Direct Drives Increase the Measuring Speed of Tachymeters:

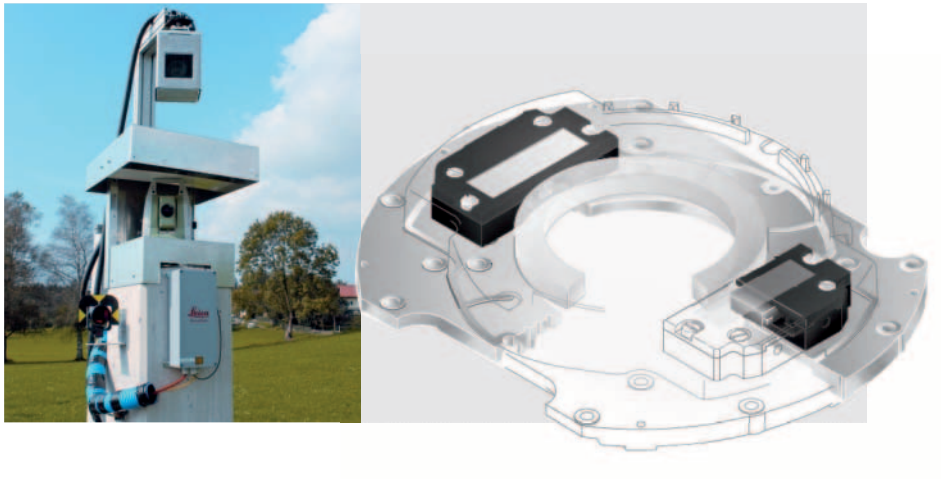
Piezo Motor Helps Monitor Railway Track Movement

A great many factors come into play when selecting a drive system for a portable precision instrument: The installation space available, the velocities, the accelerations and positional accuracy required, the energy consumption and the reliability of the motorization selected. When increased demands are placed on an application, PILine® ultrasonic piezomotors are the obvious practical alternative to classic DC stepper motor combinations. Thanks to the employment of piezomotors, the performance of the geodesic measurement systems from Leica Geosystems AG has increased drastically (see PI Newsletter 40). They showed what they were capable of when monitoring the track of the Munich-Salzburg railroad as a road tunnel was being constructed underneath it.

The engineering company "ing Traunreut GmbH" was here tasked with installing a monitoring system to safeguard the position of the track. The individually combinable measurement sensors from Leica Geosystems in conjunction with the matching software for monitoring, analysis and web-based data transmission proved to be just what was needed.

Technical Progress Helped Along by Ultrasonic Piezomotors

Two tachymeters used for monitoring measure the change in position of the track and the motion of the overhead line masts. For this purpose, among others, the Leica TM30 monitoring sensor which uses the piezomotors was employed. The advantages which resulted are convincing: The speed of the tachymeter has increased to around 200 gon/sec and the measurements are now almost silent because no reduction gears are required. The high velocity and the dynamic start and stop behavior allow a shorter time span between the measurement cycles. In addition the drives support a very high angle accuracy of up to 0.5". The tiny step sizes support high-precision measurements as are necessary for the monitoring.



Measurement pillar with webcam and TM30 monitoring sensor. The rotations are generated by two ultrasonic motors which are tangentially preloaded. The friction ring is pivot-mounted. (Photos: ing Traunreut / Leica Geosystems AG / Physik Instrumente (PI))

Piezo · Nano · Positioning

news

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Technical Progress with Ultrasonic Piezomotors

Leica Geosystems AG benefits from PILine® ultrasonic motors employed in their newest generation of surveying instruments for geodesy. The requirements for the drive of the new "Leica TS30" total station were, amongst others, higher speeds, shorter positioning times and a very high positioning accuracy when moving the measuring optics.

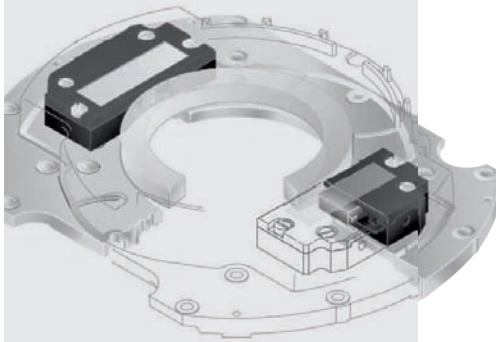
These requirements were exceeded by far through the employment of PILine® ultrasonic motors. PI's U-164 piezomotor was chosen for the vertical as well as the horizontal movement of the measuring optics. Rotations are produced by two such motors which are preloaded against a pivot mounted friction ring doubling as a brake when at rest. In operation, the ceramic piezomotors oscillate with ultrasonic frequencies. Generating a feed motion of the friction ring. This principle of operation provides unrivalled speeds of >180 °/sec and high accelerations of up to 360 °/s² and an angular measuring accuracy of 0.5". The drive also improves starting and stopping behavior and reduces power consumption. The maintenance-free motors are self locking, i.e.

Fast, Compact & Energy Efficient

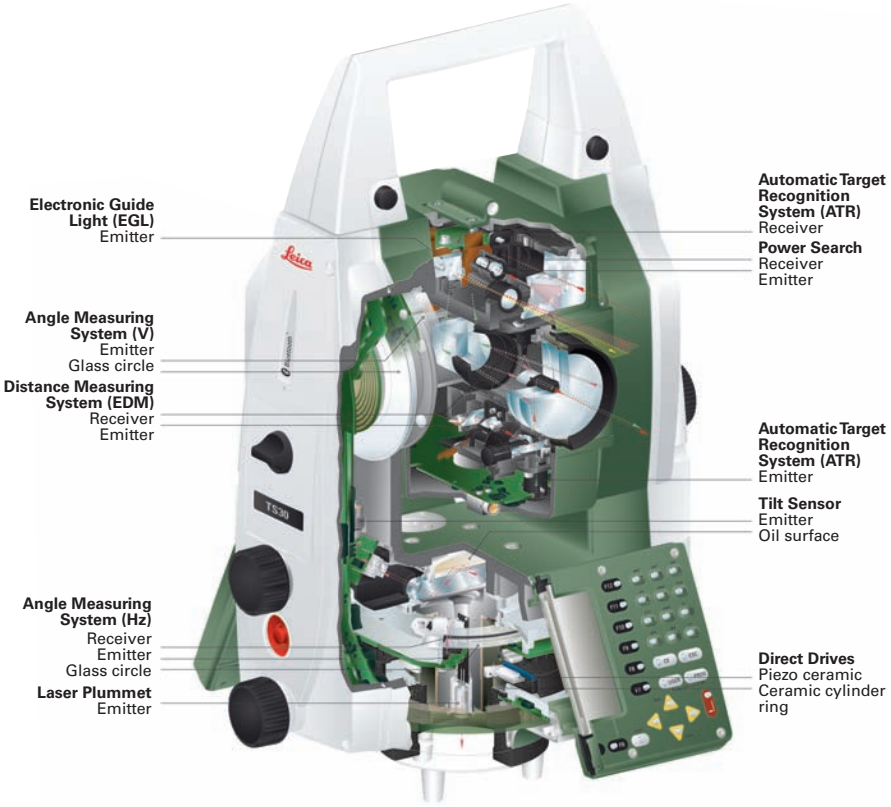
OEM Ultrasonic Piezo Motors

U-164 ultrasonic piezo motors are particularly compact, reliable and maintenance-free drives which are self-locking when at rest and intrinsically non-magnetic and vacuum-compatible. In the application, they provide as yet unrivalled speeds and accelerations while offering a high positioning resolution and low power consumption.

With its PILine® series PI offers a broad range of positioning systems with piezo ultrasonic motors: From simple motors to fully integrated custom solutions.



The rotations are produced by two U-164 ultrasonic motors that are preloaded against a friction ring. (Photo: Leica Geosystems AG/ Physik Instrumente (PI))



The cross-section of the total station shows the limited installation space available for the drives
(Photo: Leica Geosystems AG, Switzerland)

they generate high holding forces even when no electrical power is applied, they run extremely quiet and operate at ambient temperatures between –20 °C and + 50 °C.