

PRESS RELEASE

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XXL MEMS mirrors now available in volume from Mirrorcle Technologies

Mirrorcle Technologies, the established manufacturer of dual-axis MEMS mirrors, introduces new MEMS mirrors with 6.4mm or 7.5mm diameter aperture at Photonics West 2018. In addition to the company's integrated mirrors ranging from 0.8mm to 2.4mm, and the modular 'bonded' mirrors from 3.0mm to 5.0mm in diameter, the company unveils devices with even larger diameter mirror surfaces. These mirrors are available in combination with the company's stiffest MEMS actuator chip, A5L2.1, which offers quasi-static beam-steering capability of -1° to $+1^{\circ}$ mechanical angle in both X and Y axes. Mirrorcle's technology offers extremely repeatable tip/tilt capabilities, yielding an angular mechanical resolution for these devices smaller than 0.5 millidegrees. Possible applications include those that require not only a large mirror size but also maintenance-free, extremely repeatable optical beam-steering capabilities. These include many long-range uses, e.g. free-space optical communications where MEMS devices can be used for fine-tuning the optical link between transmitter and receiver systems. Mirrorcle's bonded MEMS mirrors are micro-assemblies of a monolithically fabricated actuator 'engine' that is combined with a separately manufactured mirror available in various sizes. The A5L2.1 is a MEMS actuator with a 7.25 x 7.25mm footprint and is designed not to achieve a large angular reach but to maximize torque to allow for high speed beam-steering when combined with larger mirror sizes.



Figure 1. Mirrorcle's 7.5mm Al-coated MEMS mirrors with A5L2.1 actuator chips in TINY48.4 connectorized packages. These devices offer a total angular reach of ~ 2.0 degrees mechanical in both X and Y axes.

New MEMS mirrors offer stunning optical mirror quality

To assess the optical quality of the new MEMS mirror products, Mirrorcle engineers utilized a 3D optical surface metrology system and confirmed excellent surface roughness and mirror flatness. Traditionally, the company's mirrors come with a guaranteed flatness that exceeds 5 meters radius of curvature (ROC), for any mirror size. This guarantees a high optical quality – an important feature for many applications in which beams need to be directed to predictable and repeatable angles while maintaining beam wavefront quality. Based on polished, pure single-crystal silicon wafers, MEMS mirrors are fabricated by deposition of a low-stress metal coating with outstanding optical characteristics, including high purity and smoothness. The 6.4mm and the 7.5mm MEMS mirrors match the company's established trend and show flatness deviation terms better than $\lambda/20$ for most applications.

XXL MEMS mirrors offer high-resolution beamsteering with a high bandwidth

The first 6.4mm and 7.5mm diameter MEMS mirrors were recently assembled onto A5L2.1 actuators, and offered a true mechanical tip/tilt capability of $\pm 1^\circ$ in both axes, so a total mechanical sweep of 2.0° on each axis which translates into an optical field of view (FoV) of $\sim 4^\circ \times 4^\circ$. Frequency responses are very flat from DC (for quasistatic or point-to-point actuation) to near resonant frequency. Resonant frequency for 6.4mm diameter design is in the 700-800Hz range and for the 7.5mm design is in the 500-550Hz range, in both axes. Like all of the company's MEMS, these mirrors offer a 14-bit repeatability (precision) when driven with designated MEMS drivers, so 16384 discrete angular positions are repeatably addressable in point-to-point (P2P) mode between the negative and positive maximum angles in both axes. "We are excited to offer these large mirrors tailored to customers who need to accommodate large beam sizes," commented Dr. Milanovic, Founder and CEO of Mirrorcle Technologies. "These devices were designed to match specific customers' application needs and we believe that they will meet the demand in FSO communications, LIDAR, and other application spaces that require both large mirrors as well as reliable, high-resolution optical beam-steering."

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About Mirrorcle Technologies, Inc.

Mirrorcle Technologies, Inc. (MTI), founded in 2005, is a California corporation that commercially provides products and services based on its proprietary optical microelectromechanical system (MEMS) technology. Since its founding, and supported by its continuous investment in R&D, MTI has been offering the world's fastest point-to-point (quasi-static) two-axis beam-steering mirrors, as well as resonating-type micromirror devices with rates up to HD video display. MTI is globally the only provider of tip-tilt MEMS actuators in combination with mirrors from submillimeter to several mm in diameter, offering customers a wide selection of specifications to optimize their paths to successful commercialization. In addition to a variety of existing designs and in-stock products.

MTI maintains a laboratory at its headquarters and has year-round, 24-7 access to wafer-based CMOS and MEMS fabrication facilities. MEMS mirror fabrication, wafer-level and die-level testing, packaging and outgoing inspections are all performed in clean-rooms. MTI has an established manufacturing service cooperation with a leading MEMS wafer foundry ensuring streamlined, high-quality volume production.

As a privately held company, MTI is able to act efficiently, offering creative and highly responsive service to customers. The company provides highest-quality products and support to facilitate customers' product development and successful commercialization. The team draws on several decades of combined experience in MEMS design, fabrication, and testing.