



INDUSTRIAL VISION SOLUTIONS

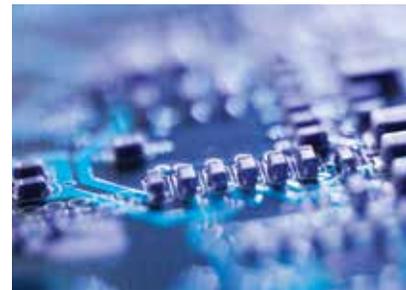


POSITIONING
IDENTIFICATION
VERIFICATION
MEASUREMENT
FLAW DETECTION

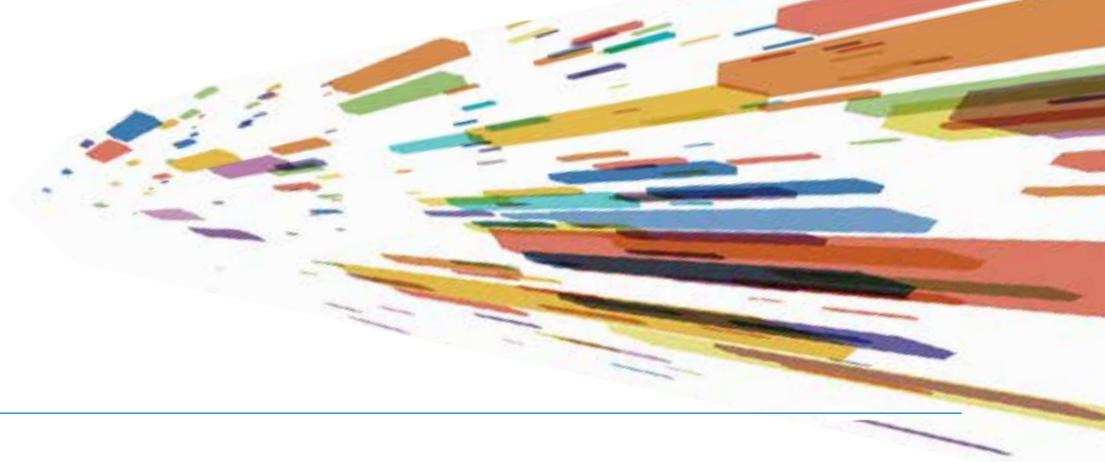
**SINGLE AND MULTIPLE CAMERA SOLUTIONS FOR
AUTOMATED MACHINE VISION APPLICATIONS**

SERVICING THE MACHINE VISION INDUSTRY FOR OVER 30 YEARS

Teledyne DALSA has focused on providing machine vision components and solutions for over 30 years. As a world leader we continue to help manufacturers apply vision technology, from image sensors, cameras, and acquisition boards, to sophisticated vision software and intelligent vision systems. Our technology is used in thousands of automated inspection systems around the world and across multiple industries including semiconductor, flat panel display, electronics, automotive, medical, packaging and general manufacturing.



TELEDYNE DALSA VISION SYSTEMS SATISFY A RANGE OF SINGLE AND MULTI POINT INSPECTION NEEDS.



INDUSTRIAL VISION SOLUTIONS

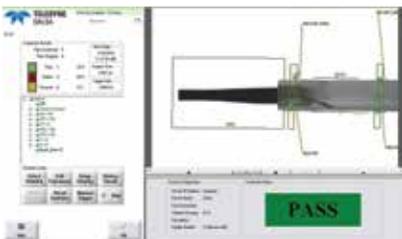
We are committed to helping manufacturers improve product quality, lower costs and increase production yields by providing automated machine vision solutions designed specifically for factory floor deployment. Our innovative vision sensors and systems offer scalable solutions that satisfy a wide range of application needs, from positioning robotic handlers to complete assembly verification.

DESIGNED FOR ALL USERS

Teledyne DALSA vision solutions are equipped with two distinct styles of application interface to accommodate the differing needs and experience of end users:

INSPECT EXPRESS INTERFACE

iInspect Express software allows experienced users and 1st-time adopters alike to set up and deploy solutions with little or no prior machine vision knowledge. iInspect Express's logical setup is built from the experience and algorithms that have been put to the test over the course of many years.



SHERLOCK INTERFACE

Sherlock software offers experienced vision integrators additional flexibility, together with a rich suite of capabilities and options that can be applied to the most challenging of applications. Sherlock provides advanced functionality in terms of scripting, customization and support for 3rd-party tools.



FULL RANGE OF VISION CAPABILITIES

Teledyne DALSA vision solutions provide a full suite of vision tools and capabilities for performing the following inspection tasks:

01. POSITIONING

Guide robotic handlers or adjust vision tools for part movement

02. IDENTIFYING

Identify product for verification or traceability

03. VERIFYING

Verify parts for correctness, assembly, or packaging

04. MEASURING

Measure parts for dimensional accuracy

05. FLAW DETECTING

Check part surfaces for scratches and other defects

READY FOR ANY CHALLENGE

Teledyne DALSA's vision systems are available in a range of cost-effective models to satisfy a broad variety of user requirements. These include single 640 x 480 standard camera configurations to high-performance multi-camera models with 4096 x 3072 color resolution. In addition, Teledyne DALSA vision systems support line scan technology to address challenging large format or cylindrical unwrapping applications.

BOA SPOT

Simple, affordable, and reliable performance for quality inspection. No matter what you create on your production line, BOA Spot can help you improve quality, reduce scrap, and increase throughput. It has never been so easy for you to expand your automation with vision.

VISION SYSTEM PERFORMANCE AT VISION SENSOR PRICING



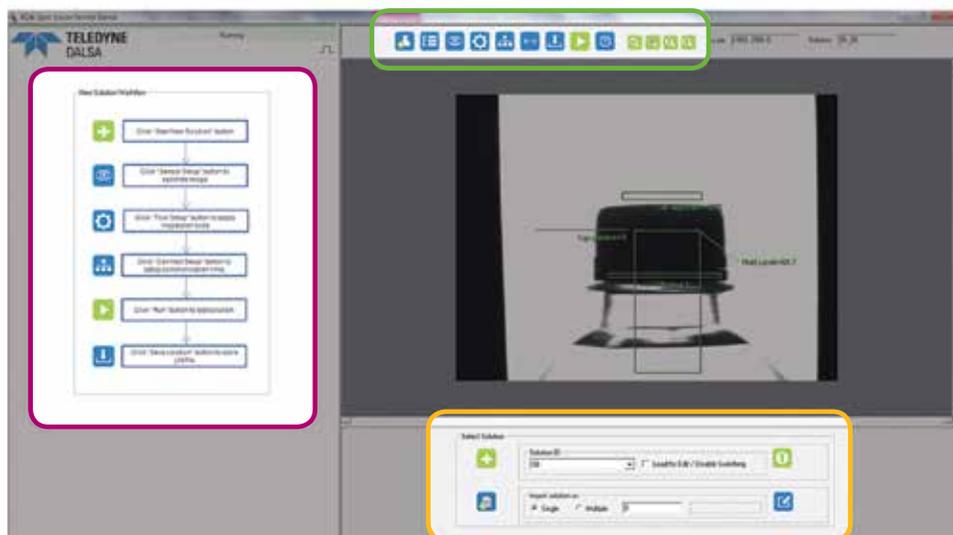
KEY FEATURES

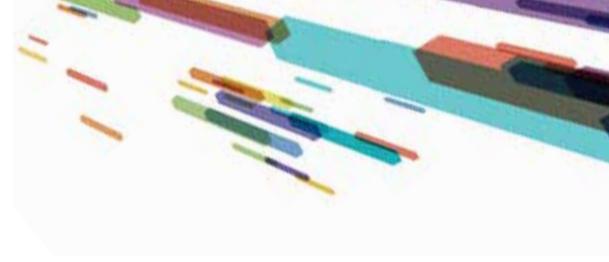
- » Easy to set up and maintain
- » 100% automatic inspection
- » Unlimited use of tools
- » Image transfers to FTP server
- » Hardware job change
- » Industrial I/O and PLC protocols
- » Password protection
- » Low cost of ownership

EASY SET UP VIA WEB BROWSER OR CLIENT PROGRAM

SOFTWARE USER INTERFACE

- One-click navigation panel
- Instruction and control panels
- Color-coded buttons





BOA SPOT SOFTWARE FEATURES

MODEL FEATURES	DETAIL	SPOT SL		SPOT EL		SPOT IDS	SPOT IDE
		Mono	Color	Mono	Color	Mono	Mono
Sensor	Mono/Color Resolution	Mono 640 or 1280	Color 640	Mono 640 or 1280	Color 640	Mono 640 or 1280	Mono
# Solutions	# Stored	32		32		32	
# Locators		2	2	4	4	2	4
Scale (in tool)				✓	✓		
XY Origin				✓	✓		
Preprocessing	In tool			✓	✓	✓	✓
	In ROI and tool					✓	✓
Graphics	Tool			✓	✓		✓
Match/Positioning	Match with position	✓	✓	✓	✓		✓
Measurement	Caliper	✓	✓	✓	✓		
	Angle, Arc, Circle, Concentric circle, Distance, Rake			✓	✓		
	Color		✓		✓		
Feature Detection	Edge Count	✓	✓	✓	✓		✓
	Point	✓	✓	✓	✓	✓	✓
	Contour, Tip, Pencil			✓	✓		
	Count	✓	✓	✓	✓	✓	✓
	Intensity	✓	✓	✓	✓		
Identification	Verify						✓
	1D, 2D					✓	✓
	Grading OCR					✓	✓
Factory Protocols	Ethernet/IP/Profinet	✓	✓	✓	✓	✓	✓
Scripting	Fixed periodic	✓	✓	✓	✓	✓	✓
	Solution switching	✓	✓	✓	✓	✓	✓
	PLC triggering	✓	✓	✓	✓	✓	✓
Network commands		✓	✓	✓	✓	✓	✓
Image Logging	FTP	✓	✓	✓	✓	✓	✓
Password access		✓	✓	✓	✓	✓	✓

SL/SE

BOA Spot vision sensors offer simplicity, affordability and reliable inspection performance for error-proofing applications.

IDS/IDE

BOA Spot ID vision sensors deliver fast and reliable code reading performance for part identification and tracking applications.

QUICK BARCODE

Our software products are updated frequently with new tools and capabilities, including QuickBarcode, for fast decoding of 1D and 2D codes printed or directly marked on a variety of surfaces, including paper, plastic and metal. The decoder is robust and able to read poorly printed, worn or environmentally degraded codes in any orientation.

BOA SPOT



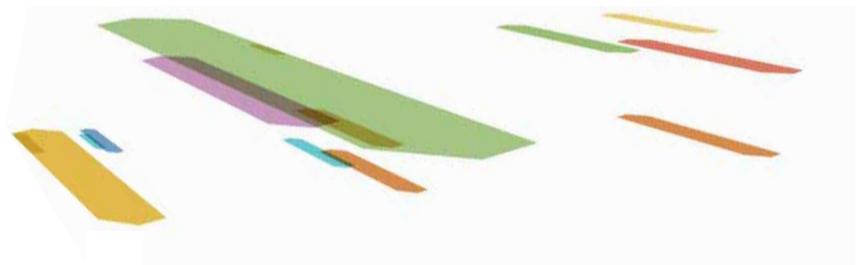
BOA SPOT SPECIFICATIONS

RESOLUTION	PIXEL SIZE	FRAME RATE	INTERFACE	LENS & LIGHTING	SOFTWARE VERSION
640 x 480	3.75 µm	45 fps max	Ethernet, RS-232	M12 with Integrated LED or C-mount (external lighting)	Multipurpose vision tools » SL (Standard) or EL (Expanded)
1280 x 960	3.75 µm	30 fps max			Focused on ID reading » IDS (Standard) or IDE (Expanded)

FOR AUTOMATED INSPECTION AND IDENTIFICATION APPLICATIONS

APPLICATIONS	INSPECTION		IDENTIFICATION	
	SPOT SL	SPOT EL	SPOT IDS	SPOT IDE
MATCH	✓	✓+		✓
COUNT	✓	✓	✓	✓
MEASURE	✓	✓+		
DETECT	✓	✓+		✓
GUIDE		✓		✓
1D/2D			✓	✓+
OCR				✓

TYPICAL USES ACROSS THE SPECTRUM OF MANUFACTURING APPLICATIONS



FACTORY CONFIGURED WITH LENS, LIGHTING AND SOFTWARE

SENSOR RESOLUTION

- » 640 x 480 @ 45 fps max
- » 1280 x 960 @ 40 fps max
- » CMOS, Global Shutter, 3.75 µm

INTEGRATED LIGHT RING

- » White, Red, Blue

LENS OPTIONS

- » 6, 8, 12 or 16mm fitted
- » Lens filter: Factory fitted



INPUTS

- » Trigger + 2 general purpose inputs

OUTPUTS

- » 3 general purpose outputs or 2 outputs plus exterior light strobe

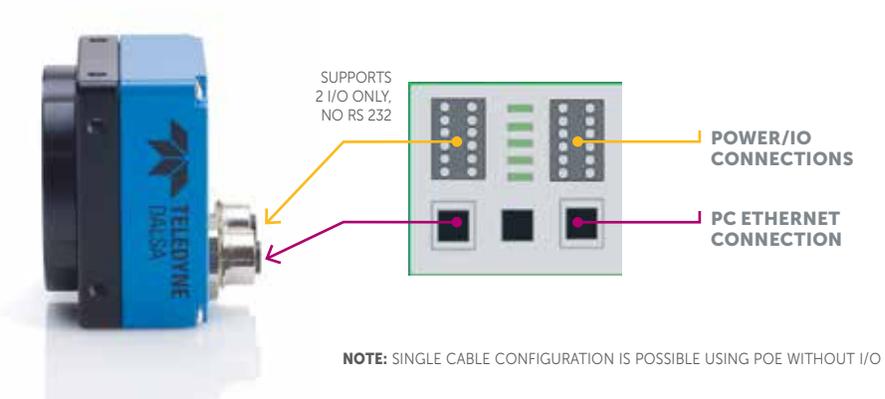
SERIAL

- » RS-232
- » Ethernet

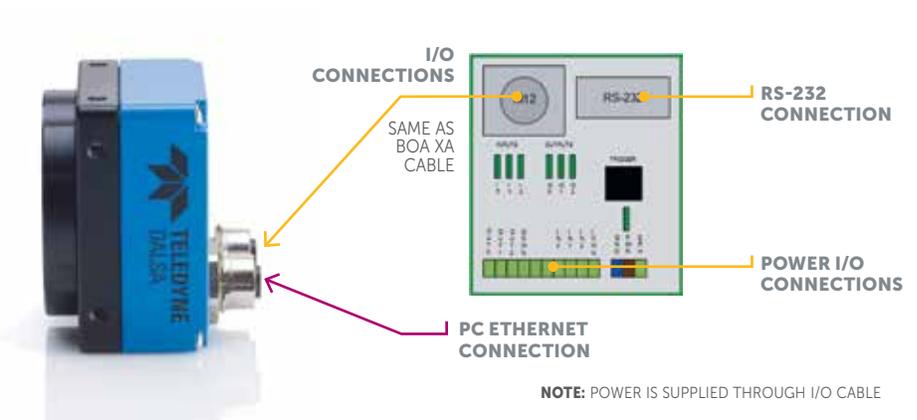


SUPPORTED PANEL LINK CONFIGURATIONS

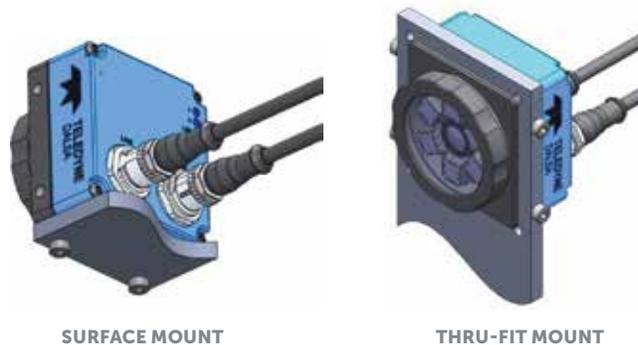
PASSIVE POE USING PL-100



I/O BREAKOUT USING PL-101



FLEXIBLE MOUNTING OPTIONS MEANS EASY FITTING IN TIGHT SPOTS



BOA VISION SYSTEMS

BOA is a highly integrated vision system in a compact "smart" camera format engineered specifically for factory floor automation. With application software embedded, BOA offers new and experienced users alike, an easy-to-deploy, cost effective vision solution for single point industrial inspections.



SINGLE POINT INSPECTION

BOA FEATURES

- » Tightly Integrated Vision System
- » Industrial Enclosure
- » Easy to use Embedded Software
- » 360° Direct Mounting
- » Multiple Processing Engines
- » Factory Style Connectors
- » Factory Communications
- » Ideal for Single Point Inspections

BOA GIVES YOU MORE

The BOA vision system comprises all the elements of an industrial machine vision solution:

- » Light Control
- » Processing
- » I/O
- » Factory Communications
- » Developer and Operator Application Interfaces
- » Protective Enclosure

Unlike traditional smart cameras, BOA incorporates multiple processing technologies – DSP, CPU and FPGA - for algorithm, communication and control optimization. The onboard application is accessed through a standard web browser for both setup and runtime monitoring.

With BOA, there is no need to install software on a PC and no need to maintain version control between the vision system and the connecting PC or factory network.

BOA's small, rugged enclosure makes it easy to integrate into tight-fit applications or harsh factory environments knowing that heat, vibration or moisture will not affect performance.

BOA INS

The standard product is offered with our iNspecT Express software. Ideal for both new and experienced users, iNspecT Express can be quickly set-up to satisfy a multitude of common inspection tasks.

BOA PRO

The PRO version is offered with our coveted Sherlock application software. Ideal for vision integrators, Sherlock provides the flexibility and tools to tackle the diverse range of applications across all industrial segments.

CAMERA MODEL		SENSOR RESOLUTION			
PERFORMANCE	SOFTWARE	640 X 480	1024 X 768	1280 X 960	1600 X 1200
BOA	INS	●● / ●●●	●● / ●●●	●● / ●●●	
BOA50	INS	●● / ●●●	●● / ●●●	●● / ●●●	●●
	PRO	●● / ●●●	●● / ●●●	●● / ●●●	●●
BOA200	INS	●● / ●●●	●● / ●●●	●● / ●●●	●●
	PRO	●● / ●●●	●● / ●●●	●● / ●●●	●●

PANEL LINK MODULES

Our panel link products are optional modules that provide integration convenience, expandability and protection against incorrect wiring. Panel Link products are DIN mountable and support standard M12 factory cabling to minimize costs. Depending on your application, these modules are designed for single cable applications as well as facilitating Ethernet communication for up to 4 BOA cameras.



PL-200-IO



PL-200-E



PL-100

BOA2 XA VISION SYSTEMS

BOA2 XA OFFERS MORE RESOLUTION, PERFORMANCE AND INTEGRATION

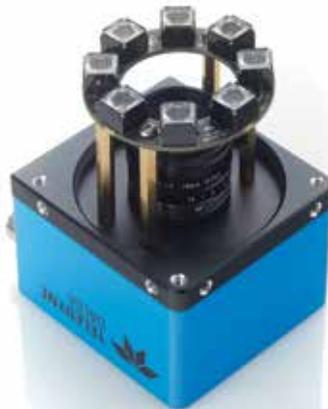
BOA2 XA vision systems are designed for applications that require higher image resolution and performance. These systems are well suited for precision part measuring and can detect small defects that are lost or difficult to distinguish with lower resolution sensors. BOA2 XA systems can image and inspect large parts or large surface areas, thus reducing the number of sensors and overall cost of deployment. Three resolution models are offered with two, three or five megapixel sensor formats.

SPECIFICATIONS	BOA2 XA2	BOA2 XA3	BOA2 XA5
Memory	Storage 4GB, Program 1GB		
Speed	1.5GHz Dual Core		
Sensor	1664 x 1216	1920 x 1440	2560 x 2048
Pixel Size	5 µm	5 µm	5 µm
Max Frame rate	up to 80 fps	up to 60 fps	up to 40 fps
Lens	C-mount 2/3"	C-mount 1"	C-mount 1"
Lamp Internal	Optional ring	N/A	N/A
Lamp External	Direct connect		
Trigger	1 opto-isolated input or via software		
Inputs	3 opto-isolated inputs (including trigger)		
Outputs	3 opto-isolated outputs		
Strobe	1 strobe output for external lamp		
Status	1 network + 2 application LEDs		
Interfaces	Ethernet: 1000 BaseT, Serial: RS-232		
Power	12-30V @ 300mA		
Environment	Operating: 0-50°C, IP67 protection		
Dimensions	83 mm x 66 mm x 48 mm (without lens cover)		



LIGHTING OPTIONS

Like all BOA smart cameras, BOA2 XA provides a direct connection to external 24V light sources with built-in strobe control. The BOA XA2 and XA3 models can optionally be equipped with a high intensity ring light with built-in collimators that provide uniform illumination across the target.



MOUNTING OPTIONS

M4 holes located on the sides, front, and back of the camera offer convenient mounting.



TOP

FRONT

BACK

EMBEDDED SOFTWARE

BOA2 vision systems include a full license to set up and run the embedded iNspec Express software. This easy-to-use application provides extensive vision tools and capabilities that satisfy a range of inspection needs, from part positioning, identification and measuring, to verification and flaw detection.

ACCESSORIES

BOA2 XA is offered with a new PL-101 Panel Link module. This DIN mountable interface provides convenient wiring and I/O isolation at the control panel through a standard M12 cordset.

Other optional accessories include lenses, lens protection caps, filters, lights, interface cables, power supplies, display controllers and HMI touch panels.

GEVA VISION SYSTEMS

GEVA vision systems offer the ease-of-use, performance and flexibility to meet the diverse requirements of industrial inspection. Integrated with high-speed camera ports, multi-core processing and choice of application software, these systems provide the capabilities and the versatility to suit a wide range of multi-camera applications.

MULTI POINT INSPECTION

GEVA-300

The GEVA-300 is our entry-performance vision system. It includes a dual-core processor and 6 GigE ports for camera interfacing. The low-cost GEVA-300 is a fanless, rugged system that easily integrates into tight-fitting environments and tolerates harsh factory conditions. Factory I/O is supported through an external DIN mountable module.



GEVA-1000

The GEVA-1000 is our mid-performance vision system. It has three times the processing power of the GEVA-300 and includes 2 dedicated GigE camera ports. The GEVA-1000 has integrated I/O that includes camera trigger inputs, lighting control and opto-isolated inputs and outputs for associated equipment interfacing.



GEVA-3000CL

GEVA-3000CL is a variant of the GEVA-3000 that supports the industry standard Camera Link interface. It allows simultaneous acquisition from two base style cameras or one medium style camera. The GEVA-3000CL is primarily targeted for line scan applications, but it can also be used with high-resolution or high-frame rate area cameras that support the Camera Link interface.



GEVA-312T

The GEVA-312T has similar performance to the GV-300, but is packaged as an HMI touch panel. The system includes 2 Gigabit ports for camera and network interfacing, USB and serial ports for I/O control, and front accessible USB for easy maintenance access. The GEVA-312T supports panel or VESA mounting options.



GEVA-3000

GEVA 3000 offers six times the processing performance of the entry level GEVA 300 and up to three times the performance of the GEVA 1000. The ruggedized GEVA 3000 provides a robust and highly capable industrial vision system for applications on the factory floor. Six (6) Gigabit compliant Ethernet ports internally connect through independent data lanes to alleviate bandwidth bottlenecks often associated with multi-camera acquisition. Like the GEVA-300, factory I/O is supported through an external DIN mountable module.



GEVA-4000

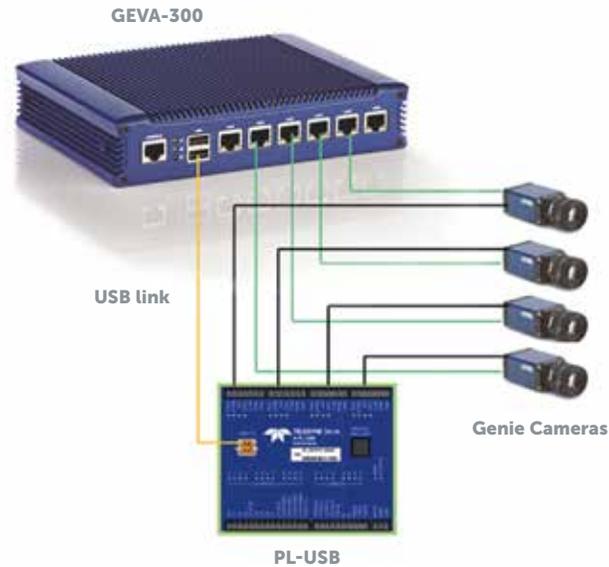
GEVA 4000 is our highest performance platform, delivering up to ten times the processing power of the GEVA 300. The fan-less GEVA 4000 is also our first platform to offer PoE (Power-over-Ethernet) on the dedicated camera ports. This alleviates the need for I/O cables when inspection triggering and control is provided by a networked PLC. The GEVA 4000 supports up to six (6) Gigabit compliant Ethernet ports (4 with PoE), each with independent data lanes. This low power, low profile platform is well suited for multi-camera industrial applications using either area or line based Gigabit camera.





GEVA – I/O SOLUTIONS

The GV-1000 and GV-3000CL systems provide I/O directly, whereas the GV-300, GV-312T and GV-3000 systems support I/O externally through the PL-USB. The DIN mountable PL-USB module offers electrical interfacing and I/O expansion for up to 4 Genie cameras. Multiple PL-USB modules can be used in a single application and they can be used with GEVA or any industrial PC platform using our software to simplify vision system integration.



APPLICATION		GV-300	GV-312T	GV-1000	GV-3000	GV-3000CL	GV-4000
Processing Scale	Relative	1X	1X	3-4X	6-8X	6-8X	10X
Memory	Program	2 GB	2 GB	2 GB	8 GB	8 GB	16 GB
	Storage	128 GB SS	32 GB CFAST	128 GB SS	128 GB SS	128 GB SS	128 GB SS
Image	Sensor Type	GigE	GigE	GigE	GigE	Camera Link	GigE
	# Sensors	Expandable	Expandable	Expandable	Expandable	2	Expandable
	Sensor Format	Area	Area	Area	Area/Line	Line/Area	Area/Line
	Color Support	Yes	Yes	Yes	Yes	Yes	Yes
	Sensor Size Min.	640 x 480	640 x 480	640 x 480	640 x 480	1024 x 1	640 x 480
	Sensor Size Max.	Variable	Variable	Variable	Variable	Variable	Variable
Communication	USB	3 (2.0)	5 (2.0)	2 (2.0)	6 (2.0)	6 (2.0)	6 (4 x 3.0, 2 x 2.0)
	Ethernet (Mbps)	6 x 1000	2 x 1000	3 x 1000	6 x 1000	2 x 1000	6 x 1000 (4 PoE)
	Serial (RS232)	1	4	1	2	2	2
	Visual (LEDs)	3	1	3	2	2	2
Display Options	Display	External	Embedded Touch	External	External	External	External
	Setup GUI	Local	Local	Local	Local	Local	Local
	Operator	Local	Local	Local	Local	Local	Local
I/O	Access	Breakout	Breakout	Local	Breakout	Breakout	Breakout
	Type	24V Opto					
	# Inputs	8	8	8 + 2 triggers	8	4 + 2 triggers	8
	# Outputs	12	12	8 + 2 strobes	12	4 + 2 strobes	12
Software	Application	iNspect Express					
		Sherlock	Sherlock	Sherlock	Sherlock	Sherlock	Sherlock
Power		24V @ 2.5A					

SHERLOCK SOFTWARE

Sherlock is advanced machine vision software that can be applied to a wide variety of automated inspection tasks. This graphical design environment provides a rich suite of proven tools and capabilities that have been deployed in thousands of installations worldwide. Recognized throughout the machine vision industry, Sherlock offers the flexibility to satisfy the full spectrum of vision applications in industry. Sherlock is supported on 32 and 64-bit Windows machines as well as BOA smart cameras.

THE CHOICE AMONG INTEGRATORS

SHERLOCK FEATURES

- » Flexible Region of Interest Selection
- » Extensive Set of Conditioning Functions
- » Advance Pattern Finding Tools for Object Alignment and Robot Guidance
- » Precise Tools for Computing the Dimensions

USER DEVELOPMENT INTERFACE

01. SOLUTION MANAGEMENT

Open and save solutions, start and stop inspection. Includes single-step debug operations.

02. IMAGE WINDOW CONTROLS

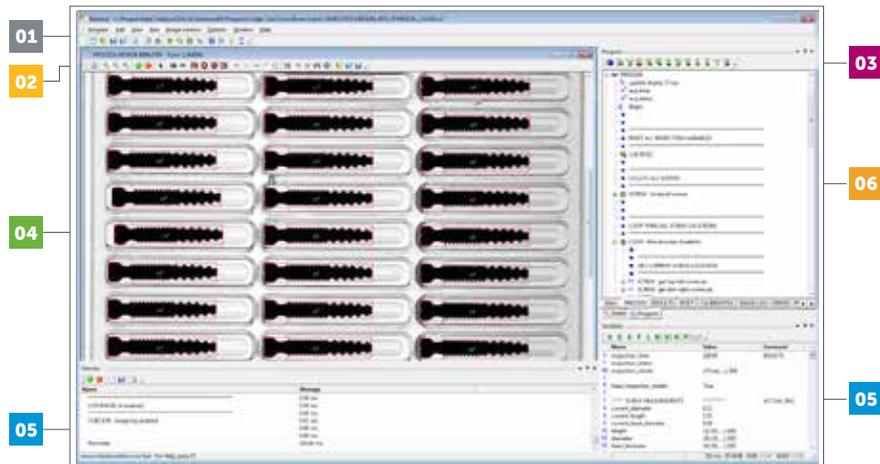
Load, acquire, save and zoom images. Select Region-Of-Interest shapes and apply image preprocessors and algorithms.

03. PROGRAM INSTRUCTION TOOLBAR

Provides quick access to commonly used instructions. These include acquisition, subroutine creation, program steering, conditional statements and scripting.

04. IMAGE WINDOW

Displays image during setup and live image at runtime. Images are acquired from cameras, files or sequence of files.



05. FEEDBACK WINDOWS

Viewing windows provide immediate status of program events. They provide feedback of instruction timing, algorithm results, variables, hardware I/O, result reporting and more.

06. PROGRAM

The program window displays the sequence of instructions or actions that comprise an inspection. Program snippets can be copied and paste back into the program or a subroutine.

RICH SUITE OF TOOLS FOR ANY APPLICATION

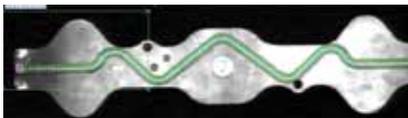
Sherlock provides a comprehensive set of vision tools and capabilities that can be applied to applications across all industries. You can quickly build a solution using Sherlock's extensive library of preprocessors and advanced algorithms or if you need something special, you can write custom scripts, import proprietary tools and develop your own custom operator interfaces.

SPECIALTY TOOLS

Sherlock tools and capabilities allow you to tackle a wide range of industrial applications. Included are a variety of specialty tools that have been specifically designed to simplify difficult inspection tasks.

BEAD TOOL

The bead tool algorithm inspects a bead (thin line) of material. A typical application is inspecting beads of glue that attach gaskets to automotive assemblies.



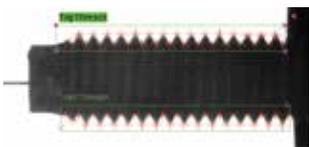
BEAD TOOL

COLOR TOOL

Sherlock provides tools for color correction, classification and presence. It also supports color mapping, a technique which allows you to segment the image by color in order to apply mono tools to the task.

CORNER FINDER TOOL

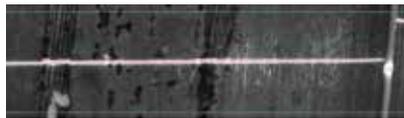
The corner finder tool generates an array of "corner points" that can be manipulated by Sherlock formulas to measure the space between "peaks and valleys" of machined parts, such as bolt threads.



CORNER FINDER TOOL

LASER LINE TOOL

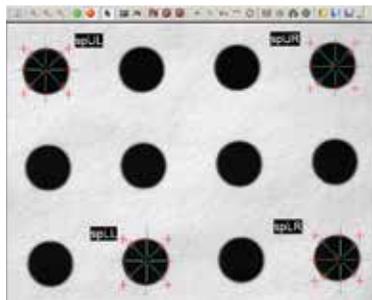
Laser tools are used to measure the profile of parts or to detect irregularities such as the placement of protective wrapping on this high-pressure pipe. At the right, a gap in the wrapping is followed by lifting of the wrapping, as shown by the upward step in the reflected laser line points.



LASER LINE TOOL

CALIBRATION TOOL

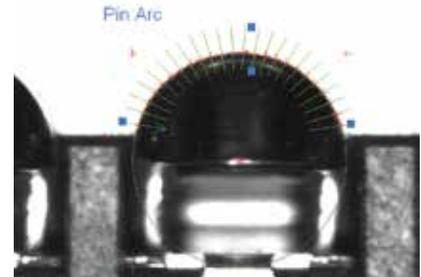
Sherlock offers several methods for translating pixel to real-world coordinates. Calibration tools also correct for lens and perspective distortion.



CALIBRATION TOOL

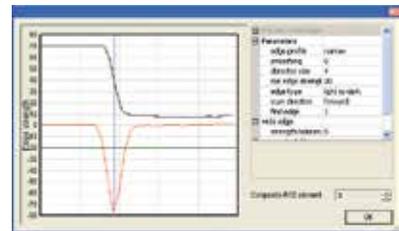
COMMUNICATION

Sherlock provides interfaces to a variety of communication mediums and supports standard factory protocols such as Modbus and Ethernet/IP.



POINTS FROM SPOKE REGION OF INTEREST

Many of the tools provide graphical feedback that allows you to tune the algorithm to match your application needs.



EDGE GUI TOOL

CUSTOMIZATION

Sherlock's Java Script based scripting tool, complete with drag and drop instruction editing, allows you to develop custom formulas for in-line and background operations.



CUSTOM OPERATOR INTERFACE

A complete Visual Basic interface is provided for developing custom operator interfaces.

INSPECT EXPRESS SOFTWARE

iInspect Express is a vision application specifically designed to simplify the design and deployment of automated inspection on the factory floor. iInspect Express offers new and experienced users alike, a practical tool delivering uncompromised functionality that can be readily applied to a wide range of manufacturing tasks.

MACHINE VISION MADE SIMPLE

INSPECT EXPRESS FEATURES

- » Multiple Cameras and Image Sizes
- » Emulator for Offline Development
- » Same Interface for Set Up and Runtime
- » Support for Custom Local Interfaces
- » Access Control
- » Direct Connect to 3rd Party Interfaces
- » Solution Switching via I/O or Network
- » Image Logging and Playback
- » FREE Updates

QUICK TO SET-UP

1. PREPARE IMAGE



- » Synchronize timing
- » Adjust lighting and exposure
- » Calibrate coordinates

2. APPLY TOOLS

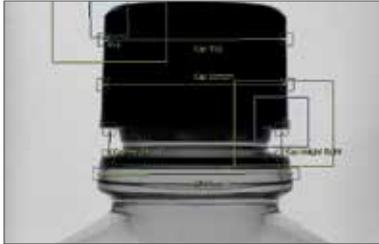


- » Click and apply inspection tools to image
- » Assign locators for alignment if required
- » Adjust pass/fail tolerances

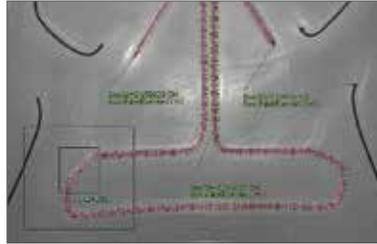
3. RUN



- » Display runtime results
- » Edit tool tolerances
- » View inspection history



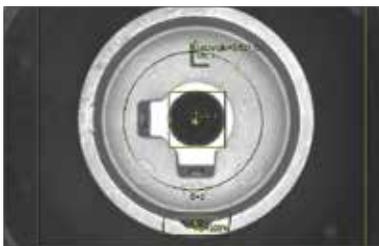
CAP VERIFICATION



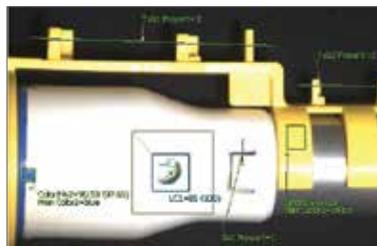
BEAD MEASUREMENT



PRODUCT IDENTIFICATION



POSITIONING



COLOR VERIFICATION



CHARACTER READING

INSPECTION CAPABILITIES

iInspect Express offers a flexible tool set that is relevant for many different applications across the spectrum of industries it serves.

Inspection capabilities include:

- » Pattern matching
- » Color matching
- » Feature finding
- » Feature counting
- » Feature measuring
- » Barcode reading
- » 2D Matrix reading
- » 2D Matrix grading
- » Character reading (OCR)
- » Character verification (OCV)

iInspect Express also offers a very capable scripting tool. This tool allows users to develop their own programs using predefined or custom functions with tool variables. Scripts can be defined based on external, processing or timed events. This method of programming provides maximum flexibility to solve more demanding applications.

ADMINISTRATION

Operator access is an important consideration in factories. iInspect Express provides the capability to restrict or lockout unauthorized users.

For highly controlled manufacturing environments like pharmaceutical, it is also required to log access and any changes made to the system. iInspect Express offers the ability to log access and change information to a secure drive on the company network.



FACTORY INTEGRATION

iInspect Express supports digital I/O, serial and Ethernet communications for interfacing 3rd party equipment, operators and the factory enterprise. Compatible protocols, such as Modbus, Profinet and Ethernet/IP, provide standard languages for connecting complementary factory devices. Teledyne DALSA is proud to be an encompass partner of Rockwell Automation.

CUSTOM AND MULTI-LANGUAGE INTERFACE

iInspect Express offers a Visual Basic API for advanced users wishing to develop custom operator interfaces. The standard operator interface provided with the product is available in various languages such as English, Chinese, French, Italian, Japanese and Spanish.



INSPECT EXPRESS
PROVIDES LOGGING
OF IMAGES AND
INSPECTION RESULTS

POSITIONING

For inspection on high-speed production lines, offline verification audits or robot-guided pick and place, positioning tools are critical to successful machine vision.

Positioning tools, locators or pattern finders recognize and determine exact position and orientation of parts. Results can be transferred directly to material handling devices or used to position other tools required for the inspection. We refer to this correcting for part movement as landmarking.

POSITIONING APPLICATIONS

- » Locating part position for material handling
- » Locating part feature for tool landmarking
- » Part counting
- » Part sorting
- » Verification of part or feature orientation

FIND AND VERIFY PARTS



MODEL EDITING

Advanced tools in Teledyne DALSA's Sherlock software support editing of the trained models that positioning tools look for. This has the benefit of eliminating noise or unimportant detail and improving speed and robustness.



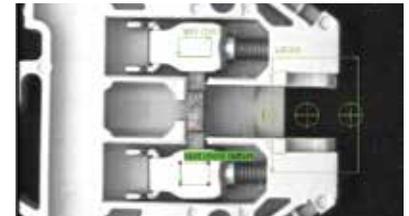
EDGE POSITIONING TOOLS

Edge positioning tools provide very fast location of objects that have well-defined straight lines. They calculate the intersection point between the horizontal and vertical edges along with the rotation.



PATTERN POSITIONING TOOLS

Pattern positioning is better for complex images with irregular shapes, low contrast, or process variations. These tools support patterns defined by pixel intensity or geometric shape.



POSITIONAL CHECKS ON ASSEMBLY

In this application, the black rectangle is found and its position used as a landmark for finding the position and angle of arrow buttons on a final assembly. The position and angle of the arrows are found despite changes in intensity, orientation, contrast, shading and shadows.

Pattern finding tools return a score for how closely they match the trained model under varying conditions. Positioning tools are often used to verify irregular shaped objects or features that are difficult to inspect with other tools.





RELIABILITY AND PERFORMANCE

Robust positioning tools suitable for any kind of machine vision application. For reliability and performance in today's demanding manufacturing environments, Teledyne DALSA provides superior geometric pattern finding capabilities that are tolerant to most industrial process variations.



GEVA300

EDGE POSITIONING TOOLS



PCB ALIGNMENT FOR PICK AND PLACE APPLICATION

Our solutions provide a variety of positioning tools that range from simple edge finders to sophisticated pattern finding algorithms.

Selecting the appropriate positioning tool (or tools) for a specific application is typically based on the following criteria:

- » Part Features – high contrast unique features or complex similar patterns
- » Part Movement – XY only or with rotation
- » Part Appearance – pattern variation due to process or environment changes
- » Part Orientation – small rotation or 360° rotation
- » Line Speed



AUTOMOTIVE PART ALIGNMENT FOR PRECISION MEASUREMENT



01. CASE STUDY

ROBOTIC ARM POSITIONING

A leading global automobile manufacturer assembles 120,000 vehicles annually—one to two cars per minute—at a plant in China. Originally parts were moved into production by equipment that was operated manually, and robotic grippers were designed to lift the vehicle parts onto the assembly line automatically.



Two Genie cameras connected to a GEVA 1000 vision system with Sherlock software, are used to process images from across these two distinct assembly lines simultaneously. Triggered independently, the two Genie cameras capture multiple positions at the same time, first to identify the type of vehicle part being moved and then to ensure that the four robotic arms will grab the part in the correct locations.



IDENTIFICATION

Identification encompasses a range of machine vision applications that involve reading printed characters and decoding 1D or 2D symbols on products or parts. For traceability of production parts, verification of product lots or grading of print codes, our Identification tools are designed for accurate results in the toughest of manufacturing environments.

IDENTIFICATION APPLICATIONS

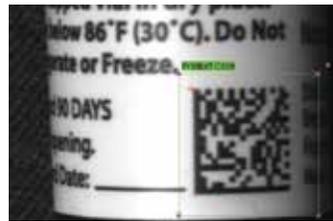
- » Work in process inventory management – verify moving parts through a fabrication process
- » Cradle to grave part traceability
- » Product verification – assure 1D or 2D code matches printed text
- » Product identification and sorting
- » Date and lot code verification
- » Code Verification. Detect problems with the marking system for preventive maintenance



2D MATRIX CODE READERS

2D matrix codes are widely used across many industries for part traceability and process control. The codes are popular for their small footprint, built-in error correction and large data capacity.

Teledyne DALSA 2D matrix algorithms provide decoding and grading of ECC 000, 050, 080, 100, 140 and 200, QR, MicroQR and PDF 417 matrix codes.



2D CODE PRINTED ON PHARMACEUTICAL VIAL



2D CODE PRINTED ON UNDERSIDE OF PLASTIC BOTTLE

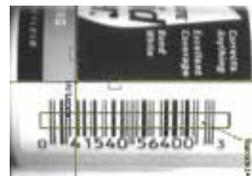
1D BARCODE READERS

1D barcodes are commonly used on products for traceability and sorting. Machine vision verifies that the barcode matches the product that it is printed on.

Teledyne DALSA's barcode product supports UPC, EAN, Code 39, Code 93, Code 128, Codabar, Interleaved 2 of 5, Pharmacode, BC412, Postnet, Planet, OneCode, RSS14 (Limited, Composite, Expanded)



PHARMACEUTICAL LABEL WITH RSS CODE



CONSUMER PRODUCT WITH UPC CODE

CHARACTER AND OBJECT READERS

Date codes and lot codes printed on products provide critical expiration and traceability information. Products with unreadable codes become defective as consumers cannot verify product quality.

Character or symbol recognition is common in many manufacturing or production environments.

Our products include trainable Object Character Recognition (OCR) tools that can handle the variation and diversity of most printing methods in use today.

OCR is based on pattern matching and so can be applied to a diverse range of verification applications outside of character reading. Often manufacturers will use OCR to build a library of parts that can later be identified and sorted.



CHARACTERS PRINTED ON CAST METAL PART



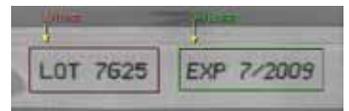
PRINTED DATE AND LOT CODE ON PRODUCT LABEL



02. CASE STUDY

DATE AND LOT CODE PACKAGE

A manufacturer of medicinal products needed to inspect printed-ink lot and date codes on packages coming down a hanging assembly chain. The hanging packages are traveling on an indexing chain about 4-5 packages per second.



Each lot and date code, after being read, must be logged and sent via Ethernet (TCP/IP) to an online computer server. The manufacturer produces six colored variations of the packages, and the BOA vision system's OCR tools are used to easily differentiate printed ink characters.

It is necessary to send and log the lot and date codes, time/date stamp, inspection count and status to a networked computer. To send inspection data to the networked computer, a script routine is necessary to format and organize the information to be transferred to a PLC.



ENGINEERED FOR INDUSTRY

Direct part marking of data matrix codes present many challenges for industrial identification. With a range of printing methods available, from direct etching and stamping to laser scribing and peening, direct part marking on metal, plastic and other materials offer manufacturers extensive printing flexibility together with variation in print quality.

Teledyne DALSA meets this challenge by providing robust identification tools that can handle the wide variation in print appearance and part position. Our tools also provide grading of printed codes that allows manufacturers to detect and correct deteriorating print quality.

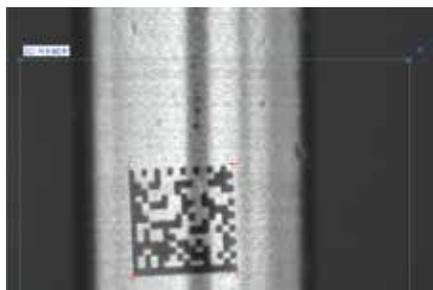


BOA SPOT VISION SENSOR

DETECTING PRINT VARIATION



DOT PEEN 2D CODES ON PLASTIC



LASER ETCHED 2D CODE ON METAL

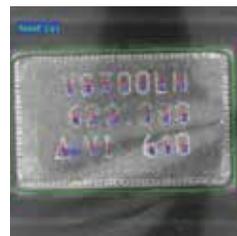
Teledyne DALSA OCR tools can read a variety of printed characters and symbols under equally challenging conditions. New font variations can be quickly trained and saved to a pattern data base. Similarity scores are provided for the character verification process to indicate match quality.



BACKGROUND INTERFERENCE



CIRCULAR PRINT



POOR CONTRAST

VERIFICATION

Machine vision systems are widely used for the verification of parts, assemblies and packaged goods. The range of verification applications are generally so broad, they utilize the same tools for positioning, measurement, identification and flaw detection. Verification is often combined with other tasks, such as measurement of part dimensions or reading of product barcodes, to render 100% product inspection.

VERIFICATION APPLICATIONS

- » Blister pack verifications
- » Molded part verification
- » Solder joint verification
- » Bottle cap and safety seal verification
- » Print verification
- » PCB assembly verification
- » Cable wiring verification
- » Package verification
- » Feature (thread, hole, notch) verification

ALUMINUM LID VERIFICATION

Pop-top can lids are checked to verify that they are 'top side up' and have the pull ring in place before they are joined to beverage cans.

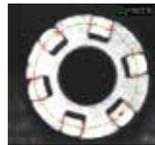
The low contrast of this image might make for a difficult inspection, but our geometric pattern tools are easily able to distinguish the pull ring from the background.



BEAD INSPECTION

PART VERIFICATION

Defects found at part assembly are easier and much less expensive to fix than in the finished product. For example, a vision system prevents these two similar parts from being interchanged.



SYMMETRICAL

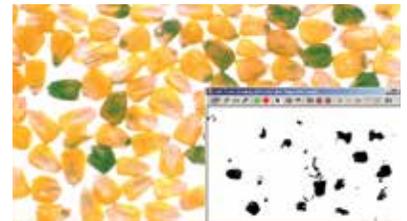


NON-SYMMETRICAL

FOOD VERIFICATION

Machine vision is used by the food industry to verify product content as well as processing and packaging.

Often, presence of product is detected by color as the position and extent of component foods vary too much to be reliably measured.

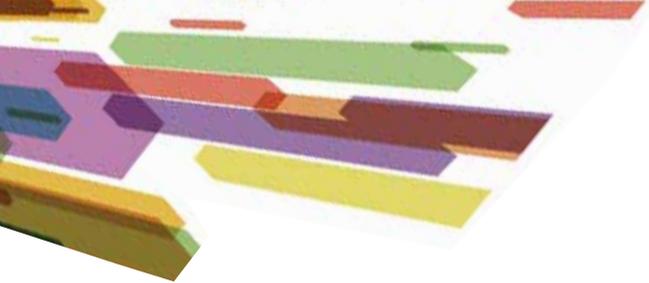


VERIFICATION OF CORN KERNEL GRADE

TEETH VERIFICATION ON GEAR



VERIFICATION OF PACKAGE SEAL



EASY SET-UP AND TRAINABILITY

Teledyne DALSA's vision systems are easy to set-up and simple to train. In the case of verification the primary concern is with presence and correctness of assemblies and parts. A trained machine vision system will evaluate a number of characteristics such as brightness, shape, dimension, orientation and color to achieve reliable inspection results.

Verification has many uses in the production and packaging of products, and in automotive, electronics, pharmaceutical and medical manufacturing.



GEVA 4000

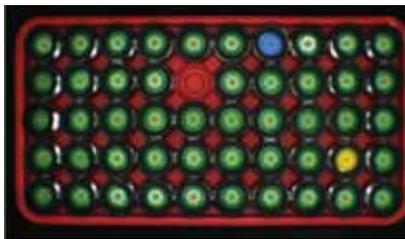
ASSEMBLY VERIFICATION USING COLOR

Color tools are often used to detect the presence and order of parts on an assembly, such as the blue and red plastic components on this medical instrument.



PACKAGE VERIFICATION OF WATER AERATORS

Ensuring that a correct type and quantity of aerator heads are correctly packed into this crate would be much more challenging without color verification tools.



SOFTWARE CAPABILITIES

- » Search and match tools to find parts and verify assemblies
- » Edge, corner, line, circle and line segment detection tools to find part "features"
- » Blob analysis tools for counting and dimensioning areas of similar color or contrast on the part
- » Counting tools to determine number of parts and indicate missing parts
- » Color tools to measure amount and location of colored elements such as automotive fuses, wire, foodstuffs, and pills
- » Measuring tools for further qualifying parts and assemblies

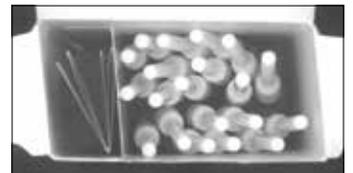


03. CASE STUDY

MEDICAL PACKAGING CONTENT

A medical package needs to be inspected for proper contents. The package contains a divider where a pamphlet insert is placed in the left pocket and 20 ointment tubes are placed in the right pocket.

The packages are traveling on a small conveyor about 2-3 second, with small varying degrees of orientation. Each package must be inspected for its proper contents, and ensure that the ointment tubes are only placed in the right pocket.



A BOA vision system is used to verify tube count and the presence of the pamphlet insert. Verifying the proper number of tubes is done by counting each white tube cap. A blue flat dome light is used for its effectiveness to create an even illumination on the cap surface. The presence of the insert is verified, as well as package movement and orientation.



MEASUREMENT

Manufacturing requirements for measurement range from presence verification to checking high-precision dimensional accuracy and geometrical tolerances. Attention to the inspection environment and image quality is as important as the vision algorithms themselves. Our sub-pixel measurement tools, combined with the right optics and stable lighting, provide the precision and repeatability to ensure manufacturing accuracy.

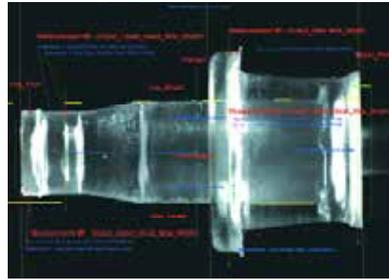
MEASUREMENT APPLICATIONS

- » Presence/absence
- » Dimensional accuracy – geometrical tolerances
- » Thickness and uniformity of parts



CRITICAL THRESHOLDS FOR MEDICAL IMAGING

Manufacturers of medical instruments measure each part of the assembly process to strict tolerances. An incorrectly manufactured part could have dire consequences.



GLAND INSPECTION

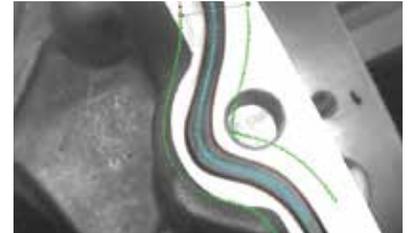


STAPLE INSPECTION

GAUGING FOR QUALITY CONTROL

The automotive industry has many applications that require online and offline measuring systems.

Using Teledyne DALSA measurement solutions, production quality can be monitored at any stage in the body shop. Results can be sent to the factory enterprise and documented for step-by-step quality control.



BEAD INSPECTION

PRODUCTIVITY IMPROVEMENTS FOR A MULTITUDE OF APPLICATIONS

For general manufacturing needs, machine vision measurement provides a fast, highly accurate and cost-effective way to assure product quality and customer satisfaction.



FILL LEVEL MEASUREMENT



3D PROFILE MEASUREMENT



CONNECTOR INSPECTION





IMAGE CAPTURE TO IMAGE ANALYSIS

Teledyne DALSA offers image capture, acquisition, processing, and analysis solutions. From both area and line scan technology, bundled with our vision systems to standalone all-in-one smart camera vision systems, there is a solution to suit almost any application.



BOA SMART CAMERAS

IMAGING FOR MEASUREMENT ACCURACY

Selecting the correct resolution is critical to distinguishing the smallest feature for measuring. In the application below, a Teledyne DALSA 1024 pixel line scan camera is used to image different sized horse shoes. In applications where the part being gauged is large, images may be sourced and combined from multiple cameras to perform measurements.



1024 X 1200 LINE SCAN IMAGE

SOFTWARE CAPABILITIES

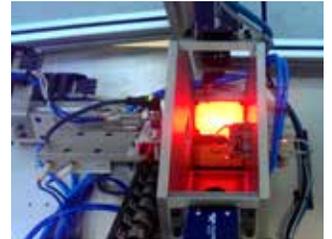
- » Positioning (search) tools to accurately landmark measurements on moving parts
- » Calibration tools to remove camera distortion and translate sub-pixel measurements locally or globally into real world units
- » Preprocessing tools to manipulate or enhance the camera image to highlight features to measure
- » Edge finding tools to accurately find edge transitions on parts for gauging
- » Shape finding tools to locate distinct shapes like corners on parts
- » Geometric fitting tools to fit lines, angles, arcs and circles to edge points
- » Caliper tools to measure between edge points
- » Math tools to create custom measurements that span multiple cameras
- » Laser tools for measuring height on parts determined by angle of projected laser lines
- » Bead tool to measure thickness and uniformity of adhesive beads or similar applications



04. CASE STUDY

RETAINER CLIP INSPECTION

Automatic Spring Products Corp. (ASPC) manufactures approximately 30,000 stainless steel retainer clips per week for use in automotive fuel injection systems. Inspections were completed by workers who checked each clip manually using a series of three gauges, each of which assessed two different measurements.



Two Teledyne DALSA BOA smart cameras with embedded iInspect software are used for the application. To start the inspection, an operator loads approximately 70 clips on a rail. As these clips move down the rail, they are grabbed by a gripper, which places them on a platform in front of the two BOA cameras: the first camera is placed to capture a side view of the clip and the second camera captures an image of the clip from above. The vision system assesses the dimensions of each clip and if the clip meets the pre-set requirement, it is saved; any clip that doesn't meet specifications is discarded as scrap.



FLAW DETECTION

Flaws—such as contamination, scratches, cracks, discoloration and burn marks—are small changes in the appearance of a product that might indicate defects. Flaws are usually random, so machine vision looks for pattern changes, changes in color or texture, or for a particular type of connected structure.

FLAW DETECTION APPLICATIONS

- » Surface scratch and crack detection
- » Break in uniformity of texture
- » Discoloration
- » Burn detection
- » Label inspection

SPLIT IMAGE SHOWING FLAW DETECTION ON TEXTURED TILE INSPECTION

Connected line patterns indicate surface scratches or cracks. Machine vision differentiates these from the irregular patterns associated with good quality tiles.

Defects like these can be further graded as acceptable or unacceptable according to feature characteristics such as area, length, direction and brightness.

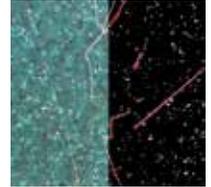
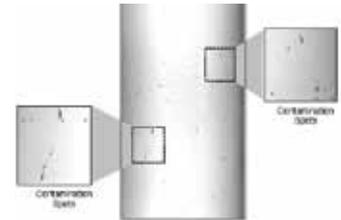


IMAGE SHOWING CONTAMINATION SPOTS ON A MEDICAL INSTRUMENT

Tiny contamination marks on the instrument surface are segmented from the background using high resolution Teledyne DALSA cameras and diffuse illumination.

Teledyne DALSA surface flaw tools are able to adjust for natural discoloration of surface coatings to extract true defects.



Dot-matrix barcodes and lot numbers are printed along edges of rolled mylar. The ink-jet printer can fail to print dots, print extra dots, or put down too much ink causing the dots to merge and potentially contaminate the product with wet ink.



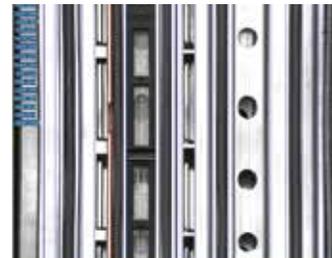
AUTOMOTIVE VALVE INSPECTION

Line scan cameras are commonly used to unwrap cylindrical surfaces, such as automotive parts for inspection.

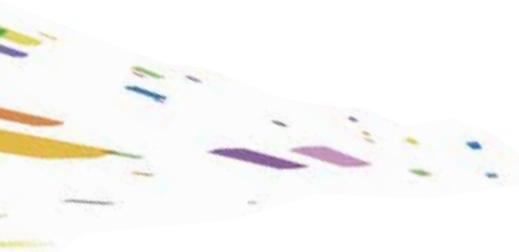
In this application, many inspections are performed to ensure that the valve surface is free of cracks and that all gaskets and filters are correctly installed and defect free.



VALVE BEING IMAGED



UNWRAPPED IMAGE INSPECTED



SUPPORT CRITICAL COMPONENT INTEGRATION

Teledyne DALSA's vision solutions allow easy integration of critical components like lighting. Surface flaws are often hard to detect, even by humans. Often they are low-contrast and random in their patterns. Proper lighting must be used to "amplify" flaws if they are to be detected by the machine vision system. In some cases multiple types of lighting are needed to show all classes of flaws.



GEVA MULTI-CAMERA VISION APPLIANCE

COLOR AND TEXTURE FLAW DETECTION

Flaws in the manufacturing process can often be detected by color or texture change. For these applications, defective product must be differentiated from normal process variation.



LABEL OR PRINT FLAWS

Printed material, such as labels on packages, are often vulnerable to print and structural flaws such as scuffs, folds, flags and tears. Teledyne DALSA software is quick to learn and detect these process defects.



SOFTWARE CAPABILITIES

- » Edge and segment finders for crack and scratch detection
- » Color measurement and monitoring tools for detecting discoloration
- » Texture analysis tools used to detect changes in visual texture, usually caused by flaws, process problems, or mismatched parts
- » Label inspection tools for detecting print or application flaws (statistical differences)
- » Burn detection using a large "ramp" edge detector



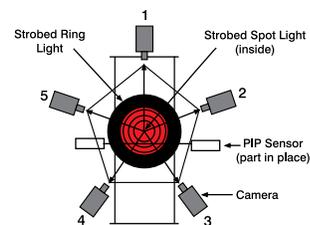
05. CASE STUDY

ROLL STEEL RING INSPECTION

The customer manufactures cold-formed, steel coupling rings. Machine vision finds seam defects on the outer surface and missing threads on the inner ring.



Two networked multi-camera vision systems connected to 5 VGA cameras are used to ensure 360° inspection at 80 parts per minute.



CONFIGURATION

Strobed ring and spot lights illuminate parts as they are inspected. The relevant defects are found and reported along with images on the operator interface.



COMPLETE VISION SOLUTIONS

Teledyne DALSA vision systems are used across all manufacturing sectors for the purpose of inspection, identification and robotic guidance. Our integrated software provides the tools and capabilities to solve a wide range of application needs and supports standard factory protocols for communicating with complementary equipment. Our robust hardware platforms are built using industrial components that tolerate the variation of environmental conditions in which they operate.



OPTICS

A good camera is dependent upon a good lens. In essence, the lens is the looking glass through which our cameras see. There are many factors to consider when selecting a lens, such as focal length, sensor size and field of view.



LIGHTING

For any machine vision application, lighting should be a top consideration. Selecting the right light can make a difficult application simple, or conversely, selecting the wrong light can make a simple application difficult. Our sales channel partners are experienced in lighting techniques and can recommend the best choice for your inspection need.

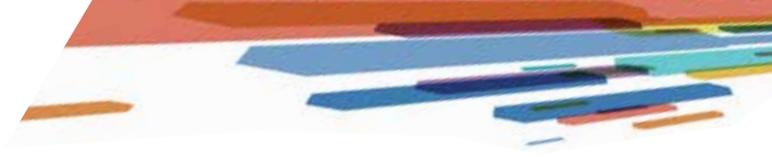


LED LIGHTING

Teledyne DALSA offers a range of LED lighting solutions to satisfy your application requirements. These include:

- » Ring Lights
- » DOAL
- » Dome Lights
- » Spot Lights
- » Back Lights
- » Indirect Ring Lights
- » Line Lights
- » Low Angle Ring Lights

LED lighting is the preferred method for machine vision applications due to its long life and available choices. Camera sensors are generally more sensitive to red wavelengths, making red LEDs the most common choice, but other colors are often used to accentuate like colors on the part being impacted.

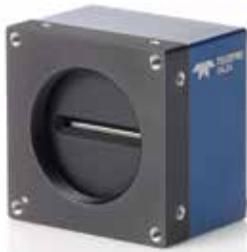


VISION SYSTEM ENGINEERING AND SUPPORT

Teledyne DALSA maintains a comprehensive network of qualified distributors and system integrators to support your production line update or new install. A team of experienced experts are ready to provide automation consultation, systems engineering, and integrated development and deployment to get your production line up and running quickly.



VERSATILE CAMERA FORMATS AND INTERFACES



LINEA—LINE SCAN

Linea is a CMOS line scan camera that can help you improve your imaging and lower your costs. Linea starts with an advanced CMOS sensor with high quantum efficiency and low noise for better images. Linea is also packed with advanced features to make your machine vision job almost effortless. Linea uses Teledyne DALSA's own advanced CMOS line scan sensors in both monochrome and color versions.



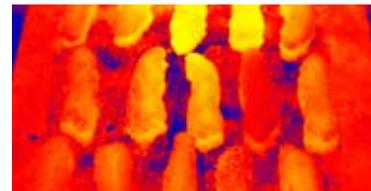
GENIE NANO—AREA SCAN

Genie Nano, a CMOS area camera that redefines low cost performance. Genie Nano starts with industry leading image CMOS sensors and adds proprietary camera technology for breakthrough speed, a robust build quality for wide operating temperature, and an unmatched feature set—all at an incredible price.



CALIBIR—INFRARED

Advanced infrared imaging for automated inspections. Calibir is a family of uncooled infrared cameras and cores, designed specifically for demanding thermal imaging applications. With its compact size and low power dissipation, and shutterless radiometric performance the Calibir is ideal for applications like food inspection and packaging.



See the full range of models available here: www.teledynedalsa.com/cameras



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