



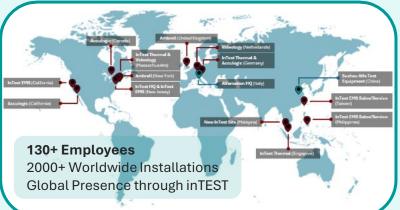
Functional Testing of Micro-Optics and Lighting Units for Automotive

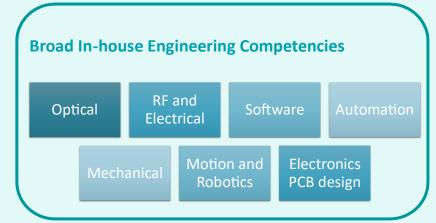


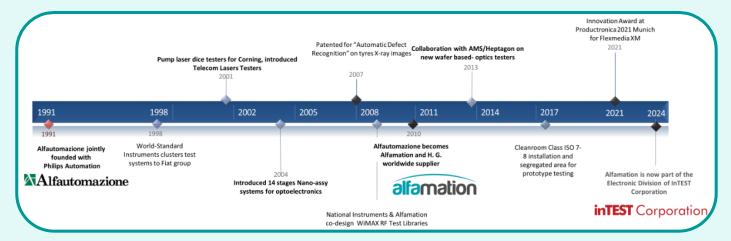
Sébastien Reithinger Tech Leader

34 years of passion and expertise













InTEST Overview





Headquarters in Mt. Laurel, New Jersey USA **NYSE: INTT**



Innovative Test and Process Solutions

Diversified Global Manufacturer of

Electronic Test Division

inTEST EMS Products

Founded in 1981, inTEST EMS designs, manufactures and markets test head manipulators, docking and electrical interface products that are used by semiconductor manufacturers to test integrated circuits and wafers.

Acculogic designs, manufactures and markets a broad range of systems and instruments for testing electronic devices, electric vehicle batteries, circuit boards and systems. Products include flying probe test systems, functional test systems and others



individual test modules to complete automated turnkey test systems for design, test, and manufacturing engineers and managers in the automotive, consumer electronics, telecommunications, and medical industries

Environmental Technologies Division



inTEST Thermal Solutions (iTS) specializes in the design and manufacture of precision temperature control systems. Our breadth of products and in-house engineering capabilities allow us to be a single-partnersolution for thermal test, process cooling, and cold storage applications. We are recognized globally for our expertise in precise temperature control and simulation of extreme thermal environments, from -185 to +500°C, with rapid transitions or long dwell times. The iTS family includes four product brands: Temptronic, Sigma Systems, Thermonics, and North

Process Technologies Division



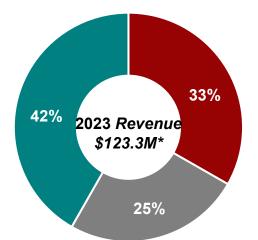
Founded in 1986, Ambrell Corporation, an inTEST Company, is renowned for our application and engineering expertise. Exceptional product quality and outstanding service and support are at the core of our commitment to provide the best customer experience in the industry with operations in the United States and Europe, including the United Kingdom and The



design, engineering and manufacturing of industrialgrade embedded video cameras, related systems, software and solutions. For more than 25 years we have been providing performance excellence in a broad spectrum of applications including biomedical devices. life sciences, banking, aerospace, traffic management, photo ID, pipe inspection and more.

~450 Employees

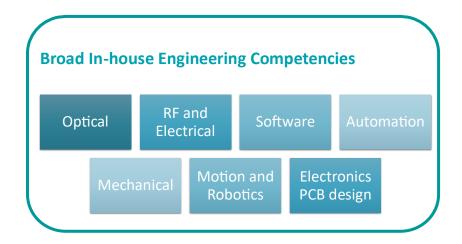




- Process **Technologies**
- Environmental **Technologies**
- Electronic **Test**

From Instruments to Automated Test Systems

Alfamation strong engineering capabilities help covering wide test needs, from instrumentation to turn-key automated test systems





- Communication Protocols
- Signal generation
- Signal analysis, measurements





- PCB testing
- Flashing station
- Burn-in station



- Electrical tests
- Optical tests
- Calibrations







Instrumentation

flexmedia XIVI.





Automotive Lighting Applications:

- generate/control lighting patterns
- measure electrical parameters
- manage data communication



flexmedia XM.

Flexmedia XM is a modular, robust and **cost-effective** solution to build flexible, scalable functional testers that **keep pace** with **technology evolutions**

Flexmedia XM is a family of ethernetpowered, OS-agnostic professional test tools in a very compact and rugged form factor, conceived for 24/7 Manufacturing Test as well as R&D, V&V and Service

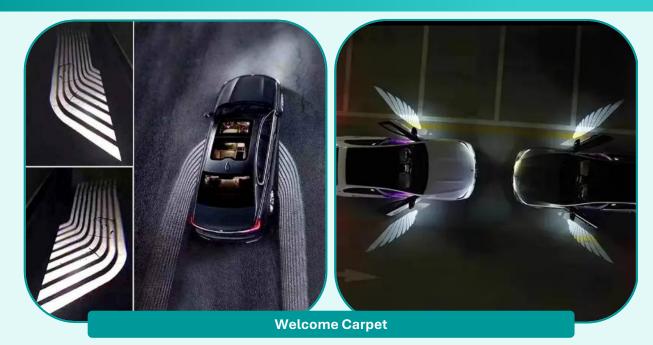
Full catalog: https://flexmediaxm.com/

Test Systems for:

Lighting Units Sub-Assemblies

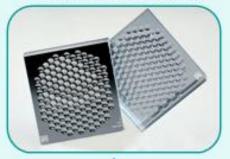


MLA Decorative Lighting Welcome Carpet and "Driving Intensions"

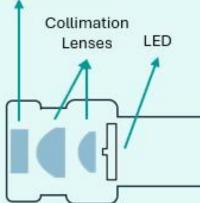








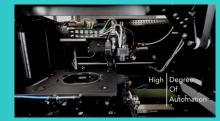
Tested at Wafer-Level!

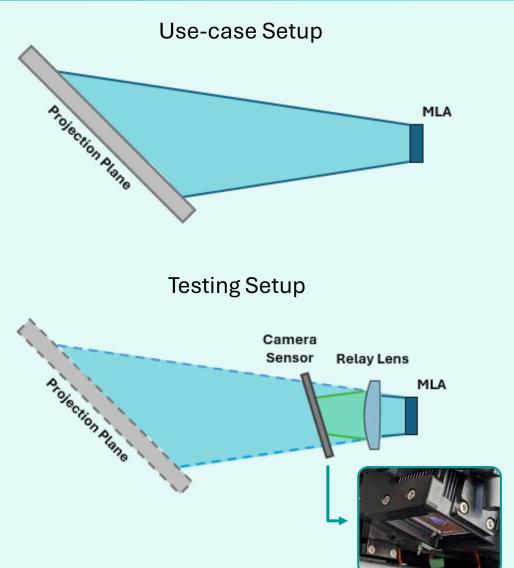


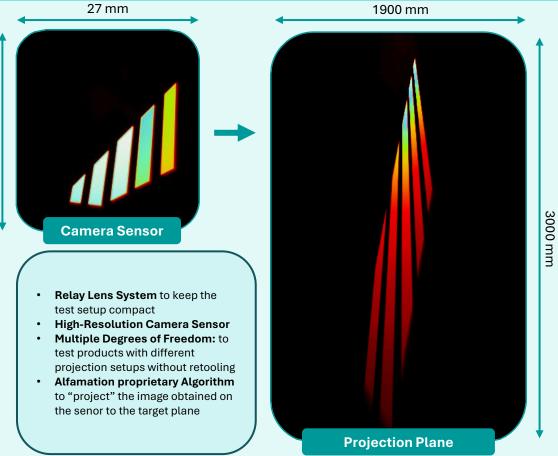
Projection Module



MLA Decorative Lighting Setup







Test Metrics: Relative Brightness, Contrast\Gradient, Cross Talk\Ghost,

Chromatic Aberration

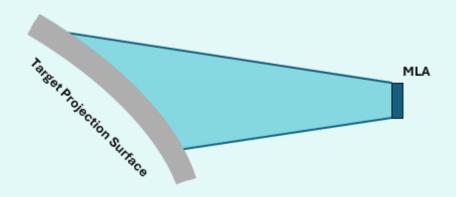
Speed: Up to 2800 UPH (Units per hour)

Stability: Gage R&R < 10%

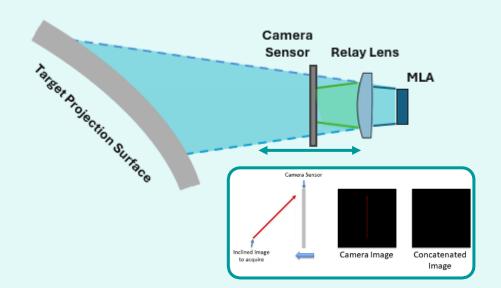
Performance

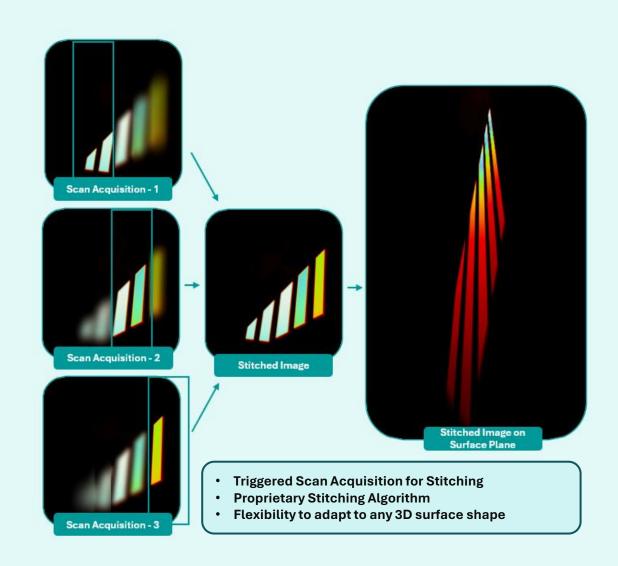
MLA Decorative Lighting Setup – Curved surface

Use-case Setup



Testing Setup













Flexible and Scalable Platforms



Lighting Sub-assemblies:

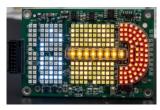


- Lighting control units
- Displays control units
- LED boards
- Light Shaping Optics (Monolithic and also wafer-level)

Test solution for production and R&D:

- Automated internal device handling and electrical contacting
- Easy device fixture swap to test variants
- Cost effective and scalable
- High throughput







Test Systems for:

Lighting Units End-Of-Line (EoL)





Flexible and Scalable Platforms

Lighting Units and Displays:

- Functional testers for:
 - LED Interactive Displays
 - Headlamps
 - Light projection units

Test solution for production:

- Automated internal device handling and electrical contacting
- Easy device fixture swap to test variants
- Cost effective and scalable
- High throughput







Scaling-up Production Challenges

High Throughput

- Optimized test sequence
 - Parallel processes
 - Batch sequencing
- Built-in step-by-step test time analyzer

Test Reliability



- Automated calibration sequences
- Golden units monitoring
- Built-in statistical tools

Cost optimization



- Instruments perf
- Testing scope
- Testing time
- Test flexibility
- Standard base platform
 - Common base components and spare parts

Cleanroom Friendly



- Automated serial number reading and alignment
- Robotized wafer loading
- Reduced footprint
- Cleanroom compatible
- Network integration

