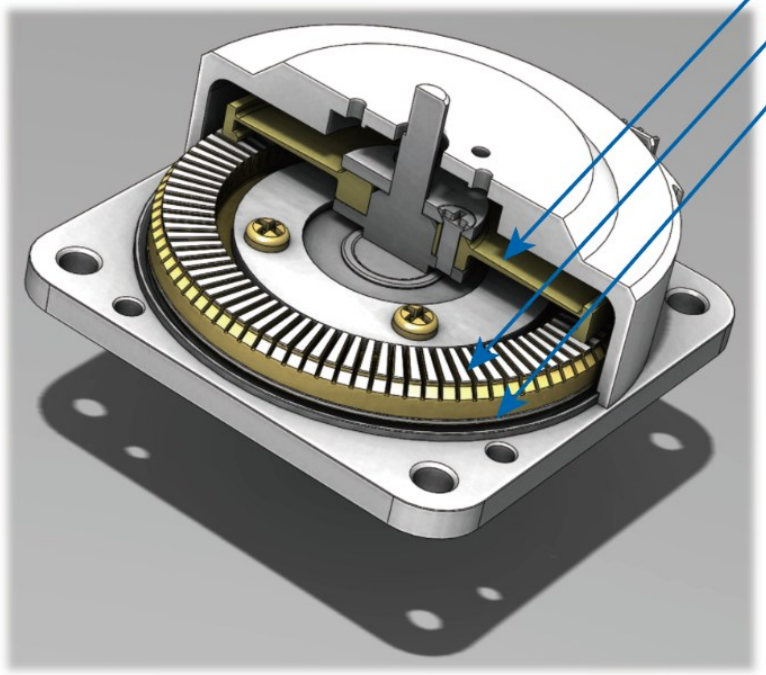


MRI / Equipment for Magnetic Field Environments

- Compact, lightweight
- High torque
- Precise positioning
- Usable in magnetic field environments
- Posture holding with zero standby power
- Quiet operation sound



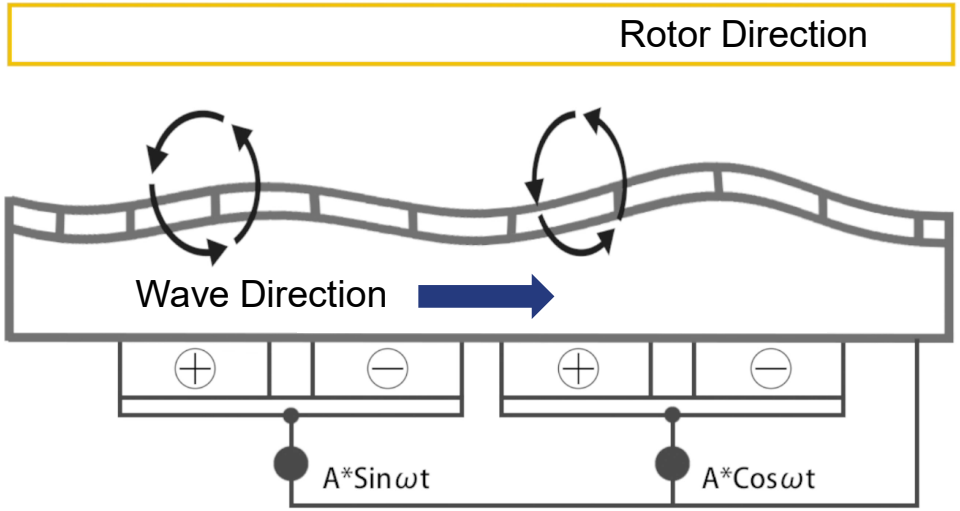
Core Technology: Piezo Sonic Motor Driving Principle



Construction of the Piezo Sonic Motor

Magnets, coils, iron core... Not required.

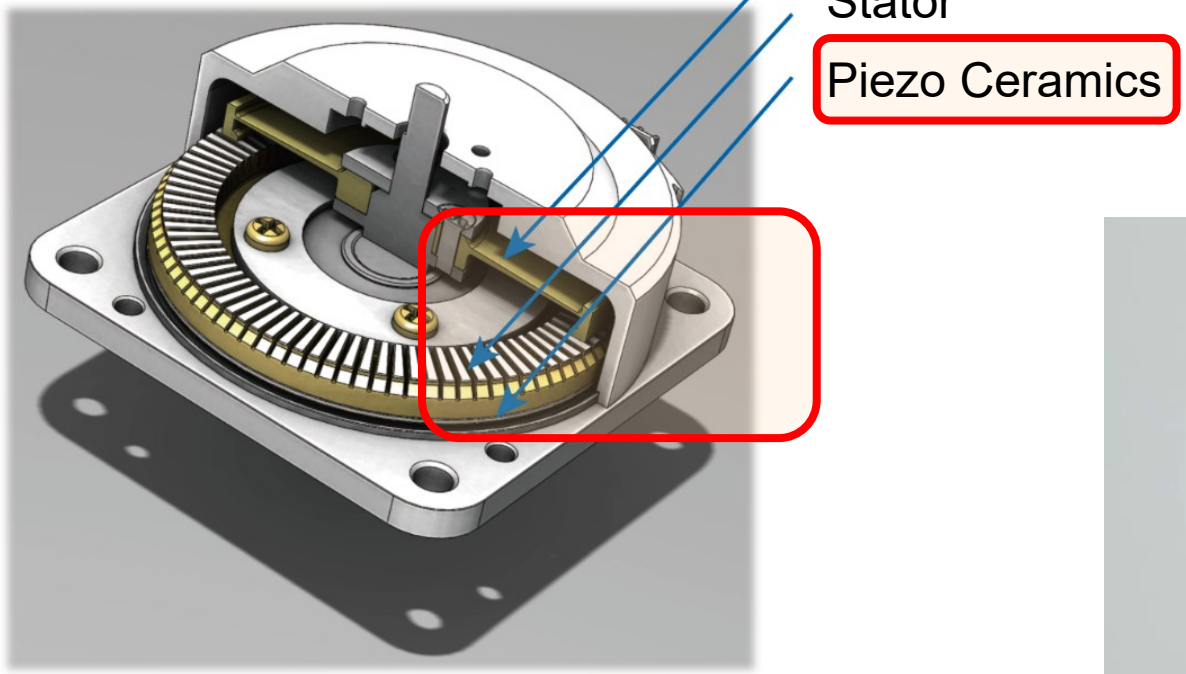
Lightweight & non-magnetic construction is possible.



Rotary Drive utilizing Piezoelectric Ceramic Vibration

Driving Principle: Converts the expansion/contraction movement of the piezoelectric ceramic into rotational movement ⇒The rotor rotates using frictional force.

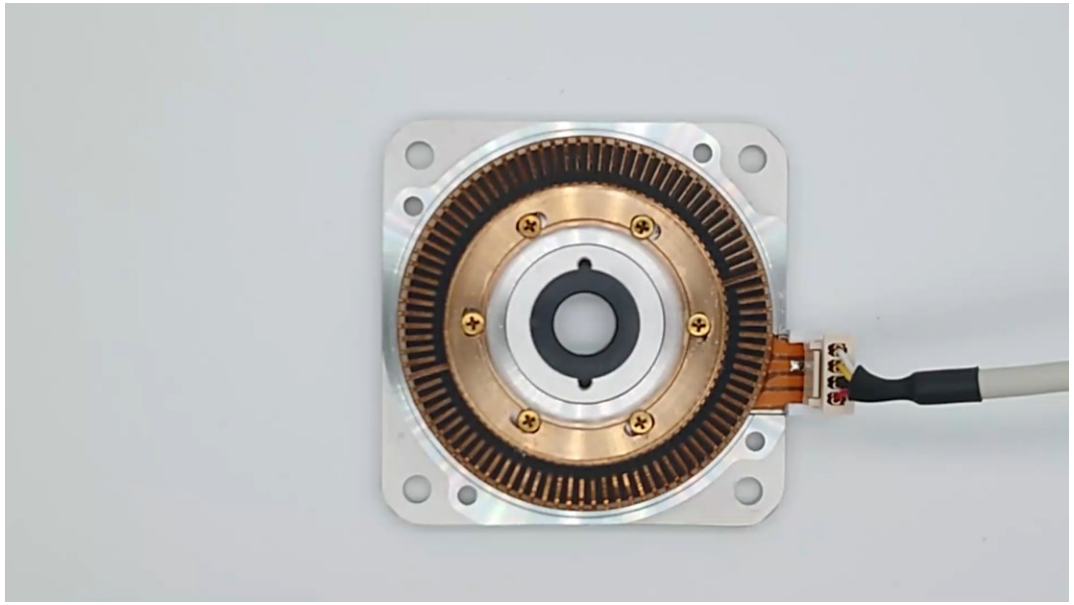
Core Technology: Piezo Sonic Motor Driving Principle



Construction of the Piezo Sonic Motor

Magnets, coils, iron core... Not required.

Lightweight & non-magnetic construction is possible.



Rotation via Piezoelectric Ceramic Vibration

Pressure is applied between the rotor and stator to increase friction, achieving holding power

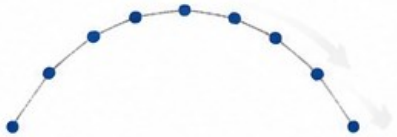
Achieving Holding power

Ultra-High Precision Enables Smooth Motion and Precise Operation

Higher Angular Resolution Delivers Smoother and More Accurate Motion

Conventional Motor

0.01° Resolution



Moves in large steps, causing jerky motionand vibration

Piezo Sonic Motor

0.00001° Resolution



Moves in ultra-fine,continuous incrementsfor smooth, natural motion

Smooth and Accurate Motion Close to Human Movement

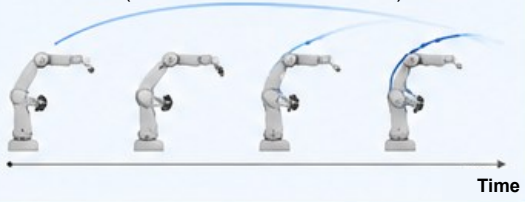
Conventional Resolution (0.01°)

Jerky Motion
(Discrete Position Control)



Ultra-High Resolution (0.00001°)

Smooth Motion
(Continuous Position Control)



Achieving Natural Human-Like Motion

By closely replicating the smooth movement of human joints, Piezo Sonic Motors enable stable and precise control.

- **Suppresses vibration**
- **Precise positioning & speed control**
- **Maintains high repeatability during long-term operation**

Human Joint Motion Range & Precision(Ref.)

Joint angle control precision: Several μrad → Piezo Sonic achieves sub-μrad precision

Applications Enabled by Ultra-High Precision



Toward Smooth, Human-Like Motion

Ultra-high-precision control reproduces the fine movements of human muscles and joints. It enables delicate force modulation and smooth, natural motion.

Essential for Physical AI and Humanoid Robots

- Smooth, natural motion
- Fine force modulation and compliance control
- Advanced tactile sensing and gripping control



Supporting Precision Surgical Robots

Ultra-high-precision control enables delicate movements and stability beyond human capability, contributing to safer and less invasive surgical procedures.

Essential for Surgical Robotics

- Sub-millimeter and sub-micron precision positioning
- Precise force control during surgery
- Stable long-duration operation



Maximizing Precision in Semiconductor Manufacturing Equipment

Nanometer-level positioning and vibration suppression contribute to improved yield and continued device miniaturization.

Essential for Semiconductor Manufacturing

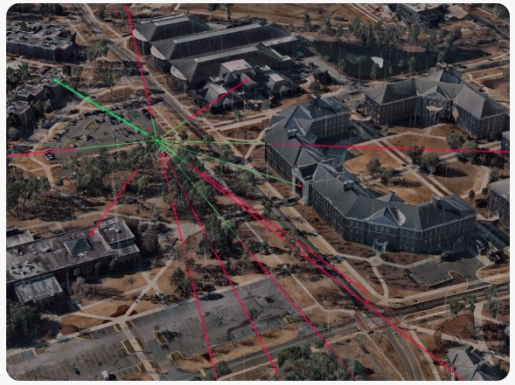
- Sub-nanometer positioning for EUV lithography systems
- Nanometer-level control of wafer stages
- Higher precision for microfabrication and inspection equipment

Piezo Sonic Motor Adoption Cases

Mass Production Case: General environment motor: PSM60S-A + Driver: PSMD-PCCII

Camera system using multiple motors to create precise aerial photography + 3DMAP.





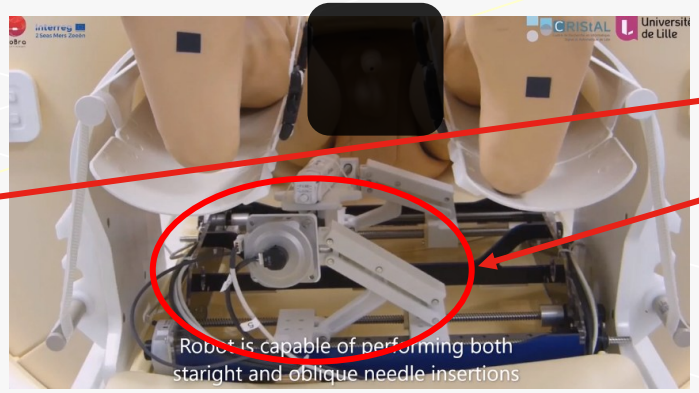




Development Case: Magnetic field environment motor: PSM60N-ET + Driver: PSMD-PCCII

High-precision inspection of MRI: CoBra Project





Probe Position Control