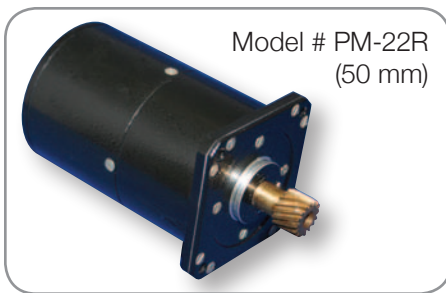


DTI's PM and UMP series of ultrasonic piezoelectric rotary motors represent a breakthrough in piezomotor design technology. These high-torque, non-electromagnetic motors overcome many of the limitations of conventional electric motors. The result is a unique series of direct drive, high resolution, fast response, ultra-smooth motion piezomotors.

## Piezo Rhino™ and Piezo Beetle™ series

DTI's rotary piezomotors are divided into two types depending on size and design construction; these are referred to commercially as the **Piezo Rhino™** and **Piezo Beetle™** series.

The Piezo Rhino™ series offer increased size and high torque. The Piezo Beetle™ provide the same technology in a miniature form (i.e. <10mm I.D.).



## COMMERCIALIZED APPLICATIONS

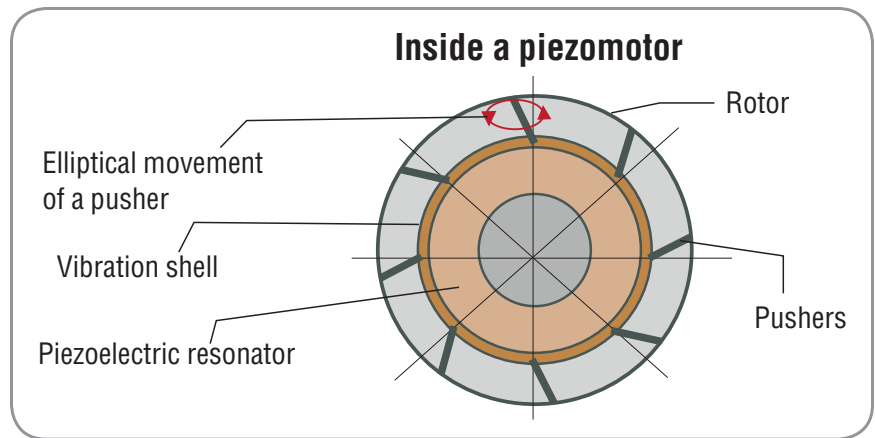
DTI's ultrasonic piezomotors are already used around the world in various applications and products commercialized within biomedical research, microelectronics/photonics and nanotechnology. Example products include; motorized rotary devices, linear nanopositioning stages, XYZ-based nanomanipulators, high precision rotary/angular positioning devices and miniature hybrid/robotic systems.

## KEY BENEFITS

- **Direct-Drive mechanism** – eliminates mechanical transmission/gear system and abolishes backlash and hysteresis, providing better accuracy, repeatability and resolution.
- **Elimination of the “Stick-Slip” effect** – due to unique start-stop characteristics, removes one of the major limitations effecting precise angular positioning.
- **High torque with wide range of torques** – 10-times better torque (per unit of size/mass) than any comparable stepper motor – enables high dynamic (start-stop) characteristics. Wide range of torques from 2 mN.m. up to 6 N.m.
- **Low temporal drift** – angular position of the rotor is held fixed (self-braked) by the self-decelerating torque of the motor, providing negligible angular drift (i.e. <1 arc sec/hour).
- **High resolution and high accuracy** – high resolution (<1 arc-sec), with an absolute positioning accuracy of 4 arc-secs in closed loop mode (using optional high-resolution optical encoder).
- **Bidirectional angular positioning** – accuracy one order of magnitude better than the best of currently available systems due to direct-drive mechanism.
- **Rapid response, dynamic range of 4kHz** – capacitive input impedance (i.e. capacity nano-farads) of piezomotor compared to inductive input impedance of EM motors (i.e. millihenries) results in rapid response time (e.g. 10-50µs) several orders of magnitude faster than a comparable EM motor.
- **Wide range of angular steps and angular velocities** – angular motion with steps ranging from less than 1 arc sec to continuous movement, covering a velocity range of 6 orders of magnitude (e.g. <5 µrad/s to >2.1 rad /s).
- **Simplified power requirements** – controller system operates from low voltage (e.g. <12 VDC), enabling convenient field deployment (where weight, size and battery operation are required).
- **Non-electromagnetic** – overcomes limitations of using EM motors in applications, such as MRI and other similar environments.
- **Scalable customizable design** – larger, smaller, non-magnetic, high-temp and hollow-shaft versions to meet special requirements.

## PRINCIPLE OF OPERATION

DTI's piezomotors work on the principal of excitation of ultrasonic standing wave(s) within a piezoelectric resonator. An ultrasonic radial standing wave is excited in the piezoelectric resonator causing the ring to expand and contract, stimulating movement of the pushers along the radius, which causes rotation of the rotor (for detailed explanation visit [www.dti-piezotech.com](http://www.dti-piezotech.com)).



## TECHNICAL SPECIFICATIONS \*

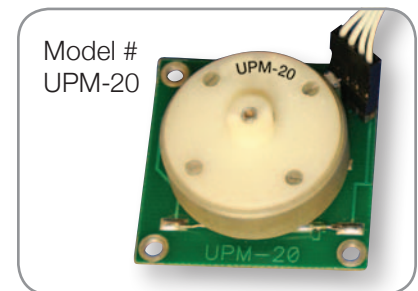
Motor Model	Piezo Rhino™					Piezo Beetle™
	PM-20RS	PM-22RS	PM-46	UPM-20	UPM-22	PM-8R/ PM-10R
Mode of operation**	Cont/Step	Cont/Step	Cont/Step	Cont/Step	Cont/Step	Cont/Step
Uni/Bi-directional	Bi	Bi	Uni	Uni	Uni	Bi
Max torque (N.m.)	0.1	0.5	6	0.1	0.5	2 mN.m
Self-braking torque (N.m.)	0.11	0.55	6	0.1	0.4	2 mN.m
Max speed (rev/min)	60	30	140	>40	30	100 (Cont) 1 (Step)**
Min angular step (arcsec)	1	0.5	1	1	0.5	10
Dynamic range (kHz)	2	2	2	4	4	4
Supply voltage (V)	12	12	12	12	12	12 (or lower)
Operating current (mA)	<300	<400	15,000	300-400	<400	<100
Motor weight (g)	220	360	800	30	50	10
Dimensions (mm x mm)	Ø38x99 with encoder	Ø50x100 with encoder	Ø80x80	Ø30x23	Ø50x30	Ø8x13 Ø10x15

\*Contact DTI for custom/OEM requirements

\*\*Cont = Continuous mode; Step = Stepping mode

## PIEZOMOTOR EVALUATION KITS

A range of evaluation kits, comprising a piezomotor, controller board, cables, and a power supply are available (contact DTI for further information)



## LOCAL DISTRIBUTOR