

Piezoelectric Motor Delivers Precise Positioning In Small Applications

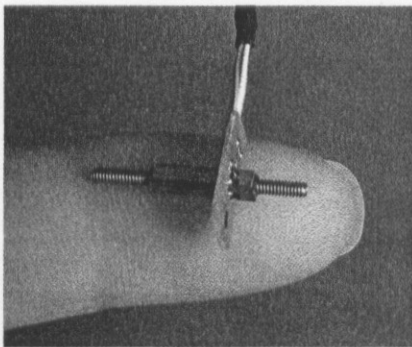
Sometimes you need a really small motor, and stepper motors and voice coil motors just won't cut it. Try the Squiggle series of piezoelectric motors from New Scale Technologies. These devices can deliver 10- μ m closed-loop repeatability. They're based on a linear actuator that generates ultrasonic vibrations at 115 kHz in a threaded nut.

This nut vibrates in an orbit that resembles a person's hips in a hula-hoop motion. The microscopic motion causes the mating screw to rotate, creating precise, bidirectional linear motion. (To see an animation and a video of this motion, go to www.newscaletech.com/squiggle_overview.html.)

Instead of wasting power, thread friction drives the screw and holds it in position when the power is off. As a result, there is no backlash, and the motor has a very high stiffness. Also, the motor size can scale from as small as 2.4 by 2.4 by 6.5 mm to sizes with travel lengths as long as 50 mm (see the figure).

The piezo motor technology generates no magnetic fields. The motors can be made from nonferrous metals for use in MRI, scanning electron microscopy, and

focused ion microscopy applications. Additional applications include autofocus and optical zoom mechanisms for mobile phone cameras, wearable and implantable medical devices, microfluidic pumps for automated drug discov-



This 10-mm Squiggle motor can be used in mobile-phone autofocus cameras, optical zoom assemblies, and other small products.

ery, and mirror alignment for cryogenic space telescopes. The motors can work in vacuum environments at levels down to 10^{-10} Torr as well.

Furthermore, the motor contains only a few parts. But it can replace complex

electromagnetic gearhead motors (such as magnets, coils, and solenoids), which typically contain hundreds of parts. Motor positioning can be accurate to within 20 nm, while position speeds can range from 1 μ m/s to 10 mm/s. The motor also can generate considerable force for its size—up to 5 Newtons.

To control the motor, New Scale developed an evaluation drive electronics package that ties into a computer via an RS-232 interface. The package also can be controlled manually. It can control up to six motors for multi-axis "set-and-hold" positioning.

A low-current 200-V_{RMS} signal drives the motor with an on/off duty cycle of 0.1 ms. A smart connector on each Squiggle motor stores the motor's optimum drive parameters, including frequency, phase, and voltage. These parameters are downloaded to the driver when the motor is connected.

A developer kit is available for \$850. In large volumes, the motor can cost less than \$1 each.

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Electronic Design Industry Barometer Poll: Q1 2006

What's your outlook on the economic health of the electronics industry for this quarter?

- Robust and growing 13%
- Showing moderate strength 63%
- Stagnant 16%
- Somewhat weak 6%
- A steep decline 2%

How's your project workload shaping up for the next quarter?

- Too much to manage 15%
- Rising but manageable 40%
- About the same 33%
- Fewer projects in the pipeline 12%

Is your company headed in the right direction to achieve stability and/or growth?

- Yes, management has a strong game plan 28%
- We're almost on the right track 40%
- We're positioned to tread water 26%
- No, we've taken a wrong turn 6%

During the upcoming quarter, will your company's workforce...

- Increase 36%
- Decrease 10%
- Stay the same 54%

During this year, will your company's revenues...

- Grow substantially 17%
- See a modest uptick 59%
- Remain flat 17%
- Drop slightly 5%
- Fall dramatically 2%

What one professional issue is of greatest concern to you?

- Job security 18%
- Your company's long-term viability 37%
- General health of the economy 25%
- The outsourcing trend 20%

What's your guess on your compensation for the coming year?

- It should rise 56%
- It will stay the same 38%
- Wages and/or benefits could be cut 6%

Do you see opportunities for career advancement in engineering?

- Yes, opportunity is rampant 21%
- Some opportunity but with limits 68%
- No, it's a dead-end career path 11%

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