

## Low cost friction unit takes aim at DC and stepper motors

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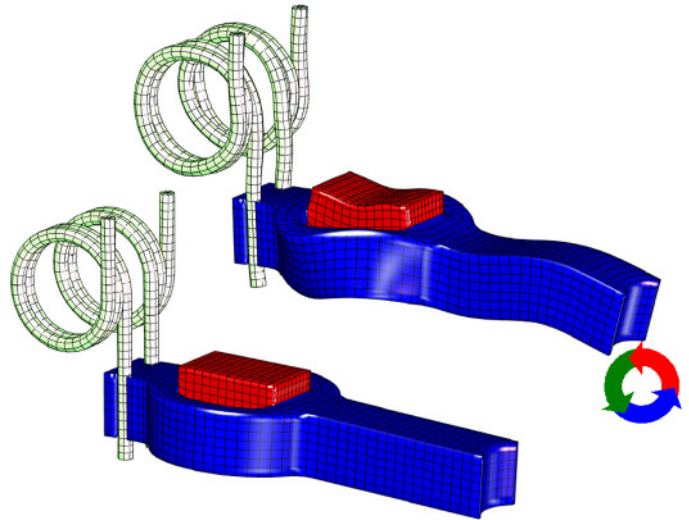
An integrated friction motor module replaces stepper motors and drives in small-scale applications and does so at a fraction of the price.

Prices of the base units in "very large volume" production are said to be one to two EUR each, according to Dr Michael Schlueter, vice president of engineering and technology of manufacturer Elliptec Resonant Actuator AG.

The motors are being used in applications from model trains through micro pump drivers for gas analysers to laser mirror controllers.

The basic unit is an ultrasonic actuator, which vibrates at around 100kHz.

"It moves in an elliptical motion," Dr Schlueter told Eureka during the Hanover Fair. "When applied to an actuator, it can move at 300mm/s, reaching maximum speed in 5ms."



The company is a spin-off from Siemens. The motor was initially developed at the Siemens Technology to Business Centre in Berkeley, California. However the research team separated from Siemens in 2001 in order to realise the motor's full potential more quickly. Siemens transferred all rights to the technology to Elliptec and remains a minority investor.

The technology is available either as the basic A10E actuator, as an X15G motor capable of driving a linear or rotary element, or a complete packaged R40 fully integrated motor and driver with built in position feedback.

The actuator consists of a preloaded piezoelectric element in an aluminium frame that transforms the piezoelectric expansion into a lateral displacement at the actuator tip.

Applied to a linear moving element or disk, the basic motor has a resolution of less than 10 microns and weighs only 1.2g. But it is the integrated motor module that is the real breakthrough. Dr Schlueter said: "It is a very simple electric motor that can nonetheless be applied to precision positioning. In a lock application, it makes the whole thing very simple."

Depending on quantity, costs can range from 20 to 70 EUR.

Dr Schlueter pointed to an example of the basic motor being incorporated into a product - in this case, a toy crane for model railways.

"The device is vibration-driven, so we have to be very careful with the mechanical design of the whole system," he said. "Prototyping was quite challenging."

This makes the finished module - which is 52mm long, 24.5mm wide, 11.5mm high, and weighs 20g - attractive to product designers. Dr Schlueter described it as, "An elliptical module integrated in a small housing, about half the size of a matchbox, with actuator, wheel and integrated sensors and drive intelligence".

Maximum speed is 250rpm, unpowered holding torque is 8-10 mNm, and maximum driving torque at zero speed is 2mNm, falling to 0 torque at maximum speed. The sensor has "1200 steps per revolution" plus a fine stepping mode and Dr Schlueter said that the module could be used "like a stepper motor, but cannot lose steps".

The same module can be wired like a DC or stepper motor, says Dr Schlueter: "We can produce 1 million motors per year - although the practical amount is several hundred thousand. The main markets are Europe and the US, but we are also looking at Asia."

In the UK, the company is represented by Unimatic Engineers.

### Pointers

\* Applied to linear movement, the device reaches a maximum speed of 300mm/s in 5ms.

\* The integrated motor and driver module can be wired either as a stepper motor or DC motor module. Unpowered holding torque is 8-10mNm, maximum driving torque is 2mNm. Maximum speed is 250 rpm

\* Price of basic motors in "very large volume production" is 1-2 EUR

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