

## CMAT™ II MANUFACTURING SYSTEM FOR DIGITAL CAMERA MODULES

### Innovative Solutions for Advanced Applications

AEi's Camera Module Align, Assembly & Test (CMAT) station's high-precision manufacturing capabilities enable digital camera module manufacturers to accurately align lens assemblies to high density camera sensors with either fixed or variable focus capability.

The CMAT station is the world's first camera module assembly station to align a lens assembly to a sensor on a circuit in up to five degrees of freedom. The CMAT station positions the lens assembly in X, Y and Z, and then across the corners in pitch and roll to achieve an even focus across the focal plane.

The CMAT II system is a complete multi-station manufacturing line that is designed for high volume production. It has a cycle time that is roughly 2-3 times faster than the CMAT I station plus provides a more comprehensive set of manufacturing operations such as fully automated material handling, second stage UV cure, full functional and image testing, and laser marking. AEi and many of our customers use a CMAT I station initially for process and product validation for a new product to be introduced and then use additional CMAT I stations or CMAT II systems as needed to reach required production volumes. This approach is very effective since the CMAT I and CMAT II both use the same AEi core technology, components and software for all camera communications, alignment, attach, and test functions.

### Concurrent Assembly and Test Improves Performance and Yield

- Fully test and characterize lens-sensor assemblies in terms of various image quality attributes and other features during the assembly process or separately
- Automatically adjust assembly positioning to ensure consistent peak performance from every assembly based upon the FlexAuto™ lens-sensor characterization
- Screen out bad components and assemblies early in the manufacturing process instead of after full assembly and perform a battery of quality tests, such as particle checking, distortion measurement, vignetting and color verification of the completed camera
- Calculate unique focus scores at different zoom lengths down to fisheye, across the center and corners of the image with FlexAuto™ alignment software
- Cut cycle time by up to 90% from manual manufacturing methods via enhanced alignment and image testing algorithms
- Dramatically improve operator efficiency and clean room utilization



### Modular CMAT Systems for Flexibility

Working with a modular approach, AEi configures each CMAT station to the client's specific requirements, eliminating unnecessary components and optimizing performance for even the most demanding automation applications, including automotive, mobile phone, medical and consumer product categories.

Typical configurations are:

- Test functions only
- Automated alignment/assembly/test and UV cure of adhesive
- Automated adhesive dispense plus alignment/assembly/test and UV cure of adhesive

### Support for Popular Camera Designs; Emerging Standards

- Complies with currently used serial and parallel communication interfaces, plus emerging standards including those promoted by SMIA and other industry groups
- Automate assembly of a multitude of camera sensors and lens housing designs, including automated focus and zoom using piezoelectric, voice coil, liquid lens, and other integrated actuators
- Manufacture different models on the same production lines with minimal changeover

### Improve Your Manufacturing Performance Now

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

## CMAT II System Specifications

|   |                           |
|---|---------------------------|
| Throughput  | ≥ 120 units/hr            |
| Equipment Yield   | ≥ 98%                     |
| Reliability (up-time fraction)                                    | ≥ 99%                     |
| X, Y Alignment Accuracy   | < +/- 10 μm               |
| Z Alignment Accuracy  | < +/- 5 μm                |
| θx, θy Alignment Accuracy   | < +/- 2 arc min           |
| X, Y Travel Range   | 100 mm                    |
| Z Travel Range  | 25 mm                     |
| θx, θy Travel Range   | ≥ 5 deg                   |
| Center Zone Focus Score GR&R                                      | < 5%                      |
| Corner Zone Focus Score GR&R                                      | < 5%                      |
| Minimum Equipment-limited Viewing Angle at Camera Entrance Window | 30 deg from camera Z axis |
| X, Y Dispense Travel  | ≥ 50 - 100 mm             |
| Z Dispense Travel   | ≥ 25 mm                   |
| X, Y Dispense Accuracy  | < +/- 50 μm               |
| Z Dispense Accuracy   | < +/- 50 μm               |
| Vision Guided Dispense plus Validation                            | Yes                       |
| Fully Automated Material Handling                                 | Yes                       |
| Secondary UV Cure Option  | Yes                       |
| Full Functional and Image Testing Option                          | Yes                       |
| Laser Marking Option  | Yes                       |

### 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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