New M-500 Generation of Translation Stages

Higher Speed & Accuracy, Lower Cost: Translation Stages Provide 102 to 306 mm Travel

- Active Motor Drive (integrated DC-Servo-amplifier)
- Stress-Relieved Aluminum Stage Base for Highest Stability
- Non-contacting home- and limit-switches
- Optional motor brake

The introduction of PI's new M-500 generation at LASER 99 in Munich was a great success.

Small wonder, considering all the improvements over the predecessor (M-5x5 Series) at lower cost.

Improvemens:
1. Integrated linear encoders (direct output metrology) are now standard in all DC direct drive versions. The stage position is measured by a non-contacting read head directly at the moving platform, providing improved resolution (0.1 µm) and repeatability (0.2 µm) close to one order of magnitude over the previous models.
2. The last generation M-500 stages required an external power amplifier between the motor controller and the stage. With the new generation, we shrunk the amplifier and installed it inside the stage (Active Drive). Why? No power loss, higher dynamics, less cables, lower costs. Now, one C-842 PC-Motor Controller Board is sufficient to drive 4 fast stages.
3. High velocity and resolution are available at the same time: 50 mm/sec and 0.1 µm. Velocities of 200 mm/sec can be achieved at 0.5 µm resolution.
4. Travel ranges were increased from 100, 200 and 300 mm, to 102, 204 and 306 mm (4", 8", 12").
5. Double limit switches provide improved protection from overtravel and damage.
6. Integrated non-contacting, Hall-effect origin switches with left/right-offset switch-position detection allow fast and precise homing procedures, a time saving feature in industrial applications.
7. An optional motor brake locks the stage in case of power loss or whenever a position has to be maintained without drive power to the motor.

All these benefits are available under the following part numbers: M-511.DD (102 mm), M-521.DD (204 mm) and M-531.DD (306 mm). Need more details? Ask for your copy of the PI Nano-Positioning catalog or check out our web site at: http://www.physikinstrumente.com

Ultra-Flat Linear Stages feature 50 to 150 mm Travel

Another highlight at LASER 99 was the introduction of the Active Drive option for the new M-400 Series of translation stages which replace the M-160 and M-155 stages (50 and 100 mm travel).

- New Active Drive featuring 0.125 µm resolution and 15 mm/sec's velocity
- Travel Ranges 50, 100 and 150 mm
- Stress-Relieved Aluminum Stage Base with integrated thermal Compensation for Highest Stability
- Crossed Roller Bearings
- High Resolution DC-Motor Drives
- Manual Knob for Convenient Position Adjustment
- Standard Origin and Limit Switches

These compact micropositioning stages are equipped with 0.5 mm pitch lead screws and crossed roller bearings providing high load capacity and excellent guiding accuracy. Two motorized versions are available: Models M-4xx.DG utilize closed loop DC motors with shaft mounted position encoders and backlash-free gearheads providing < 0.1 µm minimum incremental motion. Models M-4xx.PD are equipped with 30 W att Active Drive DC motors providing 0.125 µm resolution and velocity up to 15 mm/sec. The novel Active Drive concept features an integrated, high efficiency power amplifier and reduces overall system cost, because the stage can be driven directly from a PC motor controller card (e.g. C-842).

Ask for your copy of the PI Nano-Positioning catalog or check out our web site at: http://www.physikinstrumente.com

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E-750 Piezo Controller: Ultra-Fast and Digital, perfect Solution for OEMs!

New Controller allows
Sub-Ångstrom Resolution

- Ultra-fast Servo: 90 usec
- Optical FiberLink-Interface: 1 Mbit/s
- DSP-based Real Time Operating System
- Additional High-Speed-Analog Input
- Integrated MACH™-Algorithm for Input Shaping™ (Option)
- AutoCalibration Function for NanoPositioning Systems
- All Servo Parameters internally stored in Flash ROM
- For head test, track profiling, scanned-probe microscopy...

Longdistances between the controlling computer and the piezo controller? EMI? High communication rates? No problem for the FiberLink interface. The optical data transmission isolates the controller from the environment and guarantees communication rates of 1 Mbit/sec at distances up to 50 m. OEM customers will appreciate the AutoCalibration function, allowing random combination (and easy interchangeability) of controllers and Nano-Positioning systems with factory default configuration. Calibration data, linearization data and optimized servo parameters are stored in each Nano-Positioning system and read by the controller upon power up.

The controller is equipped with a wide range power supply for use throughout the world.

Researchers at the Heinrich-Hertz-Institut, Berlin, Germany have developed a new compound system (consisting of an adjusting bench and module) for the implementation of high precision fiber-to-chip couplings. The new patented solution (DE 19536 185 AI, DE 19636 173 AI) targets customers who need better performance in terms of damping than standard industrial systems provide today. Fig. 1 shows the thermally controllable module for coupling of optical fibers to optoelectronic components such as laser amplifiers, laser diodes and optical modulators. Coupling losses are as low as 3 dB typical. For coupling and adjusting an optical fiber to a chip, the specially designed adjustment bench is required (Fig. 2).

This device is based on three PI model P-853 and P-854 PiezoMike drives providing coarse travel to 18 mm and resolution on the order of 1 nm. Single mode fibers and polarization preserving fibers (e.g. Panda fibers) can be coupled with an angular accuracy of ± 0.5°.

If you need more information on this subject, talk to your local PI representative. Special thanks U. H. P. Fischer of Heinrich-Hertz-Institut für Nachrichtentechnik Berlin GmbH for the technical and graphical information.

Fiber-Chip-Couplers for Telecommunication. PI PiezoMikes used in alignment unit patented by Heinrich-Hertz-Institut, Germany

This new E-750.CP Digital Piezo-Controller offers unmatched responsiveness and precision for the most demanding OEM applications. Driving the ultra-fast P-752- and P-783 Series NanoStages, the E-750 provides sub-msec step times and Sub-Ångstrom resolution.

Apart from the fast servo, the integrated, low noise power amplifier and patented vibration killing MACH™-Algorithm for Input Shaping™, the E-750 offers further advantages: The AutoCalibration function and the FiberLink interface.

New High Resolution Micropositioning Stage Provides 25 mm Travel

- Resolution 0.125 µm and 50 nm
- Velocity up to 15 mm/sec
- Manual, DC/Gearhead and Active DC Motor Drive
- Crossed Roller Bearings for excellent Guiding Accuracy
- Manual Knob for Convenient Position Adjustment

The optical data transmission isolates the controller from the environment and guarantees communication rates of 1 Mbit/sec at distances up to 50 m. OEM customers will appreciate the AutoCalibration function, allowing random combination (and easy interchangeability) of controllers and Nano-Positioning systems with factory default configuration. Calibration data, linearization data and optimized servo parameters are stored in each Nano-Positioning system and read by the controller upon power up.

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LASER 99
Great Success for PI and Polytec

LASER 99, the world’s leading international trade fair for lasers, electro-optics and related components was a great success for PI and sister company Polytec. According to the officials, this year more than 15,000 people from 61 countries visited, many of whom stopped by the PI and Polytec booths.

The large halls of the new trade fair center at the former Munich Airport were the ideal stage for the new PI Polytec booth design. Both companies proved their leadership in the industry with a variety of novel products displayed on more than 400 m². With the optimistic atmosphere in the industry, PI and Polytec expect considerable business from this year’s LASER and look forward to the next exhibition, June 18 - 22, 2001.

Customers at PI’s LASER 99 booth learning about M-850 and F-206 Hexapods.

Satellite Dishes, Hexapods & More

ALCATEL SPACE, Cannes (France) has developed an innovative system for satellite antenna optimization at its Compact Antenna Test Range. A satellite antenna basically consists of a reflector and a feed. The reflector (dish) and the corresponding feed are built with respect to the specifications. Due to manufacturing tolerances the theoretical position of the feed does not completely fulfill the specifications. So relative movements of the feeds with respect to the reflector are necessary.

Alcatel Space has developed a new process for this optimization, called „Pathfinder System“. After testing the feeds with their theoretical position, deviations are analyzed by software and hardware and the new optimized position for the feeds is determined. Pathfinder is fully automated. It controls two Physik Instrumente M-850 Hexapods to reach the optimized position of the feeds. The M-850 Hexapod is a complex six-degrees-of-freedom micropositioning system featuring better than 1 µm linear resolution and better than 5 µrad angular resolution in all axes. It also allows the user to define the pivot point anywhere inside or outside the system’s envelope.

Pathfinder drastically reduces testing time and increases performance, correcting deviations in pointing and gain with an accuracy of better than 0.01 mm and 0.001 deg. The new system has already demonstrated its full efficiency. More than 15 antennas have been optimized to date (1999).

Fig. 1, Two M-850 Hexapods at Alcatel Space, Compact Antenna Test Range. Courtesy of Alcatel Space.

LabView™ Driver for C-842 Motor Controller Card

New Drivers for Windows NT™

The protection mechanisms of the NT operating system don’t allow direct hardware access and therefore impede direct programming of ISA bus cards such as the C-842 motor controller.

PI now offers a new system driver for Windows NT™. After installation in the operating system the driver allows operation of the board via the included DLLs. For LabView™ programmers, new NT drivers (VIs) are available, too. They allow access to all commands and functions of the C-842 motor controller.

The drivers and documentation are available at no charge. Please contact your PI distributor for more information.

Fig. 2, M-850 Hexapod

Fig. 3, Alcatel Space Compact Antenna Test Range. Courtesy of Alcatel Space.

High Resolution Multilayer Benders

New PI Ceramic Piezo Actuators work under extreme conditions.

- Ideal for OEM Applications
- Positioning Range up to 2 mm
- Fast Response (≤ 10 msec)
- Nanometer Scale Resolution
- Low Operating Voltage (0 to 60 V)
- Low Temperature Compatibility

The new line of Piezo Multilayer Bender Actuators from PI Ceramic now travels up to 2 mm and provides improved material characteristics (e.g. temperature range, protection from humidity etc.). Apart from standard models, custom sizes are available for volume buyers. OEMs will also appreciate the low operating voltage of only 60 V.

Recent tests at an Italian research institute have shown that the new actuators operate at temperatures as low as 4 Kelvin. The researchers who design a novel Magnetic Microscope found that the actuators worked reliably and would still provide sufficient travel under these extreme conditions.

Target Applications: Wire Bonding, fiber-optic switches, beam deflection, pneumatic valves, nanopositioning. Request our datasheet!

Fig. 1, Two M-850 Hexapods at Alcatel Space, Compact Antenna Test Range. This example shows optimization of the Eutelsat W4 Africa Antenna. Courtesy of Alcatel Space.

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Confocal Microscopy: Nanometer Precision in Milliseconds: Ideal Application Field for Piezo NanoPositioners

Confocal microscopes provide significantly higher resolution than conventional microscopes. They also allow imaging of living cells (unlike electron microscopes) and are widely used in the fields of semiconductor testing, materials research and biology. Confocal microscopy is based on scanning the specimen in X, Y and Z direction and capturing images at each individual XYZ coordinate. For high throughput and quality, the motion between the individual positions has to be fast and precise at the same time. Both requirements are met by PI Piezo NanoPositioning Systems as indicated in the examples which follow.

Fig. 1 shows the principle of a confocal microscope. The specimen is illuminated by a laser beam. Due to the small dimensions of the illuminating light spot in the focal plane, stray light is minimized. Reflected light from all structures being out of focus is suppressed by a pinhole before reaching the detector. Only light returning from an exact plane passes through. For a complete 3-D image many slices have to be taken and superimposed by software. The depth of the focal plane is typically on the order of several 100 nanometers. For imaging small structures with optimal contrast, scanners (nanopositioners) with resolution better than 20 nm should be used. Confocal microscopes use different types of scanning techniques: as scanning the objective and bi-scanning the sample. PI offers a variety of solutions for both versions:

- P-720 through P-723 PIFOC®
- Microscope Objective-Scanners are simply screwed between the microscope and the objective.
- A variety of thread options allows adaptation to all standard microscopes.
- PIFOCs® are available with scanning ranges of 100 - 350 µm providing resolution of better than 1 nm.

POWFOC™ Turret-Scanners provide scanning ranges of 100 µm and 200 µm and sufficient force for scanning the complete turret with several objectives (Fig. 3).

For scanning the sample, the new P-500 stages are recommended (Fig. 2). They provide scanning ranges to 200 µm and resolution of better than 1 nm (integrated capacitive position sensors).

Interferometric Telescopes

Alenia Aerospazio, Italy, designs Mirror Stabilization with PI Piezo Actuators

The Global Astrometric Interferometer for Astrophysics (GAIA) is one of ESA’s (European Space Agency) cornerstone missions in the Horizon 2000 Plus long-term scientific program. GAIA’s objective is to determine star positions and motions with an accuracy of 10 micro-arcsec. This accuracy can only be realized with sophisticated interferometric measurements where distance variations as small as a few picometers between individual optical components in the interferometer can be detrimental.

For nullification of these variations Alenia Aerospazio, Italy, designed an active tip-tilt mechanism based on three PI Piezo Actuators (model P-844.20, Fig.2). The following tests proved the active control system to be capable of ensuring the ultra-high stability requirements fundamental for the achievement of the GAIA mission goals.

Need more information? Talk to your local PI representative.