

## PMAT™ PHOTONICS MODULE ALIGN, ASSEMBLY AND TEST STATION

### Field-Proven Technology in a Customizable Platform

AEi designed its highly flexible Photonics Module Align, Assembly and Test Station (PMAT™) platform for photonics development and production applications. AEi developed PMAT by standardizing technology AEi deployed in its custom semi-automated and fully automated stations over the last decade. This results in a comprehensive photonics align, assembly, and test station platform that significantly decreases deployment time while supporting a wide range of options to best suit specific customer needs.

### Broad Range of Development & Production Applications

The PMAT platform supports a variety of different photonic/opto-electronic product and packaging requirements at both the development and production level, including:

- Device testing and characterization in a lab environment to support new or revised product designs
- Both single channel and multi-channel opto-electronic devices
- Automated alignment, testing and product assembly with components bonding for both pre-production and full production needs
- Automated material handling features as appropriate to the level of automation required

### Configurable for Current and Future Applications

AEi's PMAT platform offers a superior alternative to the choice between limited featured standard products and custom stations available from other sources as well as end-user built custom stations, providing the following important benefits:

- Flexible and extensive control software architecture that supports motion stages, test equipment and other key components from multiple suppliers
- Re-configurable fixturing, electrical and optical interfaces to more quickly support different applications and product/packaging designs over time
- Re-configurable software sequencing, alignment and testing functionality with little or no need to create custom programming in C, C++, Labview, Delphi or Visual Basic
- Lower cost of system deployment and support
- Long-term warranty and service support from AEi and AEi support partners worldwide

### Modular PMAT Systems Maximize Flexibility

Working with a modular approach, AEi delivers each PMAT station to meet the client's specific requirements, integrating only necessary components and optimizing performance for even the most demanding and highest precision photonics/opto-electronic applications. PMAT standard and optionally available features include:

- Rigid industrial grade station base with integral active vibration isolation breadboard for adaptable mounting of stages and fixturing
- Automated precision motion stages for aligning optical components such as lenses, fibers, and fiber arrays. This includes up to 6 degrees of freedom motorization on either one or two sides of devices to be aligned
- Adaptable and reconfigurable part grippers and fixturing
- Multiple machine vision camera options with configurable machine



vision analysis for automated initial alignment in horizontal and vertical planes

- Adaptable and reconfigurable electronic probe card interface option for different products to be aligned and tested
- Standard support for a number of common instrumentation devices (LD drivers, power meters, TEC units, etc.) plus customer configurable support for custom and additional devices via IEEE-488 and other means
- Optional automated dispense of index matching fluid and adhesives as well as automated thermal or UV cure
- Optional single beam or dual beam laser welding attach
- Highly flexible but easy-to-learn and use control software based on FlexAuto motion/vision development environment with support for extension and customization with ActiveX plug-ins written in C++, Labview, Delphi or Visual Basic, if needed
- Customizable align and test sequences via intuitive sequence editor that allows password-authorized users to create and adjust station control logic with only modest training
- Configurable automated alignment algorithms such as raster scan, box scan, spiral scan, downhill simplex, etc..
- Range of data output and export options
- Comprehensive documentation for station setup, maintenance, and operation
- Training programs available either at AEi or at customer sites
- Full warranty and service contracts available as well as turn-key installation
- Available AEi engineering services for designing and developing custom fixturing, process and product design refinement for customer packages, and other custom features and functions.

### Improve Your Products and Manufacturing Performance Now

PMAT stations are in operation now in factories across North America, Asia and Europe. For more information on how PMAT stations can improve your product development and manufacturing performance, call AEi at (978) 658-1000 or email us at: [sales@aeiboston.com](mailto:sales@aeiboston.com)

# Available Configurations/Basic Specifications

## PMAT Elements Base System

AEi's basic PMAT system includes:

- Air isolation table with optical breadboard top, 1.1 x 0.9 meters
- Industrial PC with Pentium IV, DVD-RW, 1 GB RAM, 100 GB HDD, Ethernet, USB, flat panel touch screen monitor, IEEE-488 interface, 32 point isolated digital I/O interface and termination, and pendant arm to mount keyboard/mouse and touch panel monitor
- Enclosed AC control panel for circuit protection, power supplies, drive amps, and I/O termination mounting
- Single 12U equipment rack for control PC and instrumentation with slide mount for easy service access
- Single six-axis precision alignment stage with 100 by 100 mm travel in horizontal travel, up to 25 mm travel in vertical travel and up to +/-10 degrees travel in roll/pitch/yaw; linear motion resolution of 10 nm, rotary resolution of .03 arc seconds
- Simple device holding pedestal (static) with vacuum fixture to hold device to be aligned to (specific features as needed for application)
- Custom gripping feature/fixture on top of alignment stage to hold second component (specific features as needed for application)
- AEi PMAT configurable align and test control software that includes multi-level user interface and system configuration utilities/editors to allow end users to create custom align and test recipes quickly
- Two days system training at AEi and/or customer facilities
- Comprehensive PMAT operation and maintenance manual
- System installation at customer facilities plus one year standard AEi warranty

## PMAT Enhanced Base System

Includes everything included in PMAT Elements Base System, plus:

- Overhead XYZ tooling stage
- One, two, or three machine vision cameras mounted on tooling stage to view devices to be aligned from different perspectives and magnifications
- Configurable sequencing support in software for automated machine vision analysis to support automated pick-and-place and first-light positioning
- Motorized two axis device nest to index components and/or package in front of alignment stage
- Quick change nest/fixturing interface for top of device nest and top of alignment stage to accommodate different products to be aligned, assembled and tested

## Options

**Extended PMAT Station Base** for PMAT Elements or PMAT Enhanced Base System

- Wider station base with 1.4 meter by 0.9 meter integral optical breadboard with active vibration isolation
- Second 12U equipment rack for control PC and instrumentation with slide mount for easy service access

**Second Alignment Stage** for PMAT Elements or PMAT Enhanced Base System

- Second six axis alignment stage
- Quick change nest/fixturing interface for top of alignment stage to accommodate different products to be tested
- Configurable sequencing support in PMAT control software to implement dual ended alignment

## Automation Engineering Incorporated

Automation Engineering, Incorporated (AEi) is a leading supplier of high-precision automation systems across the optoelectronics, medical devices, consumer products, aerospace/defense, and other world-wide markets. AEi provides comprehensive design for manufacturing, process development, and pre-production build services in addition to complete turn-key automated manufacturing stations and lines. For more information, visit AEi's website: [www.aeiboston.com](http://www.aeiboston.com)

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**Safety Enclosure** for PMAT Elements or PMAT Enhanced Base System

- Safety enclosure with polymer side panels for top of station base with front and rear access doors and associated interlock circuits – UV safe side panels optional
- Light tower at top of enclosure for station status annunciation

**Automated Dispense** for PMAT Enhanced Base System

- Dispensing subsystem with pressure/time or auger valve
- Dispense valve and needle mounted to vertical positioning slide on XYZ tooling stage
- Tip finding substation for automated dispense needle align/calibration
- Configurable sequencing support in PMAT control software to implement lines and dots of dispense fluid with adjustable parameters

**Automated UV Cure** for PMAT Enhanced Base System

- UV cure source
- Bifurcated or trifurcated UV cure wands mounted to pneumatic slide fixture for positioning during cure and retract during alignment
- Configurable sequencing support in PMAT control software to implement curing with variable intensity versus cure time profile

**Laser Welding** for PMAT Enhanced Base System

- 10 watt or 15 watt YAG laser source with either single or dual balanced output
- Single or dual motorized laser delivery heads
- Optional coaxial cameras to assist in teaching and verifying weld locations
- Configurable sequencing support in PMAT control software for vision guided weld sequencing and control

**Probe Card** for PMAT Enhanced Base System

- Three axis motorized probe card stage with manual micrometer adjustment for pitch, roll, yaw
- Probe card interface fixture to support use of interchangeable probe cards with modest changeover time
- Configurable sequencing support in PMAT control software for vision guided probe card engagement

**Automated Pick and Place** for PMAT Enhanced Base System

- Pick and place head with quick change tooling interface mounted to vertical positioning slide on XYZ tooling stage
- Gel pack, waffle pack, JEDEC tray style, or other parts loading nest (manual or automated)
- Configurable sequencing support in PMAT control software for vision guided pick and place