

Low-profile linear stage brings speed and precision to semiconductor inspection

With some of the most demanding quality control regimens of any industry, semiconductor manufacturers use a variety of sophisticated metrology instruments to inspect wafers at each and every production step. All of these instruments have something in common: They simply will not function without precision motion stages.

“Choosing the right stage for moving wafers around during inspection procedures is vital to achieving the required quality control levels,” explains Brian Bobrzynski, a mechatronics engineer with Semilab, a maker of semiconductor inspection systems.

“At Semilab, we use different types of stages depending on the application. In applications involving contact measurement, we typically favor stages driven by piezomotors to eliminate vibration. In non-contact applications, such as wafer mapping and scanning, speed and precision are more important than vibration reduction. One of the best positioning devices we’ve found for our non-contact systems is the LowBoy linear stage.”

Designed and manufactured by Bell-Everman Inc., the LowBoy linear stage is driven by a cog-free linear servomotor rated for up to 280 N of continuous force. The compact stage is ideal for semiconductor metrology applications that require a reliable and precise linear positioning device in a streamlined package. Gyorgy Fule, head engineer at Semilab headquarters in Budapest, Hungary, describes how the company first learned about Bell-Everman stages.

LowBoy precision stages are ideal for semiconductor metrology and other applications that require fast and accurate linear positioning.

“Our engineers had been using the SemiTest platform as our standard and tried to build a 300-mm junction photovoltage (JPV) tool based on it,” explains Fule. “However, for measurements like JPV or μ -PCD, the original R-Theta stage wasn’t fast enough. One of our engineers discovered Bell-Everman and their stages as an alternative. We’ve been using them ever since in several of our platforms.”

LowBoy stages are now used on Semilab’s WT-3000 double FOUP platform, WT-2500 multifunction wafer mapping tool and QC-2500e near surface doping mapper. The WT-3000 and WT-2500 are powerful standalone measurement platforms that perform many different semiconductor material measurements, such as dielectric characterization and epitaxial layer monitoring. The QC-2500e measures qualities such as doping concentration and recombination lifetime for epitaxial wafers. In each of these non-contact platforms, positioning speed and precision are critical to achieving the increased throughput required by today’s semiconductor fabs.



CASE STUDY



The QC-2500e near surface doping mapper from Semilab uses non-contact technology to measure near-surface resistivity, doping concentration and recombination lifetime on epitaxial wafers. The fully automated platform features a LowBoy linear positioning stage to quickly and precisely move wafers into position for inspection by optical lasers.

“The high torque and acceleration provided by the LowBoy means that the stage begins moving almost immediately at full speed. It doesn’t need anywhere near the time to ramp up to full speed as a stepper motor and leadscrew combination, for example,” says Bobrzynski. “The faster the positioning stage moves, the faster the inspection process can take place, which ultimately means greater chip production per shift.”

LowBoys are capable of speeds to 4 m/s with a bidirectional repeatability of ± 1 encoder count. Beyond speed and precision, LowBoys also feature a sleek low-profile design. Even when stacked in a dual-axis configuration, the total height is just 169 mm.

“The low-profile design is helpful because it keeps the overall machine size down. If the stage itself is too tall, there’s not as much room for the metrology equipment,” says Bobrzynski. “The LowBoy gives us plenty of room to work with in our platforms.”

For more information on Semilab USA LLC, call (508) 647-8420 or visit www.semilab.hu. To contact Bell-Everman Inc., call (805) 685-1029 or visit www.bell-everman.com.

LOWBOY LINEAR STAGES

LowBoy precision stages feature a sleek, low-profile package that simplifies integration into OEM machines. They are ideal for semiconductor metrology and other applications that require a reliable, precise linear motor positioning stage.

SPEED AND PRECISION. LowBoys reach speeds up to 4 m/s with a bi-directional repeatability of ± 1 encoder count.

LOW PROFILE DESIGN. Even when stacked in a dual-axis configuration, LowBoys have a stacked height of 169 mm.

INTEGRATION OPTIONS. LowBoys can be configured with an integrated rotary axis. Utilities can exit from the stage end or base. Top plates can be configured to customer specifications. Due to their self-contained covers, LowBoys lend themselves to clean room operation.

RUGGED CONSTRUCTION. LowBoys feature an anodized aluminum and stainless steel construction. Their linear bearings are lubed for life.