CyberOptics Award-Winning Systems Portfolio
Automated Optical Inspection, Solder Paste Inspection and Industrial Metrology

The Global Leader in High-Precision sensors and systems for AOI, SPI and Industrial Metrology.

Technology Leadership. Global Solutions.
3D Solder Paste Inspection (SPI)
Ultimate Precision Accuracy with World-Class Usability

SE3000™ Solder Paste Inspection System

The new SE3000™ SPI System is the very first SPI system to incorporate the industry leading Multi-Reflection Suppression (MRS) technology with a finer resolution for the best accuracy, repeatability and reproducibility - even on the smallest paste deposits. Combined with the award winning, easy-to-use SPI software, solder paste inspection has a new level of precision for the most stringent requirements.

SE3000-DD 3D SPI Dual Lane - Dual Sensor

- Dual MRS sensors delivers metrology grade accuracy at production speed
- Flexibility to switch from dual to single lane for large boards
- SE3000-D Dual Lane option available
MRS Technology for 3D SPI

The new SE3000 SPI System brings the revolutionary MRS technology to solder paste inspection delivering higher performance in accuracy and precision. Effective suppression of multiple reflections is critical, making MRS an ideal technology solution for a wide range of applications including those with very high quality requirements.

CyberOptics MRS Sensor architecture, extended from the award-winning SQ3000 AOI platform, has been designed for use in solder paste inspection applications. The unique sensor architecture with multi-view 3D sensors and a parallel projector, simultaneously captures and transmits multiple images in parallel while proprietary 3D fusing algorithms merge the images together, delivering metrology grade accuracy at production speed.

SE3000 | MRS Enabled for 3D SPI

- MRS Sensor for metrology grade accuracy at production speed
- Enables unrivaled GR&R
- SE3000-X available for Large Board capability
3D Solder Paste Inspection (SPI)
Ultimate Precision Accuracy with World-Class Usability

**SE600 | High Precision**
- Dual illumination sensor
- Enables unrivaled GR&R up to 108cm²/sec.
- SE600-X available with Large Board capability

**SE500ULTRA | High Speed**
- High-speed single illumination sensor
- All-in-one scan
- On the fly measurement at 210cm²/sec.
3D SPI Sensor Technology - Faster, More Accurate Performance

Designed and built by CyberOptics, the sensor is manufactured as an integrated unit with no moving parts – which means no machine-to-machine variation either. Plus, there is no drift over time, no parts to wear and absolutely no recalibration needed. The Dual Illumination Sensor comes standard with the SE600.

For improved repeatability on smallest paste deposits, you can choose from the ULTRA and Dual Illumination sensor options on the SE500 Ultra. Pads as small as 100 microns (4 mils) can be accurately measured with the MicroPad sensor. And, it is easy to swap with the standard sensor too – so you can plug-and-play whenever you need to.

High Speed, On-the-Fly Inspection

Using white strobe light to project patterns of structured light on the surface of the printed circuit board (PCB). Full FOVs are acquired with each strobe and vibration effects are minimized – delivering high accuracy and consistent repeatability. Any PCB surface including flexible circuits can be measured as white light causes minimal diffusion. With its continuous image acquisition, you can be assured of fast, focused and reliable inspection.

Height measurement accuracy is critical to SPI measurement as it has a direct correlation with solder volume and defects. The importance of accurate height measurement increases with the continuous miniaturization and density of electronic components.
CyberOptics’ software delivers world-class user experience with its intuitive interface, completely changing the way users interact with our system. Yet, at the same time, the software is extremely stable and simple to use enabling shortest learning curve. With full multi-touch experience, SPI software offers a range of features that enable smarter and faster inspection:

- Seamless integration of all applications - Teach, Inspection, Defect Review and Real-time SPC
- Unlimited undo-redo and global search options in Teach
- Loads of smart, informative and relevant charts that provide yield summary, FPY information, hotspot display, top 10 pad failures, historical panel and more.
- Easy, hassle-free operation using multi-touch, multi-selection, pinch-zoom and pan-move options
- CyberPrint OPTIMIZER™ - Automatically optimizes the print process by proactively analyzing accurate trend data – first-ever in the industry! Pre-defined templates help you get started quickly while customizable rules support perfect customization for specific product needs. With its predictive process improvement capability, you can get better yields and reduce downtime.
Closed Loop/ Feed-forward Ready

Reduce rework costs, increase production throughput and improve quality

CyberOptics’ SPI systems fully support feedback and feed-forward capability with leading Solder Paste Printer and SMT Mounter vendors. Closed loop feedback gives you the power to do more with SPI results – optimize printing process, establish stencil cleaning cycles and fine-tune printer setup. While feed-forward capability improves the solderability of smaller components by using the printing offset data for compensating parts placement. All this means reduced rework costs, increased production throughput and improved quality.

Closed Loop Feedback

- All Major Screen Printers
- CyberOptics

Shifted solder
Corrected data of shifted solder

Feed Forward Ready

- Improves solderability of smaller components for reduced rework cost, improved production throughput and improved quality

Gives you the power to do more with SPI results - optimize printing process, establish stencil cleaning cycles and fine-tune printer set-up
Automated Optical Inspection (AOI)
Best-in-Class 3D AOI Technology

SQ3000-DD™ Dual Lane - Dual Sensor

The SQ3000-DD™ 3D Automated Optical Inspection (AOI) System is an extension of the award-winning SQ3000™ 3D AOI platform. The dual lane, dual sensor system maximizes flexibility catering to varying PCB widths. This unique design provides the ability to inspect high volume assemblies, the convenience of inspecting different assemblies and board sizes simultaneously on different lanes, or even switching from dual lane to single lane mode to inspect very large boards.

Not only does the SQ3000-DD™ provide PCB flexibility, it also provides the flexibility to choose two of the same or two different proprietary MRS sensors.

SQ3000-DD™ Dual Lane - Dual Sensor

- Dual MRS Sensors
- Delivering metrology grade accuracy at production speed, powered by MRS Technology
- Switch from dual to single lane to inspect large boards
- SQ3000-D Dual Lane option available
3D Multi-Reflection Suppression (MRS) Sensor Technology

The revolutionary MRS technology delivers unmatched accuracy by meticulously identifying and rejecting reflections caused by shiny components and reflective solder joints. Effective suppression of multiple reflections is critical, making MRS an ideal technology solution for a wide range of applications including those with very high quality requirements.

CyberOptics’s unique sensor architecture with 4 multi-view 3D sensors and a parallel projector, simultaneously captures and transmits multiple images in parallel while proprietary 3D fusing algorithms merge the images together, delivers metrology grade accuracy at production speed.

CyberOptics has advanced the proprietary MRS sensor to an even finer resolution. The Ultra-High Resolution MRS sensor enhances the SQ3000 3D AOI platform, delivering superior inspection performance, ideally suited for the 0201 metric process and micro-electronic applications where an even greater degree of accuracy and inspection reliability is critical.

**SQ3000 | 3D AOI**

Ultimate in Speed and Accuracy

- MRS sensor delivers metrology grade accuracy and production speed
- SQ3000-X available for Large Board capability
SQ3000 Application Examples
Expanding Capabilities for Multiple Industries

- Automotive SMT - Pins
- Packaging
- Through Hole
- Medical SMT
- Automotive SMT - Gap
- Mobile Phone SMT
SQ3000 Application Examples

Expanding Capabilities for Multiple Industries

Memory SMT

Wafer

SPI

Solder Bump / Ball
Automated Optical Inspection (AOI)
High Value - Flexible Inspection 2D AOI Technology

**QX600** | 2D AOI
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Ultra-Fast, Ultra-Versatile
- Strobed Inspection Module (SIM)
- Best-in-Class 01005 and solder joint inspection

**QX250i** | 2D AOI
Fast, Flexible, High-Performance
- 2 Strobed Inspection Modules (SIM)
- Shortens production line and delivers ~50% productivity improvement vs. single SIM
- Ideally suited for pre-reflow

**QX150i** | 2D AOI
High-Value, Flexible for All Applications
- Strobed Inspection Module (SIM)
- Ideally suited for pre-reflow and selective solder joint inspection

QX200i, QX150i-B, QX150 Tabletop, Large Board and Dual Lane options available
2D AOI Sensor Technology - High-speed, On-the-fly Inspection

The SIM (Strobed Inspection Module) is at the core of every CyberOptics’ 2D AOI system. Designed and manufactured exclusively by CyberOptics, the SIM delivers high performance inspection at 200cm²/sec - making our AOI systems the fastest in the world. And, it is absolutely calibration-free too!

The SIM on the QX600™ is designed with enhanced illumination using LED lighting - delivering the best 01005 and solder joint performance ever. With an 80/150 Megapixel sensor and higher resolution (12µm), you get crisp, perfect quality images for more accurate defect review. The capabilities shown below are achieved with CyberOptics’ 2D and 3D AOI systems.

- 01005 component size inspection capability
- Active Pixel Marking
- Selective Soldering Inspection
- Floating Pin
- Missing Pin
- Intelligent Ranking of Examples
- Components Inspected / Detected
- Pre-Reflow Inspection
- OK
- NG
Award-Winning AOI Software
Faster, Simpler and Smarter

Intuitive, Easy-to-use Software
The multi award winning SQ3000 AOI software is a more powerful yet extremely simple software designed with an intuitive interface that reduces training efforts and minimizes operator interaction - saving time and cost. Including multi-touch controls and 3D image visualization tools, it brings ease-of-use to a completely new level. Exceptional for pin height and coplanarity measurement.

Fast, Scaleable SPC Solution
CyberReport offers full-fledged machine-level to factory-level SPC capability with powerful historical analysis and reporting tools delivering complete traceability for process verification and yield improvement. CyberReport is easy to set-up and simple to use while providing fast charting with a compact database size.
**AI² - Superior in Programming & Performance**

CyberOptics AI² (Autonomous Image Interpretation) technology is all about keeping it simple - no parameters to adjust or algorithms to tune. And, you do not need to anticipate defects or pre-define variance either - AI² does it all for you.

Just draw a box, show a few good examples and you are ready to inspect just about anything. Add more images to the model and watch false call rates get even lower. With AI², you have the power to inspect the most comprehensive list of features and identify the widest variety of defect types - including those that you least expect.

A 90% reduction in examples required enables even faster programming - so you get superior defect detection and low false call rates even with just one example. This means significantly lower tuning time and quality results with one panel inspection. Perfect for those high-mix or low volume applications. With its unique ability to ‘ignore’ bad examples in a model, AI² offers precise discrimination even with excessive variance and minimizes effects of outlier examples. The pixel marking feature highlights defective spots, so you can identify genuine defects instantly.

**3-Easy-Steps Programming**

Our latest software improvements take programming to a whole, new level - zero to production ready in less than 13 minutes! All this is made possible, with a data-rich, pre-loaded library and automated scripts that collect examples and update models - all on their own.
Industrial Metrology
Ultimate in Speed and Accuracy for Metrology, Semiconductor, Microelectronics and SMT Applications

SQ3000™ 3D CMM

SQ3000™ offers unmatched accuracy with the revolutionary MRS technology by meticulously identifying and rejecting reflections caused by shiny components. Effective suppression of multiple reflections is critical for true height measurement making MRS an ideal technology solution for a wide range of applications including those with very high quality requirements.

CyberOptics has advanced the proprietary Multi-Reflection Suppression (MRS) sensor to an even finer resolution. The Ultra-High Resolution MRS sensor enhances the SQ3000 3D CMM platform, delivering superior inspection performance, ideally suited for mechanical parts inspection, socket metrology and micro-electronic applications where an even greater degree of accuracy and inspection reliability is critical.

Fastest - Seconds, not Hours
- Significantly speeds attaining coordinate measurements vs. traditional CMMs
- Reduces engineering resource time

Easy-to-use Interface
- Simplifies process with award-winning, intuitive, touch screen experience
- Quick programming for complex applications
- Multi-process capable - AOI SPI, AOM, CMM

Metrology Grade Accuracy
- Achieve metrology-grade accuracy with MRS-enabled technology
- Repeatable and reproducible measurements for metrology, semiconductor, microelectronics and SMT applications

SQ3000™ 3D CMM
- MRS Sensor High Precision
- Increased data acquisition
- Intuitive interface
- Metrology grade accuracy
Faster, Highly Accurate Coordinate Measurement Suite (CMM)

CyberCMM™, a comprehensive software suite of coordinate measurement tools provides highly accurate, 100% metrology-grade measurement on all critical points much faster than a traditional CMM, including coplanarity, distance, height and datum X, Y to name a few. A fast and easy set-up can be performed in less than an hour for programming complex applications as compared to slow, engineering resource-intensive set-up that typically requires multiple adjustments with traditional coordinate measurement machines (CMMs).

Fast and highly accurate with repeatable and reproducible coordinate measurements for Metrology, Semiconductor, Microelectronics and SMT applications.

CMM Capabilities

SQ3000™ 3D CMM provides measurement capabilities across a wide variety of applications.

- Line / Distance / X,Y / Mid Line
- Datum X,Y / LSF X,Y Offset
- Height / Local Height / Regression / Radius
- Difference / Absolute / $2\sqrt{}$ / VC
- Inter Point / Regression Shifted
- X,Y Offset / Value / Location / List of X,Y Values
- Coplanarity / Distance to Plane / 2nd Order Fitting
- Max / Min / Ave / Sigma / Plus / Minus / Multiply
Industry 4.0
Intelligent Self-Learning, Self-Adjusting Zero Defect line

Save Time, Save Expense and Improve Yields with CyberOptics’ Powerful Value-Add Solutions

CyberOptics offers a range of unique value-add software solutions that enable automation, reduce rework costs, minimize scrap and optimize print process.

Feedback and feed forward capable SPI Systems with leading Solder Paste printer and SMT Mounter vendors reduces rework costs, increases production throughput and improves quality.

- Optimize printing process, establish stencil cleaning cycles and fine-tune printer set-up.
- Gain the power to do more with SPI results with closed loop feedback.
- Improve the solderability of smaller components by using the printing offset data for compensating parts placement with forward capability.
**SPI SOFTWARE**

Enables smarter and faster inspection

- Reduce training efforts and minimize operator interaction saving time and cost with the powerful yet simple software with intuitive multi-touch interface and 3D visualization tools.

**AOI SOFTWARE**

Enables smarter and faster inspection

- Reduce training efforts and minimize operator interaction saving time and cost with the powerful yet simple software with intuitive multi-touch interface and 3D visualization tools.

- Speed programming and performance with AI2 (Autonomous Image Interpretation) technology for set-up in <13 minutes with a data-rich, pre-loaded library and automated scripts that collect and update models all on their own.

**CYBER PRINTOPTIMIZER**

Automatically optimizes the print process by proactively analyzing current trend data.

- Improve yields and reduce downtime with its predictive process improvement capability.

- Get started quickly with pre-defined templates

- Customize with customizable rules for specific product needs.

**CYBER REPORT**

A complete Statistical Process Control (SPC), offers full-fledged machine-level to factory-level SPC capability to improves yields

- Attain effective process verification and control with traceability.

- Identify trends and enhance line yields with real-time monitoring tools for historical analysis and reporting.

- Reduce training with easy-to-set-up intuitive interface that facilitates quick learning.

- Achieve fast parsing and charting speed with the robust and scalable software, while enabling an extremely compact database size.

**CYBER CMM**

Enables smarter and faster coordinate measurement

- Inspect faster with the comprehensive software suite of coordinate measurement tools providing highly accurate, 100% metrology-grade measurement on all critical points much faster than a traditional CMM, including coplanarity, distance, height and datum X, Y to name a few.
Unprecedented speed, accuracy and one-button simplicity for non-contact automated 3D scanning inspection. A highly precise full 360° scan in <3 minutes.

The CyberGage360 is a blue light 3D Scanning System powered by CyberOptics’ breakthrough, patented 3D scanning technology that enables metrology-grade accuracy by inhibiting optical measurement distortion and reflections. CyberOptics’ MRS 3D scanning sensor technology is at the heart of the world’s cell phone manufacturing inspection systems.

Designed for use in general purpose metrology, the CyberGage360 has a range of potential industrial applications from automotive to aerospace where high accuracy and high speed throughput are important.

MRS allows simultaneous data capture from multiple sensors and transmits in parallel multiple image data at unprecedented speeds. CyberGage360’s patented algorithms combine tremendous amounts of data into a single coordinate system using high-precision encoder position feedback for mechanical metrology-grade part measurement. No best fit piecing together of scan regions is used as is common in competitive projection scanning systems. The resulting part measurement provides NIST traceable system accuracy to 7 µm + L/10000, and repeatability to 5 µm.

- MRS Sensor High Precision
- Generates highly precise full 360 degree scan to 7 microns

MRS suppresses the effects of variations in surface characteristics of parts under inspection, resulting in a highly precise scan.
CyberGage360 MRS Scanning Sensor Architecture

The patented CyberGage360 system design utilizes two dual camera optical blue light scanning sensors mounted above and below the subject part sitting on an optically flat, clear glass plate calibrated for scanning. The glass plate allows simultaneous data capture from both sensors and eliminates the need to flip-over the part necessary for all other scanning and other conventional measuring systems. The rugged industrial enclosure provides a stable measuring environment and eliminates the effects of ambient light on the part under measurement. The small footprint of CyberGage360 can be used on the factory floor, in the inspection lab, or for incoming parts inspection.

The CyberGage360 dramatically speeds-up part inspection, compared to traditional Coordinate Measuring Machines, and provides a complete volumetric part surface scan with dimensions, GD&T and comparison to CAD in under 3 minutes including impressive part inspection report generation. Software simplicity allows the capture of millions of data points per part position with a typical complex part requiring 6-12 rotary positions to accurately represent part geometry.

Scan generates high density point cloud data to compare to CAD model or reference part
CyberGage360 Software
Easy-to-use with Push-Button Automation

CyberGage360 provides the easiest user experience for 3D scanning inspection requiring no fixture or part alignment. Open the door, place part on the glass plate and press the button. The system comes standard with bar-code reader allowing for automatic program selection. CyberGage360 requires no specialist training providing factory-friendly shop-floor operation while supplying metrology-grade inspection accuracy.

MRS Technology provides metrology-grade accuracy by inhibiting optical measurement distortions (glints) common in white/blue light scanned data.

The generated full volumetric scan provides a high density point cloud for automatic alignment to the CAD model or ‘golden part’ with the embedded industry-standard Polyworks® inspector software technology. CyberGage360 comes complete with the built-in Polyworks software license and factory training.

CyberGage360 can be utilized as a 3D AOI device providing fast and accurate absolute measured data or as a comparative analysis gauge providing production trend and go/no go analysis when measuring a reference part.

CyberGage360 lowers Cost of Quality and shortens Time-to-Market by dramatically speeding up In-Process Inspection and Incoming/Outgoing Parts Inspections.
Automated Generation of Part Program and Inspection Report from CAD with PMI

The full volumetric part scan generated by Cybergage360 is automatically aligned to the CAD model by Polyworks software. A comprehensive inspection report including dimensions and GD&T is generated automatically using PMI (Production Manufacturing Information) if contained within the CAD part model. Critical part inspection criteria are tracked automatically by trend analysis/SPC. A 3D color deviation map is displayed indicating tolerance variation as compared to CAD. Red or blue indicate oversize/undersize condition. Inspection projects can be digitally shared throughout a manufacturing organization, suppliers and customers using the free Polyworks Inspection Viewer providing rapid access to critical geometric data.
CyberOptics’ headquarters is located in Minneapolis, MN and conducts worldwide operations through its facilities in North America, Asia and Europe, with a large network of distribution partners around the world. Through continuous technology advancements, a rich patent portfolio, and our sensor expertise CyberOptics continues to be an industry leader at the forefront of technology.