alfamation
an inTEST Company

WALOT™

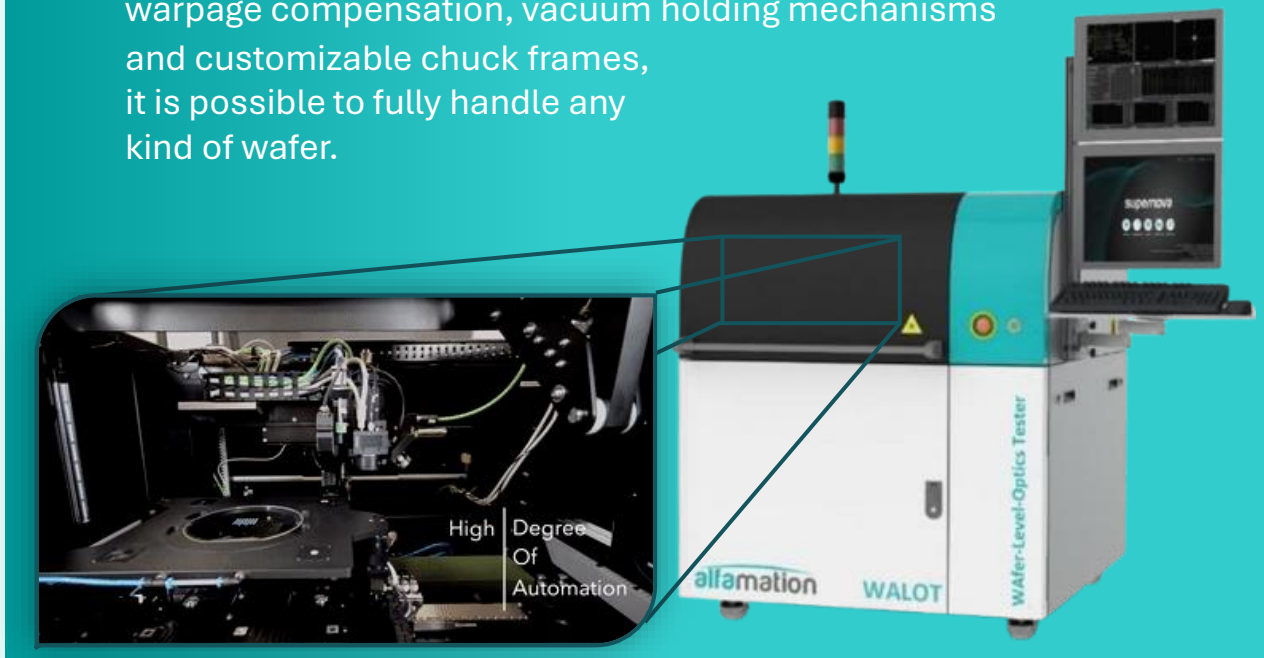
WAfer Level Optics Tester
Fully Automated

The Challenge of Wafer-Level Optical Testing

Wafer-level testing of passive optical components such as **diffractive optical elements** (**DOE**), **meta optical elements** (**MOE**) and **micro lens array** (**MLA**), presents a set of unique challenges. The use of these optical elements ranges industries such as consumer electronics, automotive, and telecommunications. As these components become more integral to advanced technologies - like facial recognition in smartphones, light projection in vehicles, and signal transmission in optical fiber networks - the **scalability of testing process** becomes a critical challenge: manufacturers need to **catch defects as early as possible** in the production process, balancing the need for **high accuracy and repeatability with a high throughput**.

WALOT™ : the fully Automated Wafer-Level Test Systems

At Alfamation we offer a fully automated test system designed to combine efficient automation with the capability of handling a wide range of functional tests. The platform is equipped with a high performative and reliable air-bearing wafer handling system combined with a flexible measurement setup architecture which requires little to no maintenance. With features like wafer warpage compensation, vacuum holding mechanisms and customizable chuck frames, it is possible to fully handle any kind of wafer.



WALOT™
Key Features and Benefits

- **Off-the-Shelf Automated Platform**: boost productivity with standard options or configurable builds to meet specific needs
- **Wide Configurability**: modular approach used to equip the system with different instruments configurations allowing to test different type of devices
- **High Test Coverage**: one platform with multiple test capabilities
- **Multiple Chuck Compatibility**: test different wafers with different shapes and layouts
- **Singulated Devices Test**: through the use custom-designed tray, the platform can test singulated devices as well
- **Wafer Warpage Compensation**: through a tip-tilt motion system
- **Automated Loading Options**: the platforms can either be stand-alone, manually loaded by operators, or integrated in the assembly line through an additional wafer handler unit
- **Powered by Alfamation Supernova™**: based on the testing industry standard sequencer NI TestStand, it provides a fully programmable automatic test sequence

Platform Specifications	
XY Wafer Positioning Accuracy, Repeatability (3σ)	±5 um/m, ±0.3 um
Maximum Wafer Diameter	Up to 12 inch
Dimensions W-D-H	1250-1150-1100 mm
Weight	800 kg
Air Pressure	6.5 – 8 bar
Flow rate	30 L/min
Air pressure humidity – Dew Point	Maximum temperature: 0°C Ideal temperature < -20°C

Comprehensive Testing Capabilities for Complete Optical Characterization

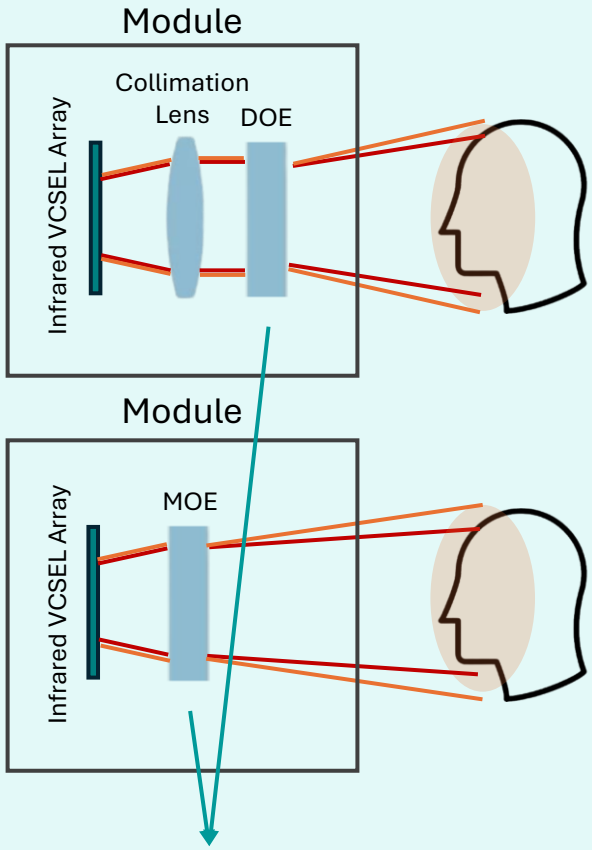
The WALOT™ platform offers a comprehensive and scalable solution for the many challenges associated with wafer-level optics testing across a board spectrum of industries. The system can thus be tooled in different configurations to test specific devices. Some of the configurations for the WALOT™ system are:

- **Conoscopy Mode**
- **Collimated Beam Profiling Mode**
- **Light Pattern Projection Mode**
- **Coupling Micro-Optics Mode**

These are just some of the possible configuration of tester setup: the flexibility of our solution allows to test multiple kinds of device, so you can reach out to Alfamation to integrate your specific test needs within our platform!

Conoscopy Mode: DOEs and MOEs testing

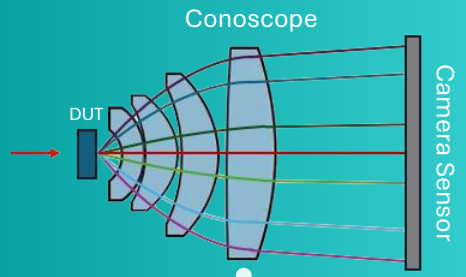
Diffractive optical elements (**DOE**), **meta optical elements** (**MOE**) are all widely used components in consumer electronics, for **face ID and gesture recognition**.



DOEs and MOEs are used for both **Dot Pattern Projection (red)** and **Flood Illumination (orange)** in the face id and gesture recognition procedure.

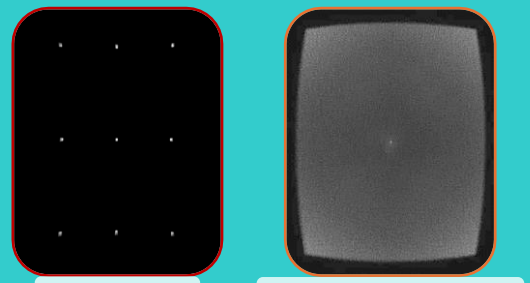
Conoscopy Mode: Test Principle and Configuration

To characterize this kind of devices, the tester is equipped with a **high-resolution camera** and a **specialized optics** called **Conoscope**. This lens system has a **high acceptance angle** and produces an **angular map** of the light emitted by the device on the camera sensor. The device is typically illuminated with a **single spot** laser source. The properties of the beam depend on the specific device.



Different conoscopes design for different needs!

Acquired Images



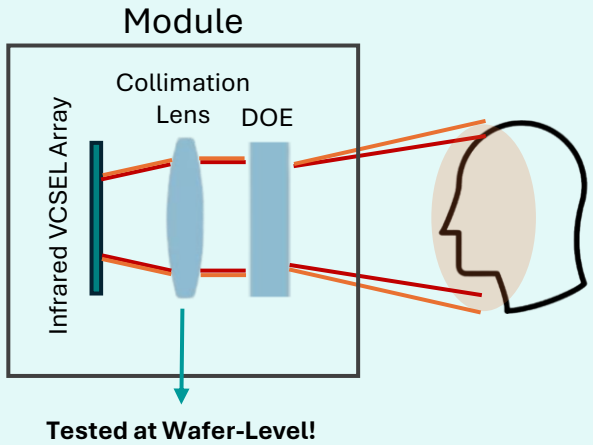
Dot Pattern | Flood Illumination

Test Metrics: **Angular Distribution, Transmission Efficiency, Diffraction Efficiency, Uniformity**
Speed: Up to **3000 UPH** (Units per hour)
Stability: **Gage R&R < 10%**

Performance

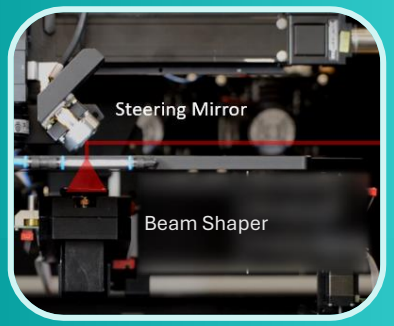
Collimated Beam Profiling Mode: Collimation Lenses testing

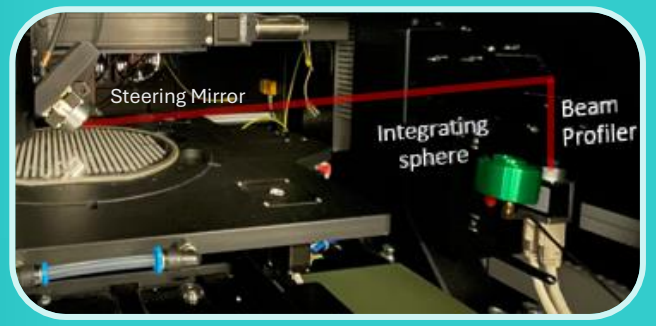
Collimation Lenses are components used in a very wide range of applications. In consumer electronics, they are often paired with DOEs for **face ID and gesture recognition**.



Collimated Beam Profiling Mode: Test Principle and Configuration

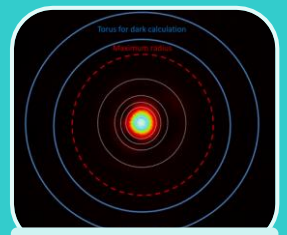
These devices are typically illuminated with a **single spot divergent** laser source. The tester is equipped with a **distance sensor**, used to characterize the wafer warpage. A scan is then performed by moving the light source: the goal is placing the beam waist at the focal distance from the collimation lens. The resulting collimated beam is deviated by a **steering mirror** towards a **camera sensor** and an **integrating sphere**.





Test Metrics: **Spot Size, Transmitted Power, Flange Focal Length, Effective Focal Length**
Speed: Up to **1500 UPH** (Units per hour)
Stability: **Gage R&R < 10%**

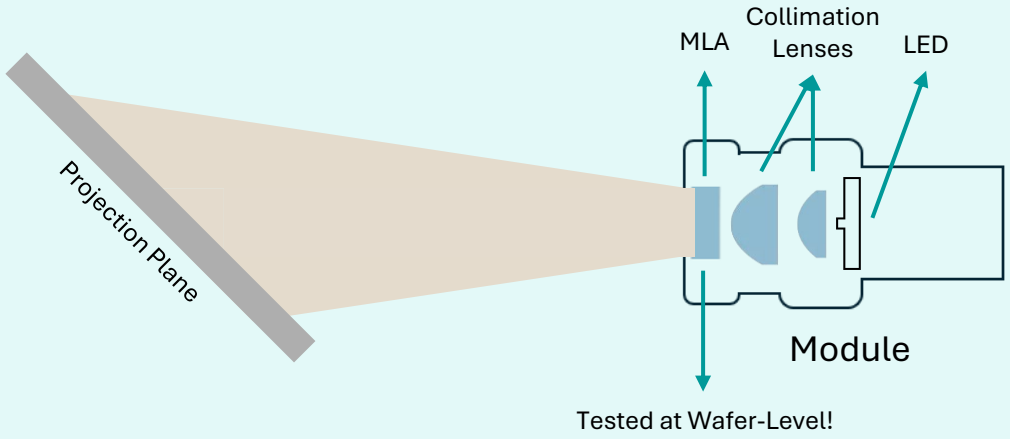
Performance



Spot on Beam Profiler

Light Pattern Projection Mode: Micro Lens Arrays (MLAs) testing

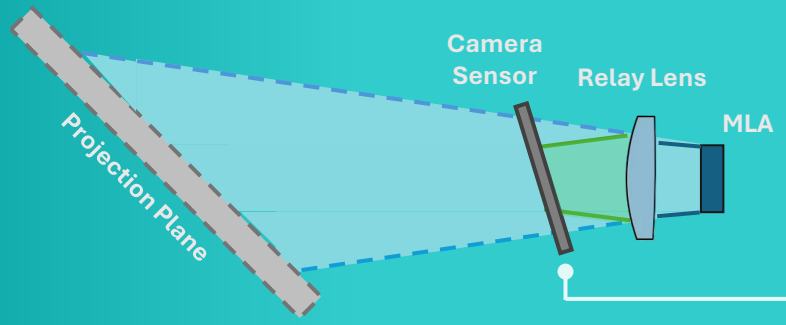
Micro Lens Arrays (MLAs) are used in the **automotive industry** for vehicle light projection. They are employed for both **decorative lighting** purposes (welcome carpet or dashboard illumination) and **headlights**.



A LED mounted on a PCB shines light on a system of collimation lenses. The resulting signal gets to the MLA, which projected a pattern on a target projection plane (i.e. street, dashboard, ...). The projection surface is can be from 500 mm to tens meters away from the device, and the projected area can range from 0.5 to a few meters too.

Light Pattern Projection Mode: Test Principle and Configuration

Due to the dimension of the working distance and illuminated area of the device, to keep the test environment compact, Alfamation designed a **relay lens system**, which allows to get the information needed for the test on a relatively small **camera sensor**. The MLA is usually illuminated with a **LED** and the specific properties of the beam hitting the device can be adjusted based on the specific test needs.



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

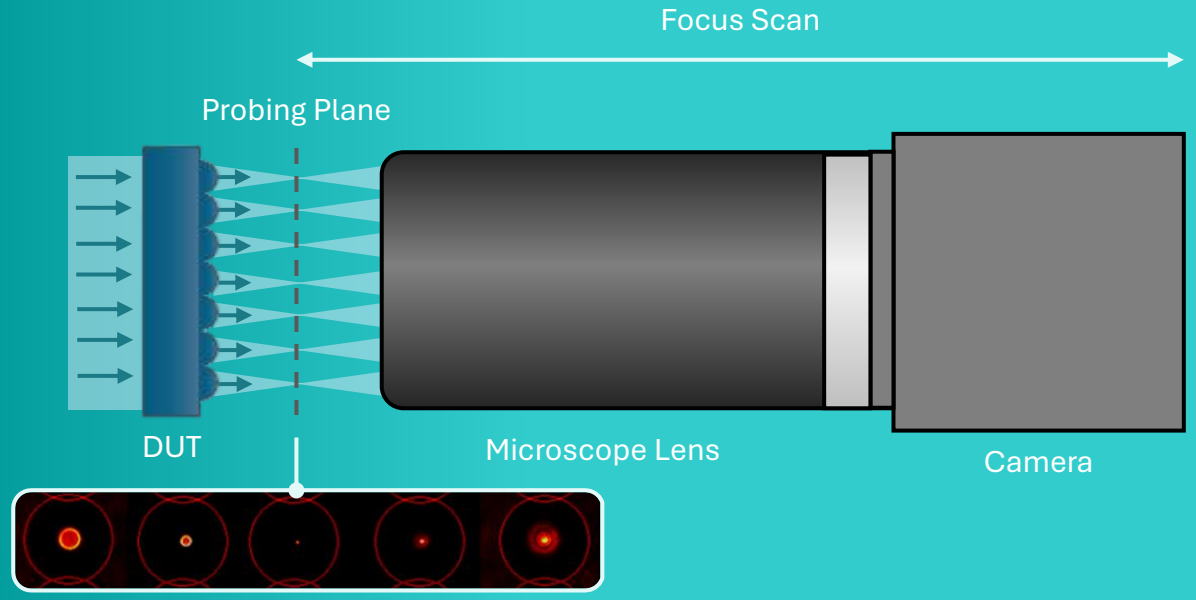
Projection on Camera Sensor

Coupling Micro-Optics Mode: Telecom and Imaging optics testing

Coupling optics are often used in telecommunication industry and for imaging purposes.

Coupling Micro-Optics Mode: Test Principle and Configuration

These lenses or array of lenses are usually illuminated by a laser beam. A **microscope lens** is used to collect the signal coming out of the devices: a **focus scan** is performed to minimize the resulting spot sizes on **a high-resolution camera sensor**.



Test Metrics: **Efficiency, Flange Focal Length, Uniformity**
Speed: Up to **1500 UPH** (Units per hour)
Stability: **Gage R&R < 10%**

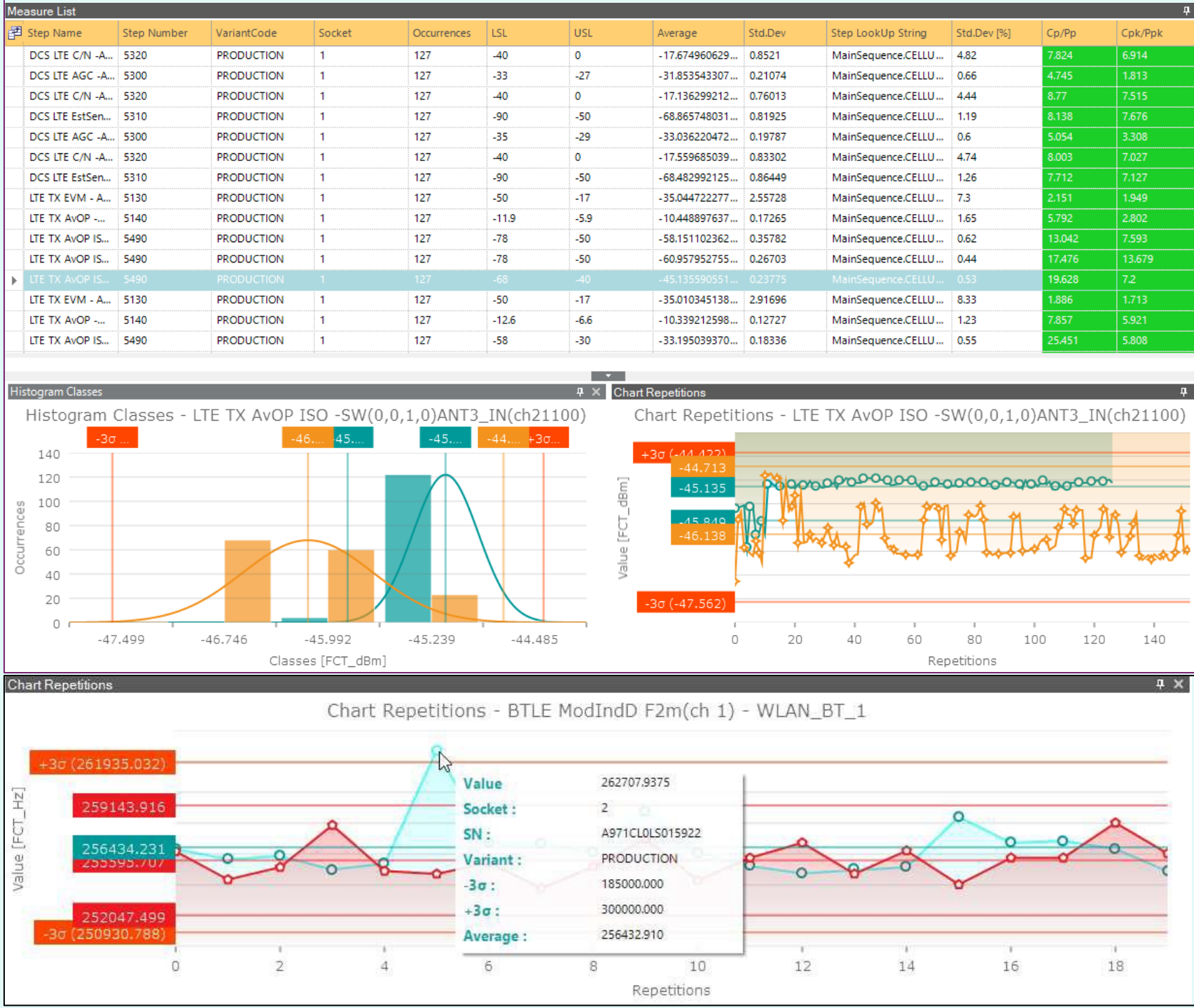
Performance

Powered by supernova

Variants Management: Single control panel for management of all variants
Resources Management: Panel with all HW resources
Application development: Graphic management of test recipe; easy integration of customer libraries
Results Management: SQL DB for limits/results storage and analysis
Integrated software version management
Over 2’000 Active Licences

Powered by TUNETRON

- Analyse test stability & repeatability
- Analyse test time
- Correlate test results

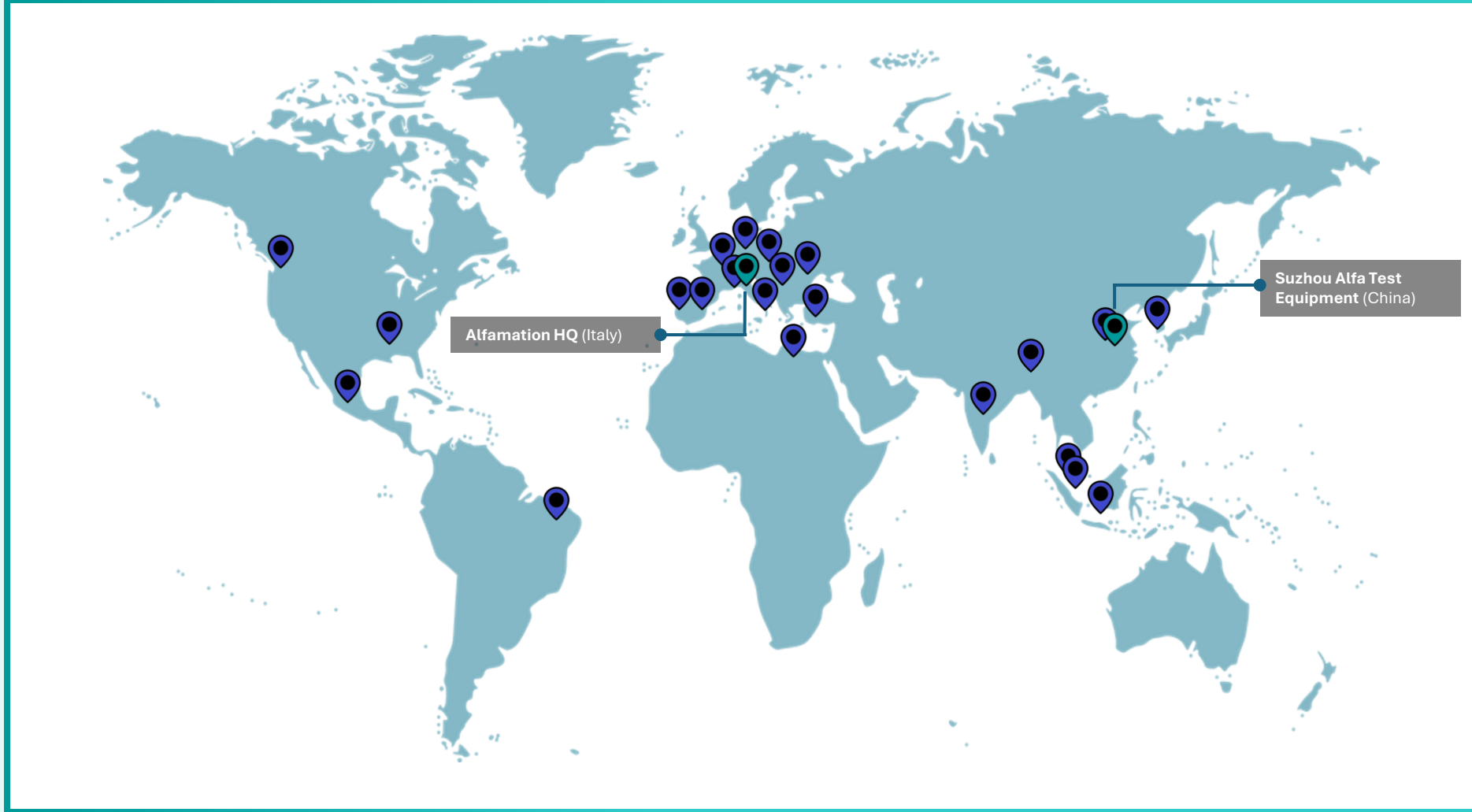


Since 2001 DNV ISO 9001 Certified
Since 2003 Certified Registered CSIA Member
Since 2014 Bureau Veritas ISO 9001 (Quality Management) Cert.
Since 2021 Bureau Veritas ISO 45001 (Occupational Health & Safety)
Since 2022 Bureau Veritas ISO 14001 (Environmental Mgmt.)
Since 2023 Bureau Veritas ISO 27001 (Cyber Security)

Install your System Worldwide

Alfamation has been installing test solutions worldwide for more than 30 years.

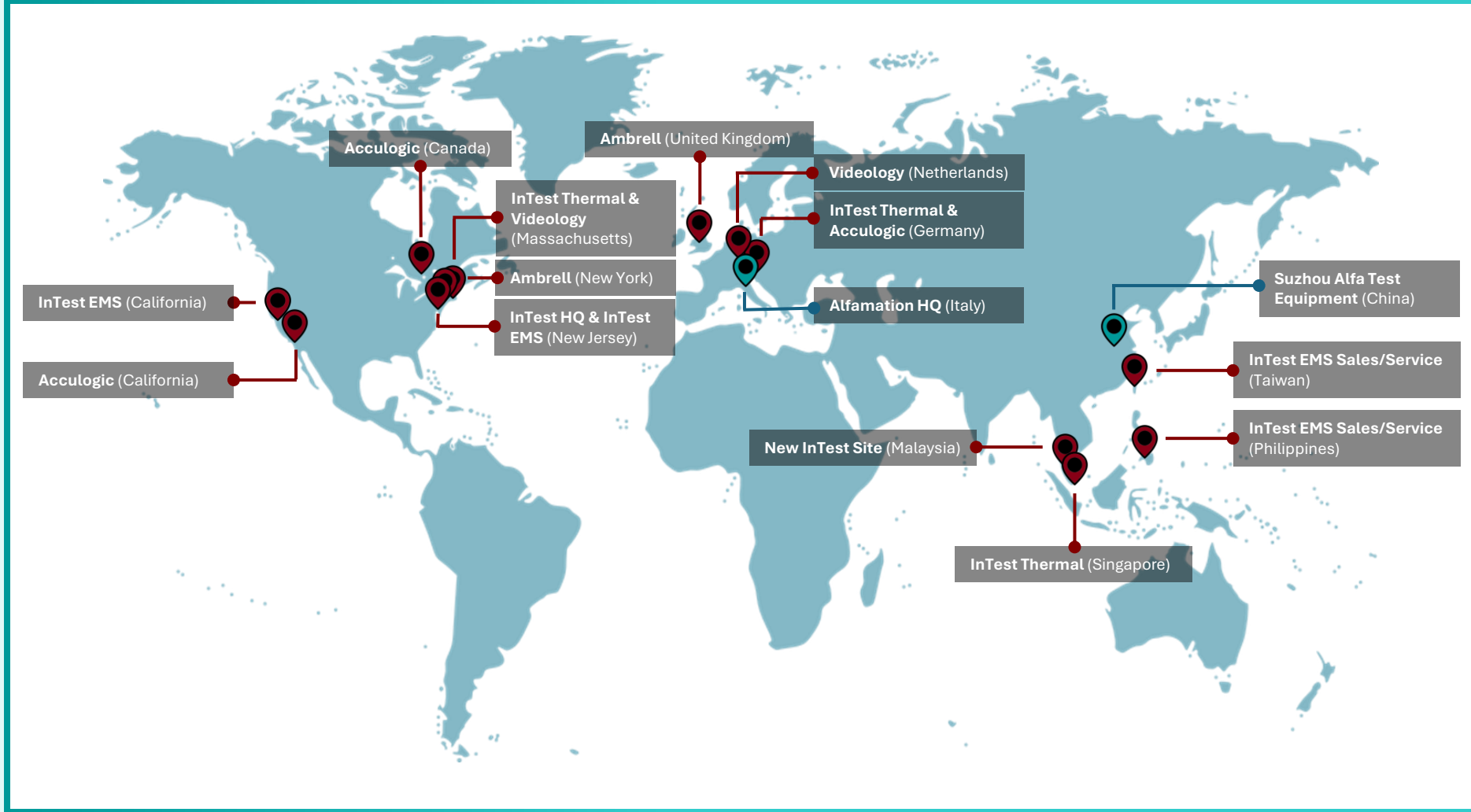
EMEA: France, Germany, Italy, Portugal, Poland, Czech R., Slovakia, Spain, Belgium, Hungary, Romania, Egypt
Americas: Brazil, Canada, Mexico, USA
Asia: China, HK, Indonesia, Malaysia, Singapore, Korea, Taiwan, Thailand



Get Support Everywhere

Alfamation has its HQ in Italy and can easily provide support around Europe. An additional office in Suzhou (China) provide service all over Asia.

As a part of InTest Corporation, Alfamation has also access to a network of support which ranges worldwide.



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