LMI TECHNOLOGIES

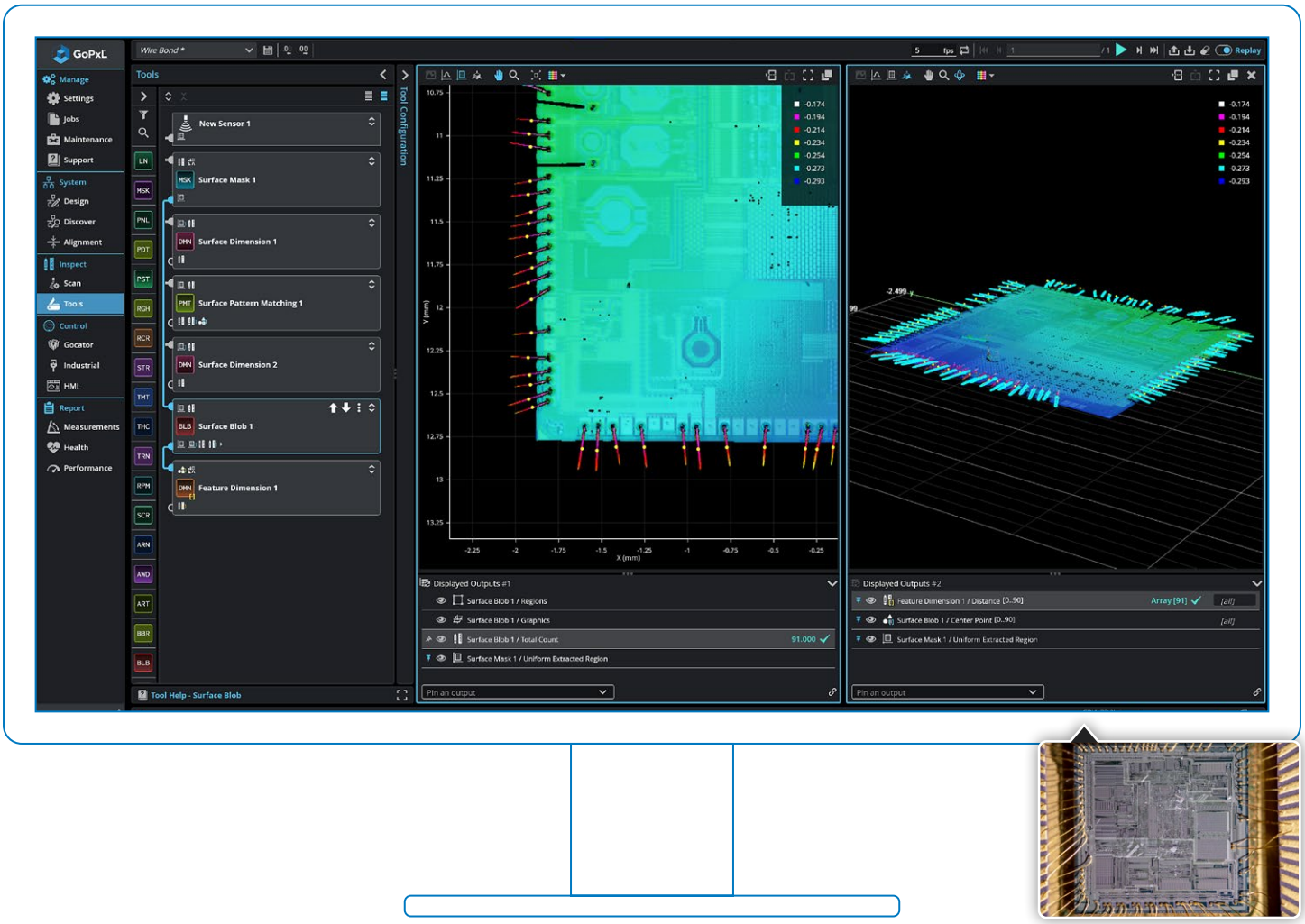
GoPxL®

IIoT VISION INSPECTION SOFTWARE

LMI TECHNOLOGIES' 3D MEASUREMENT AND INSPECTION PLATFORM

CONTENTS

POWERFUL MEASUREMENT AND INSPECTION SOFTWARE DEPLOYED ON GOCATOR® 3D SMART SENSORS



GoPxL® is our software application for creating end-to-end, web-based, inline measurement and inspection solutions deployed on a Gocator® 3D Smart Sensor.

Vision engineers can use GoPxL® to solve a wide range of industrial inspection tasks leveraging a combination of on-sensor measurement filters and tools running on Gocator's industry-leading laser, snapshot, and line confocal sensors. GoPxL takes advantage of 30 years of 3D experience at LMI to create a user experience that helps engineers develop measurement and inspection solutions more efficiently and effectively than ever before.

Why Should You Try GoPxL

- Create an accurate and repeatable measurement solution, without expert machine vision or 3D knowledge and experience
- Extract real world measurements directly from the sensor and connect outcomes and decisions to PLC using industrial protocols
- Create a custom end-user interface connected to Gocator outputs and accessed using a browser on PC, touchscreen, or mobile device

WITH GoPxL YOU CAN:

SCAN.

GoPxL runs on LMI Technologies' industry leading smart 3D laser, snapshot, and line confocal technologies. Simply enter the sensor's IP address in a web browser to access the GoPxL user interface and set up your application and start scanning.

ALIGN.

Easily align single and multi-sensor systems for accurate and repeatable measurement. For applications requiring greater scan coverage, native multi-sensor networking allows you to capture and generate merged scan data, minimize or remove occlusions, or scan targets with 360° scanning capability.

MEASURE.

Scan and perform measurements directly from the sensor leveraging built-in tools that can be applied to multi-dimensional data: 3D profiles, 3D surfaces, and 2D intensity images. Array support helps simplify complex measurement applications.

CONNECT.

Connect measurements and decisions to PLCs using standard industrial protocols including EtherNet/IP, Modbus, PROFINET, and ASCII. Communication with the factory is low latency and leverages a real-time operating system.

ACCELERATE.

With GoPxL, data processing can be accelerated for single sensor applications or distributed across multiple Gocator sensors using a GoMax® NX embedded hardware device or desktop PC to scale up system size and improve overall inspection performance in data-heavy applications.

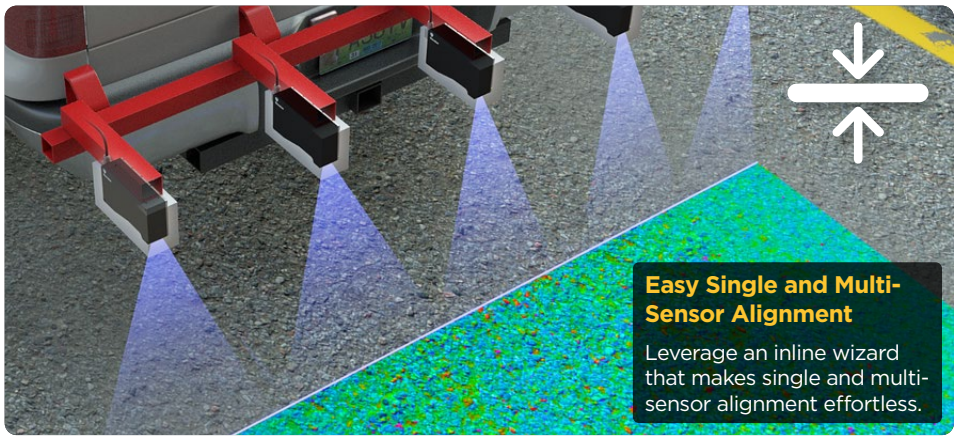
INTERFACE.

Using GoHMI, create a custom end-user interface connected to Gocator® sensor outputs that is easily deployed on the production floor and accessed using a web browser on PC, touchscreen, or mobile device.

HOW GoPxL IS FACTORYSMART

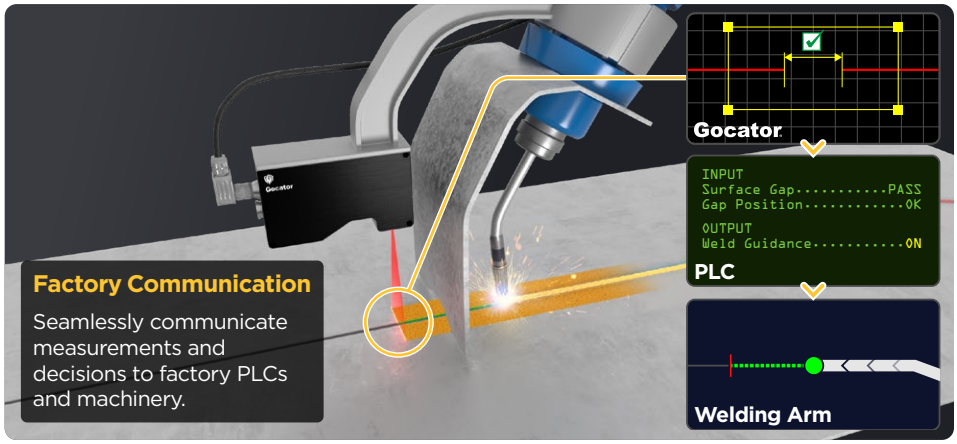
Modern Web-Based User Interface

Access and control the full power of Gocator sensors from any web browser.



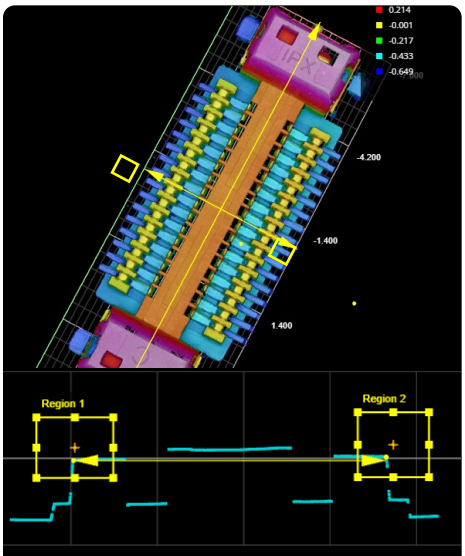
Easy Single and Multi-Sensor Alignment

Leverage an inline wizard that makes single and multi-sensor alignment effortless.



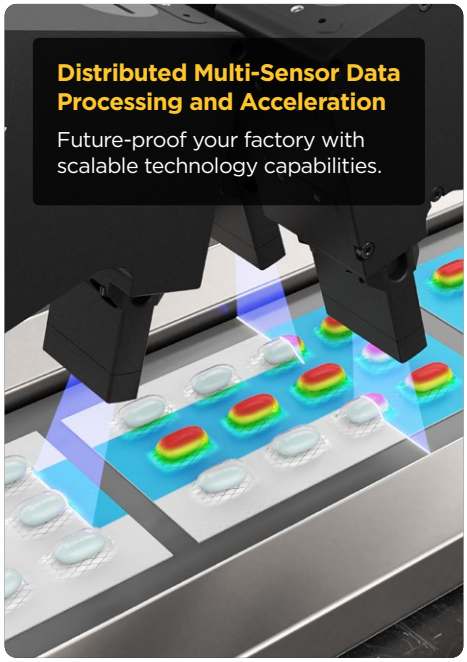
Factory Communication

Seamlessly communicate measurements and decisions to factory PLCs and machinery.



Multi-Dimensional (2D/3D) Measurement Capability

Work with 3D surface, 3D profile, 2D intensity, and even multi-layer data.



Distributed Multi-Sensor Data Processing and Acceleration

Future-proof your factory with scalable technology capabilities.

Custom Human-Machine Interface Design

Build and deploy your own custom Gocator-to-Factory user interface.

WHAT'S NEW IN GoPxL

Embedded Tool Help

Access help resources without leaving the application.

Multi-layer Scanning Capability

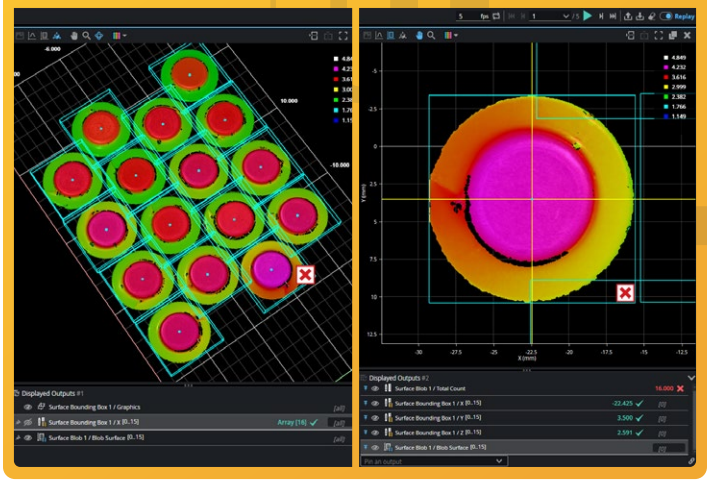
Scan, measure, and inspect multi-layered material structures with Gocator line confocal sensors.

Sensor Alignment Wizard

A built-in wizard makes single and multi-sensor alignment easier than ever.

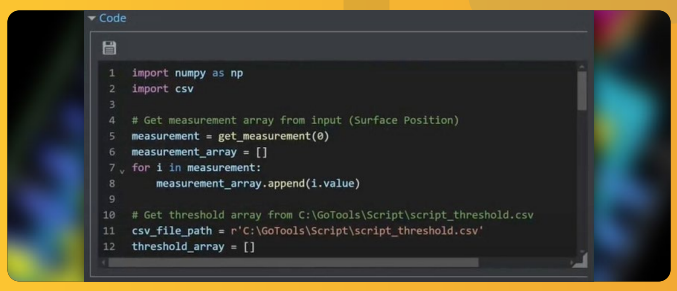
Array Decision Tool

Apply measurements and output decisions on similar surfaces such as battery cells.



Script Tool

Create custom processing logic for measurement values, surfaces, profiles, or geometric features



Region Types

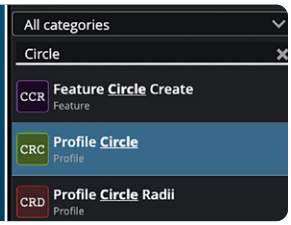
Use circle and ellipse region types to apply tools and filters on circular objects.

Data Export Tool

On PC, you can use the new Data Export tool to save scan data to a file for importing into other applications.

Searchable Tools

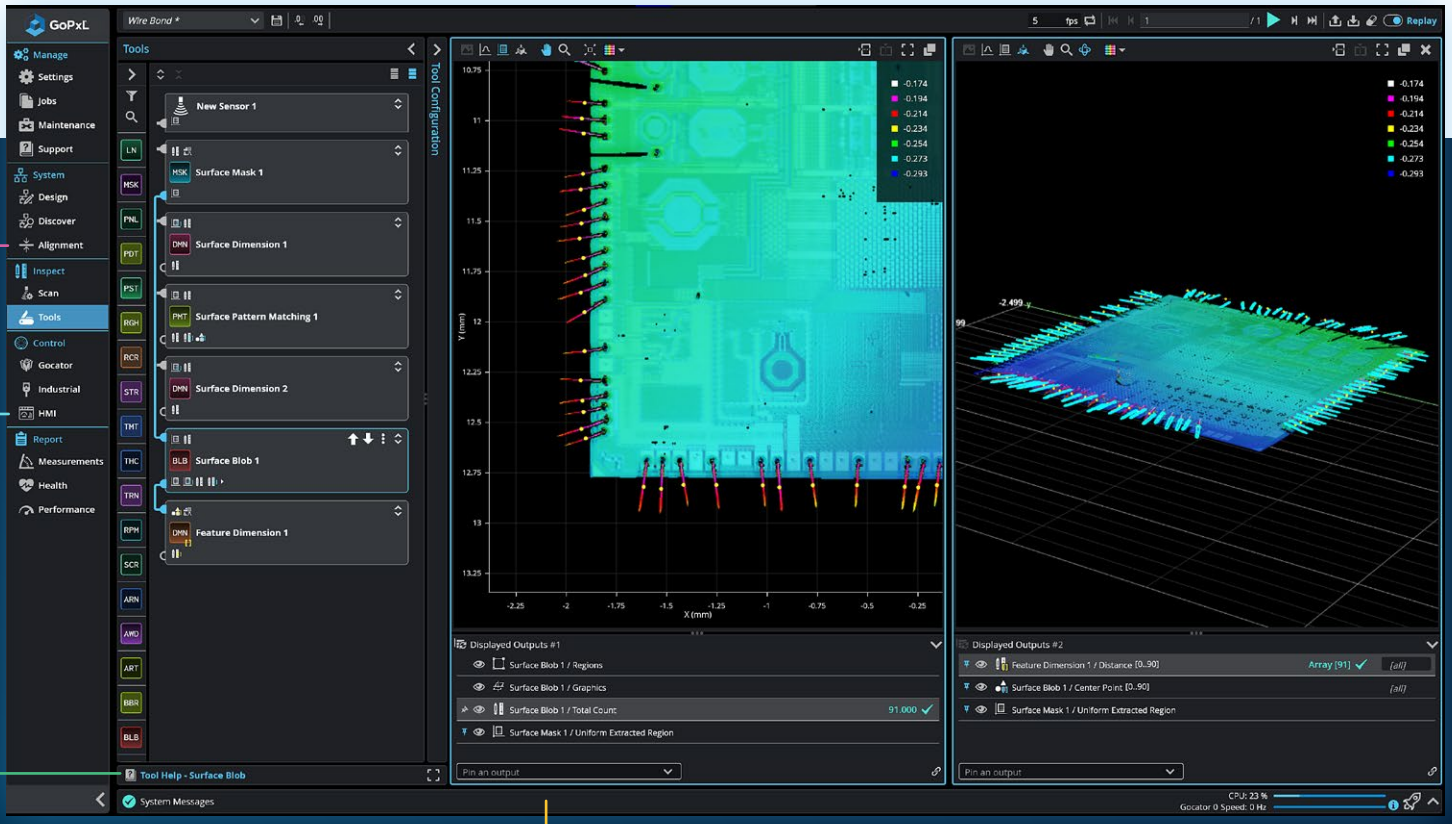
Find the measurements tools you're looking for quickly and easily.



Profile Roughness Tool

The new Profile Roughness tool allows you to calculate measurements of profile roughness according to several different industry standards.

STILL RUNNING GOCATOR FIRMWARE ON YOUR SENSOR?



NEW Reimagined Modern Web-Based User Interface with Powerful On-Sensor Measurement and Inspection Tools

NEW Searchable Tools and Embedded Tool Help

NEW GoHMI Custom Human-Machine Interface Builder

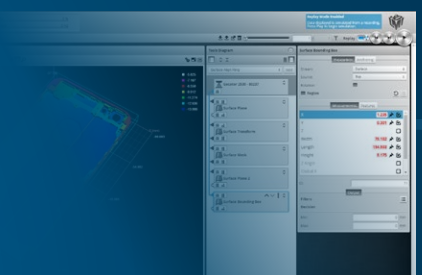
NEW Single Sensor and Multi-Sensor Alignment Wizard

Runs on Gocator 3D Laser Profilers, Gocator 3D Snapshot Sensors, and Gocator 3D Line Confocal Sensors

Includes All the Best and Most Trusted Features from Gocator Firmware with Major New Additions and Improvements

Easy Download to Upgrade Your Existing Gocator Sensors to GoPxL

NEW Multi-Layer Scanning and Multi-Dimensional Measurement Capability with Array Support



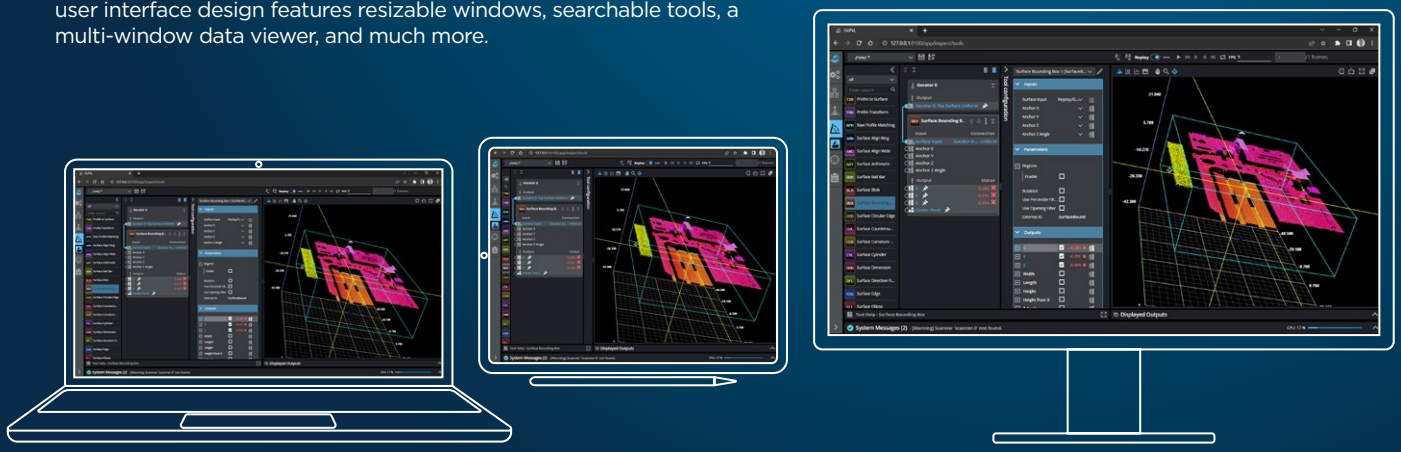
Evaluate GoPxL Today

NOTE: While users are encouraged to evaluate GoPxL, previous Gocator firmware releases will continue to be supported and maintained. G2 and G3 products are currently shipping with Gocator firmware 6.1.42.10 or later.

MODERN WEB-BASED USER INTERFACE

Access and Control Your Gocator Sensors via Any Web Browser

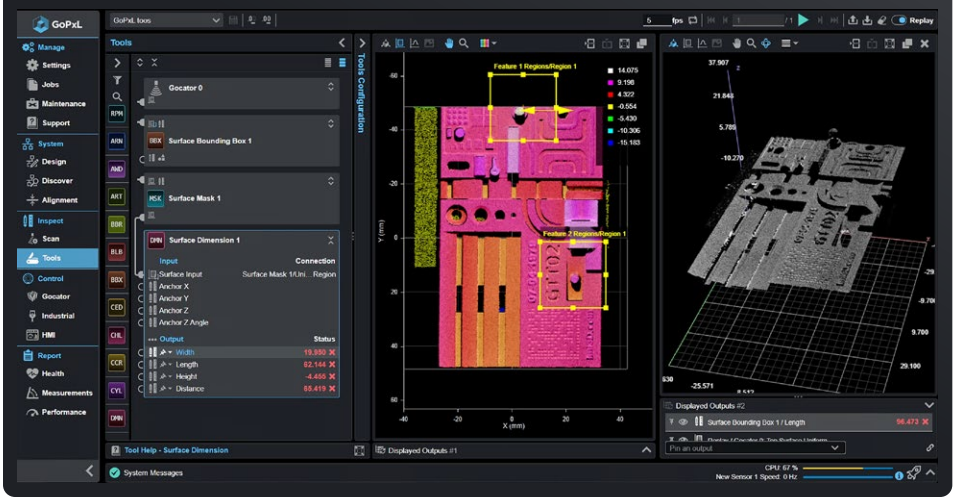
You can connect to a Gocator® sensor from any PC or mobile device connected to the local network using any web browser. The modern user interface design features resizable windows, searchable tools, a multi-window data viewer, and much more.



Sleek Look & Feel. Intuitive to Use.

Enjoy the Modern GUI Design

- Sleek, eye-catching “Dark Mode” styling
- Easy to navigate UI display architecture
- Resizable panels allow you to adapt the UI to suit your specific user behavior



Easy Sensor and System Setup. Out-of-the-box Performance.

GoPxL makes it easy to connect to and run your sensor or sensor network, acquire scans and communicate measurement results to the factory network.

MODERN WEB-BASED USER INTERFACE

Connect to a Gocator Sensor and Set up and Run Your Application

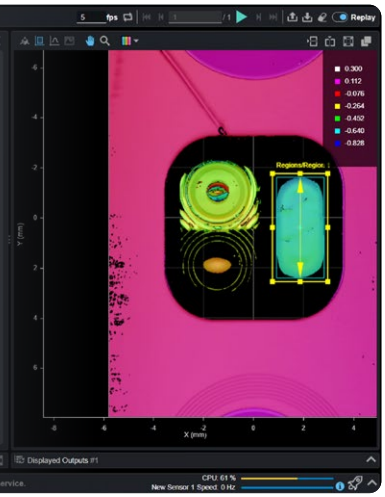
1. Connect a sensor to GoPxL
2. Create a new job file
3. Align your sensor
4. Acquire a profile or surface scan
5. Apply measurements with built-in tools
6. Output results and control decisions to factory network

Visualize Your Data with Total Control

GoPxL's configurable, maximum-field data viewer gives you total control over your data display.

View Scan Data in the viewer

- Streamlined graphical layout suited to wide screens allows for maximum-field data visualization
- View surfaces and outputs from different tools and filters at the same time with up to four split windows
- Apply different color palettes to each surface or profile

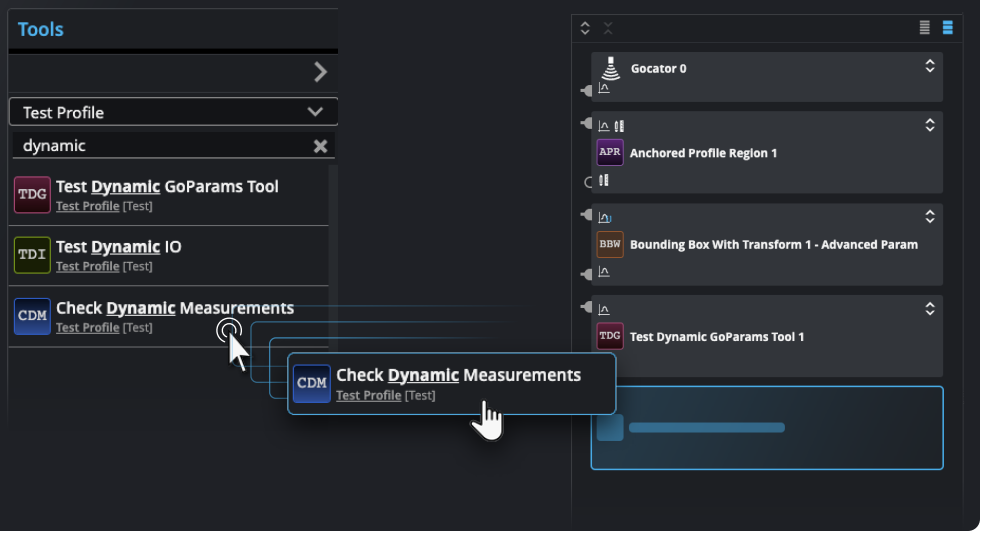


Data Recording/Playback

- Variable rate recording playback allows you to view individual frame data while controlling the playback framerate
- Continuous loop allows you to quickly improve your measurement configuration while immediately seeing updated measurement results for each frame. No need to click "Start" each time.

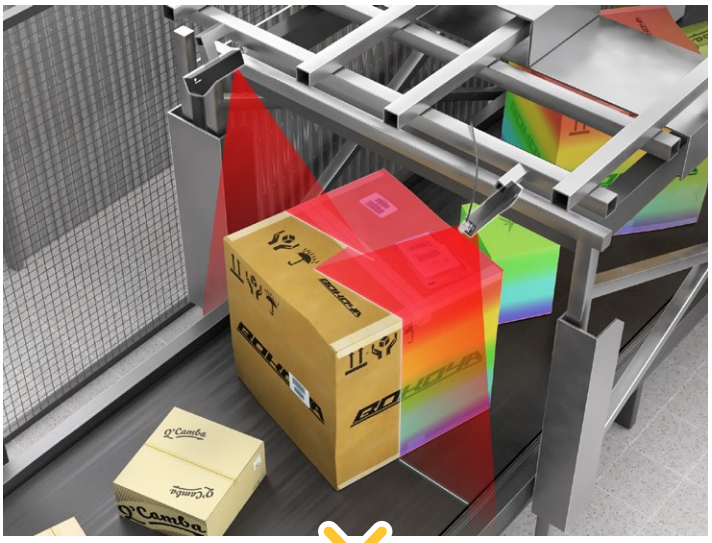
Enjoy Streamlined Tool and Filter Management

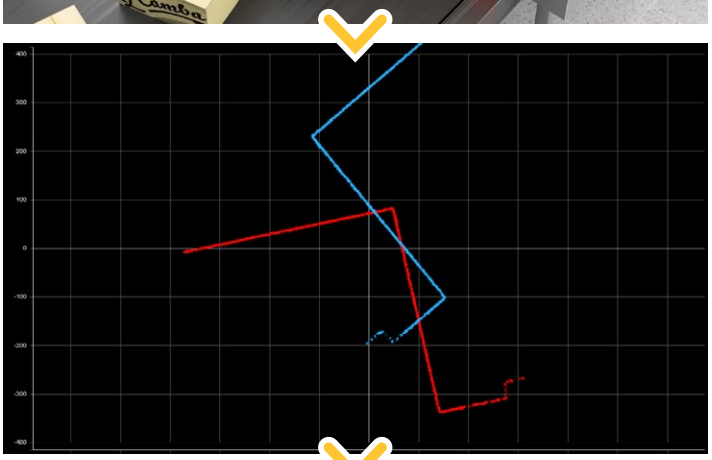
- Drag and drop tool addition allows you to easily insert tools at any location
- Drag and drop tool reordering allows you to easily sort tools in your preferred order
- Find the tools you are looking for quickly and easily with Search, Categories, and Icons
- Embedded Tool Help allows you to explore tool capabilities with supporting diagrams without leaving the application

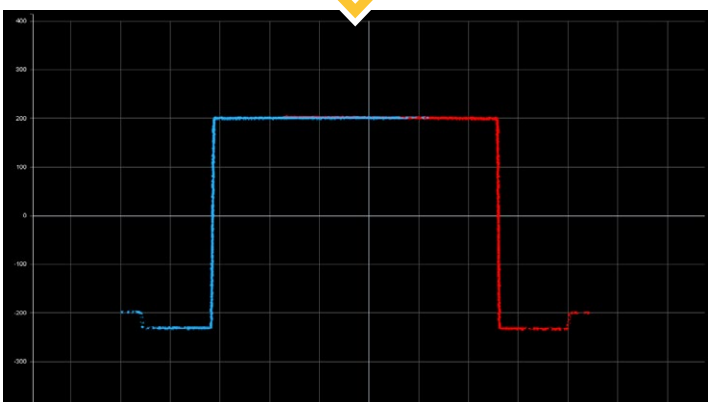


SINGLE AND MULTI-SENSOR ALIGNMENT WIZARD

Easily Align Sensors for Accurate and Repeatable Measurement





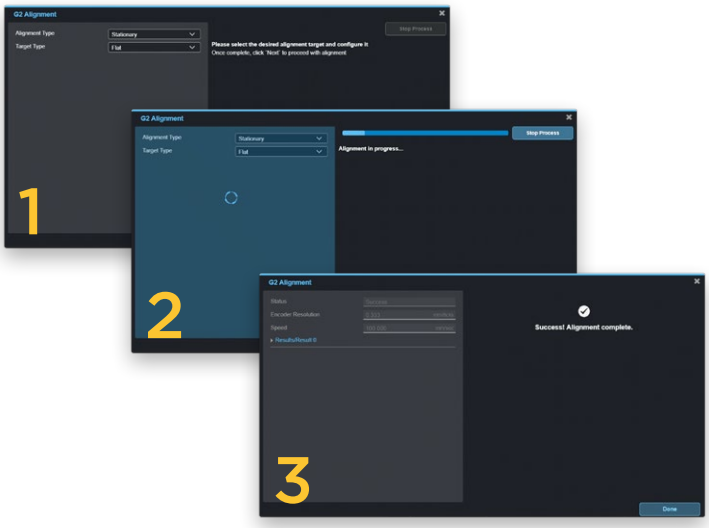


The intuitive Alignment Wizard provides point-and-click operations to align your single or multi-sensor system.

For applications requiring greater scan coverage, you can configure layouts for deployment in 360° scanning of complete objects (e.g., cylindrical targets), or to solve for occlusions on irregular or complex-shaped targets.

Benefits of multi-sensor networking capability:

- Ideal for achieving increased surface coverage and 360° scanning large, complex, and cylindrical objects
- Maintains high resolution across wide field of view
- Supports a range of layouts, such as wide, angled, opposite, and ring
- Master hub networks up to 24 sensors and controls microsecond data synchronization, power, and laser safety



Let the Wizard Do The Work

Easy multi-sensor alignment includes:

- Point and click wizard-style sensor alignment interface
- Provides fast single and multi-sensor alignment with maximum ease of use and control
- Easy configuration through added graphical guidance
- Expanded feedback for deeper understanding of measurement results

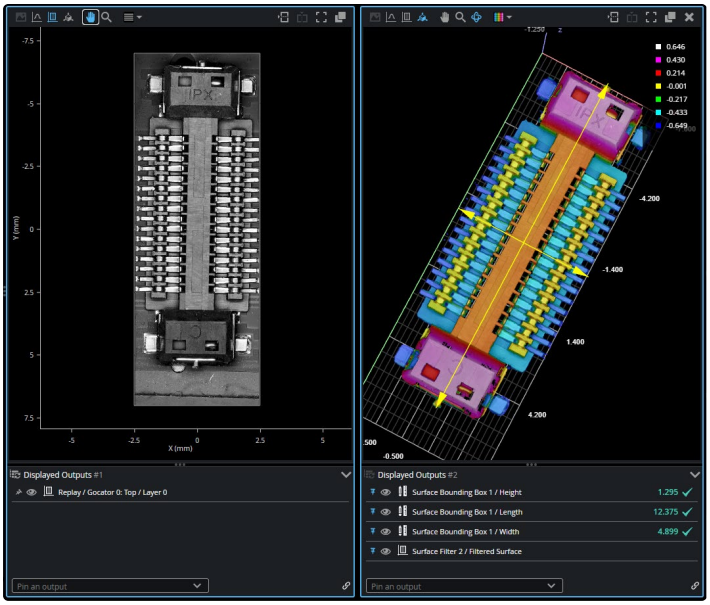
MULTI-DIMENSIONAL (2D/3D) MEASUREMENT CAPABILITY

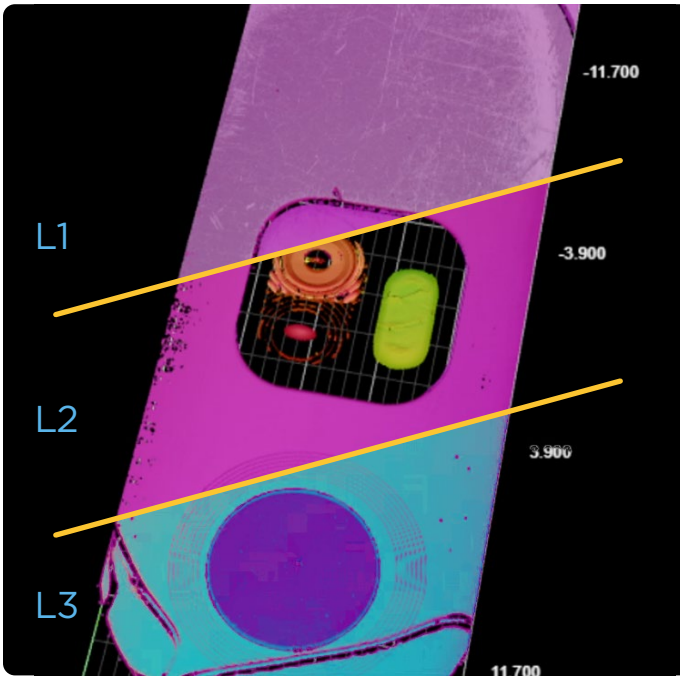
Apply Measurements to 2D (Intensity) and 3D (Shape) Data

Gocator measurement tools can be applied to multi-dimensional data, which includes: 3D profiles, 3D surfaces, and 2D intensity images.

Gocator allows you to:

- Simultaneously generate 2D and 3D data and measurements from a single device
- Perform simple 2D contrast-based inspection such as surface markings, barcode, and printed text
- Perform advanced 3D shape-based (height, width, volume) inspection on a wide range of manufactured parts and assemblies as well as organic materials





Multi-Layer Profiling Capability

When running on Gocator® 5500 sensors, GoPxL lets you process 3D tomography, 3D topography, and 2D intensity data for each layer of a material, making it possible to measure the thickness of individual layers or detect defects on secondary layers in transparent and translucent materials.

Multi-layer profiling includes:

- Ability to identify defects such as delamination, scratches, or dust on the surface or inside of multi-layered structures such as mobile phone displays, sealed medical packages, and more
- Ability to measure and inspect up to 8 stacked profiles simultaneously
- Note: Multi-layer profiling on G5 sensors leverages acceleration using GoMax NX Smart Vision Accelerator

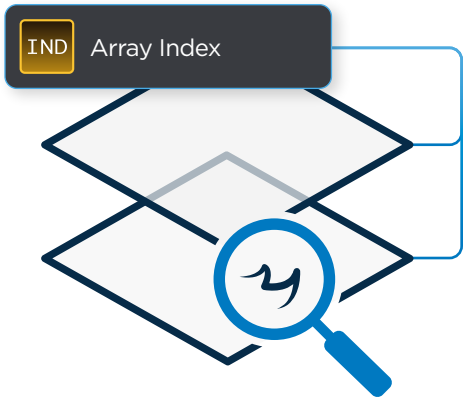
ARRAY SUPPORT, TOOL BATCHING, AND SCRIPT TOOL

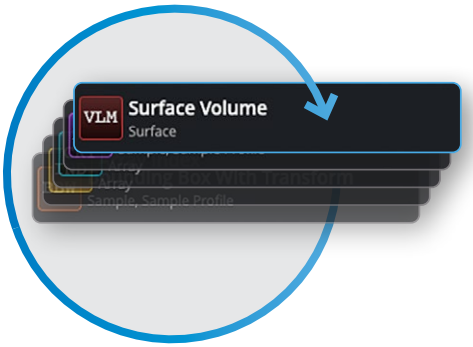
Array Support

An array is a group of data messages bundled into a single data object, for example, an array of profiles or an array of surfaces. Support for Arrays offers a number of benefits when using Gocator 3D smart sensors—especially when working with multi-layer data from Gocator line confocal (G5) sensors.

About Array support:

- When used on Gocator 5500 sensors, the Array Index tool lets you separate profiles or surfaces from multiple layers and apply measurements on individual or consolidated layers
- When working with any Gocator sensor type, the Array Create tool lets you combine individual profiles or surfaces (e.g., from separate tools or multiple sensors) into an array, which can then be input to other measurement and processing tools to perform batch operations (see below)





Tool Batching Operations

When parts have multiple sub-parts or many similar features, feature locations might be unknown or can change from part to part. In these cases, you want to perform the same set of measurements on each feature despite this complexity and variability. Tool Batching in GoPxL addresses this measurement challenge.

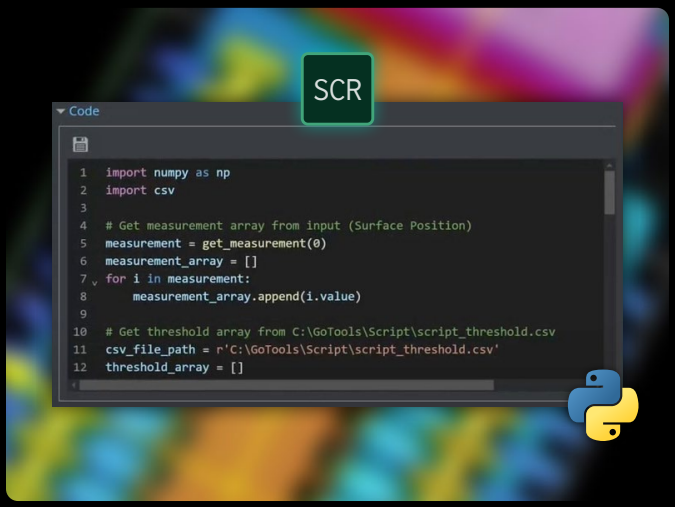
About Tool Batching:

- When batching is enabled, tool outputs become an array for each output
- You can then perform batch operations of a tool on isolated elements of the array
- Works with tools such as Surface Volume to obtain volume under each surface; Surface Ellipse to determine orientation of each surface; and multiple Surface Position tools to measure height at different locations

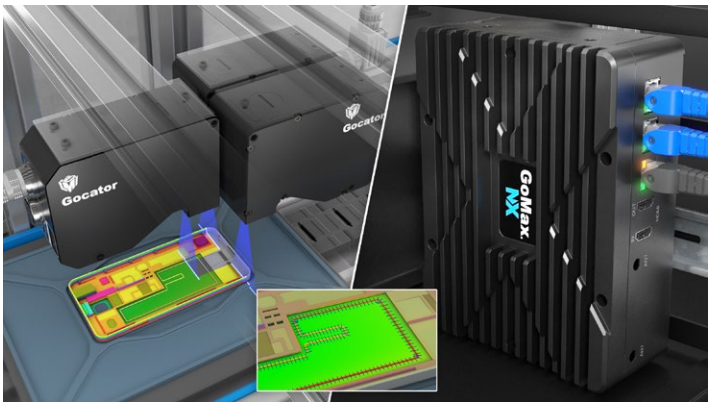
Python Script Tool

The new Script tool lets you solve applications that require custom processing or conditional logic to manipulate measurement values, surfaces, profiles, or geometric features passed as input from other tools, and to generate new measurement values, surfaces, profiles, or geometric features that can be passed to other tools or PLC outputs.

- Python-based script allows the user to add a custom processing step to a toolchain
- Error log popups provide improved feedback by indicating the precise line of code that requires correction
- Multiple instances of the script tool can be added to a single job
- Supports access to frame stamp information and storing values in memory using GoMax NX Smart Vision Accelerator



DISTRIBUTED MULTI-SENSOR DATA PROCESSING AND ACCELERATION



GoMax® NX

Smart Vision Accelerator

GoMax® NX is a high-performance embedded device that allows you to accelerate any Gocator® sensor or multi-sensor network in order to solve the most data-intensive applications—without the need for an industrial PC.

This compact, fanless, and easy-to-use vision accelerator enhances data processing power in real-time, minimizing cycle times and augmenting overall inspection performance so you can achieve optimal results in demanding applications such as engine piston bowl, weld seam, glue bead, and medical packaging inspection.

- Runs GoPxL® inspection software
- Easy to set up and run through GoPxL® web browser interface
- GPU-accelerated data processing with no industrial PC or controller required
- Allows you to simultaneously accelerate Gocator® multi-sensor networks
- Ability to add multiple GoMax® NX units to scale up acceleration

PC-Based Sensor Acceleration with GoPxL

In addition to the GoMax NX embedded device, users have the option of accelerating a Gocator sensor by running GoPxL on a PC, and connecting to the sensor from that instance of GoPxL.

- Deploy for single and multi-sensor acceleration
- Easy access and control through the GoPxL web-browser user interface (no need to leave the application)
- Offloads sensor datastreams to PC to increase memory and accelerate data processing (both surface generation and measurement)
- Maintains Gocator communication protocol stacks (EtherNet/IP, Modbus, ASCII) to send results to the factory

FACTORY COMMUNICATION

Support for all Standard Industrial Protocols

GoPxL supports built-in I/O connectivity to communicate with factory networks and devices for reporting results, diagnostics and monitoring, software upgrades, and to exchange or combine data. Gocator sensors communicate over Ethernet (TCP/IP), and available protocols include Gocator, EtherNet/IP, Modbus, PROFINET, and ASCII.

Gocator

Gocator Protocol

The Gocator protocol uses TCP messages to receive commands from client computers, and to send video, profiles, surfaces, intensity, and measurement results to client computers. You use the Gocator protocol in conjunction with the GoPxL SDK and REST API.

The Gocator Protocol enables the client to:

- Discover sensors on an IP network and re-configure their network addresses
- Configure sensors
- Send commands to start and stop sensors, provide software triggers, read/write files, etc.
- Receive data, health, and diagnostic messages
- Upgrade firmware

EtherNet/IP™

ETHERNET/IP

EtherNet/IP is an industrial protocol that allows bidirectional data transfer with PLCs. It encapsulates the object-oriented Common Industrial Protocol (CIP).

EtherNet/IP communication lets the client:

- Switch jobs
- Start and stop sensors
- Receive sensor states, stamps, and measurement results

Modbus

Modbus is designed to allow industrial equipment such as Programmable Logic Controllers (PLCs), sensors, and physical input/output devices to communicate over an Ethernet network.

About Modbus:

- Switch jobs
- Start and stop sensors
- Receive sensor states, stamps, and measurement results

PROFINET

PROFINET is an Industrial Ethernet network protocol that allows controllers such as PLCs to communicate with sensors.

About PROFINET:

- Sensors are PROFINET IO devices with Conformance Class A
- Start and stop sensors
- Receive sensor states, stamps, and measurement results

ASCII

This protocol communicates using ASCII strings. The output result format from the sensor is user-configurable.

About ASCII:

- Sensors are PROFINET IO devices with Conformance Class A
- Over Ethernet, communication can be asynchronous or can use polling

GoHMI

CUSTOM HUMAN-MACHINE-INTERFACE DESIGN

Design and Deploy a Custom Interface with GoHMI Designer

GoHMI Designer is a new application included with GoPxL for building a custom user interface that reports Gocator outputs to an end user and visualizes scan data. The GoHMI runtime can be deployed on a Gocator Smart Sensor and accessible from any PC, touchscreen, or mobile device connected to the sensor network.

Quickly and easily create web-based HMIs

Provides System Integrators and End Users with an HMI editing tool that enables customizable views of system and inspection metrics for rapid and mobile deployment on the production floor.

- Drag-and-drop addition of controls
- Easy reporting of common data
  - + Pass/Fail, measurement values
  - + Sensor status (scan rate, processing time...)
- Simple control of common actions
  - + Switch jobs, start/stop, perform alignment

40+ widgets included

Leverage WYSIWYG functionality that includes templated elements with a professional look and feel. Simply choose the right widgets to display your data then drag-and-drop to add.

Mobile device ready

Flexible use on multiple devices ranging from phone, tablet to large PC monitors.

Deploy on sensor, GoMax® NX, or PC

Simple deployment on the production floor and immediate accessibility through web browser interface.

It’s Better to Be Smart.

contact@lmi3D.com | lmi3D.com

AMERICAS
LMI Technologies Inc.
Burnaby, BC, Canada

EMEAR
LMI Technologies GmbH
Teltow/Berlin, Germany

ASIA PACIFIC
LMI (Shanghai) Trading Co., Ltd.
Shanghai, China

LMI Technologies has offices worldwide. All contact information is listed at lmi3D.com/contact

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