

POSITIONING | IDENTIFICATION | VERIFICATION | MEASUREMENT | FLAW DETECTION



INDUSTRIAL VISION SOLUTIONS

SINGLE AND MULTIPLE CAMERA SOLUTIONS FOR AUTOMATED MACHINE VISION APPLICATIONS



Get more vision

servicing the
machine vision industry
for over 25 years



Teledyne DALSA has focused on providing machine vision components and solutions for over 25 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 that meet the diverse needs of industry and end user alike. Designed specifically for factory floor deployment, our innovative Vision Appliances and smart cameras 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 INTERFACE

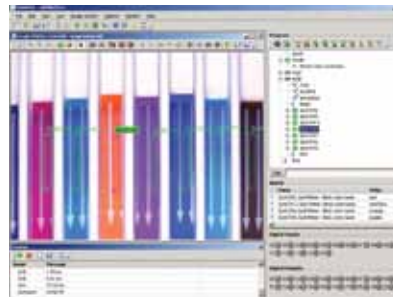


iNspec software allows experienced users and 1st-time adopters alike to setup and deploy solutions with little or no prior machine vision knowledge. iNspec's logical setup is built from the experience and algorithms that have been put to the test over the course of many years.

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 1600 x 1200 color resolution. In addition, Teledyne DALSA Vision Appliances support line scan technology to address challenging large format or cylindrical unwrapping applications.

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

BOA vision system

SINGLE POINT INSPECTION

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.

BOA GIVES YOU MORE

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

- Sensor
- 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.

Built-in support for protective Lens cover with gasket



IP67 rated housing

Interchangeable C Mount Lens

2 M4 threaded holes on each surface allow for easy 360° direct mounting



Visual LED indicators provide health and application status

Power and strobe control for external lighting is provided through a dedicated M12 connection

Rugged M12 style factory connectors for Ethernet, Serial and I/O offer low-cost cabling solutions

BOA FEATURES

- Tightly Integrated Vision System
- Easy to use Embedded Software
- Multiple Processing Engines
- Factory Communications
- Industrial Enclosure
- 360° Direct Mounting
- Factory Style Connectors
- Ideal for single point inspections

READY TO RUN SOFTWARE

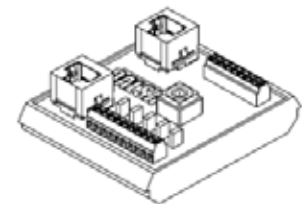
BOA is fully supported by Teledyne DALSA's iNInspect application software. iNInspect provides users with access to a comprehensive library of tools and functions that can be quickly set-up and deployed across a wide range of industries and applications, including:

- Pattern and Part Finding
- Optical Character Reading
- Label Management
- Measuring and counting
- Barcode and Matrix Reading
- Alignment and Edge Detection
- Color verification
- And more

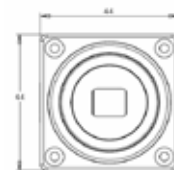
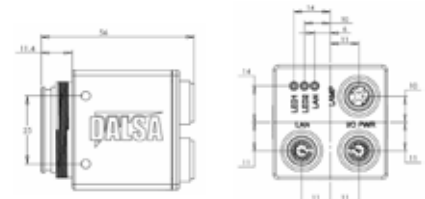
FLEXIBLE CABLING OPTIONS

The BOA vision system offers flexible cabling options to suit a number of application configurations. For single cable applications, the Ethernet cable can be used to supply power and communications between the camera and the control environment. Teledyne DALSA provides a convenient breakout module to simplify panel wiring and isolate the factory or PC LAN in single cable configurations.

SPECIFICATION	DEFINITION
Memory	Storage 256MB
	Program 256MB
Image	Sensor 1/3 inch CCD
	Pixel size 7.4 µm
	Resolution 640x480, 1024x768, 1280x960
	Type Mono or Color Progressive Scan
	Exposure 22 µm to 1000 ms
	Acquisition Async Reset, full or partial frame integration
	Up to 100 f/s maximum (application dependent partial mode)
	Lens C Mount (lens cover optional)
Lamp Direct connect (Pwr/Gnd/Strobe)	
I/O	Trigger 1 opto-isolated input
	Software trigger via Ethernet or internal timer
	Inputs 1 General purpose opto-isolated
	Expandable via Ethernet I/O
	Outputs 2 General purpose opto-isolated
	Expandable
	Strobe 1 dedicated strobe output for LED light source
Status Network + 2 application assigned LEDs	
Serial RS232 Flying leads from M12 cable	
Network Ethernet 10/100 BaseT (Supports "Passive Power over Ethernet")	
Power 12-30V Via I/O or Ethernet	
Mechanical	Material Machined Aluminum with anodize/paint finish
	Mounting 8 x M 4 plus optional mounting block
	Size 44mm x 44mm x 56mm (without lens cover)
Environment	Temp -10°C (14°F) to 50°C (122°F) Operating (-60°C to 80°C Storage)
	Protection IP67 with cables attached
	Shock 70 G
Certification	FCC Class A and EU CE



PANEL LINK MODULE



Available Models

- 640x480 to 1280x960 Resolution Mono or Color
- Sherlock software coming soon

Vision Appliances

MULTI POINT INSPECTION

Vision Appliances offer cost-effective solutions for applications that require multiple cameras. They comprise a centralized camera controller that delivers low deployment cost with high performance processing. Vision Appliances are available with choice of application software and camera interface to suit a range of application needs.

VA15/VA3X

Designed for easy integration, the VA15 and VA3X products offer users performance and flexibility with support for one or two analog cameras. Housed in compact, DIN mountable enclosures, these vision solutions are fully equipped with industrial grade I/O and external connections conveniently located on the front of the unit. Flexible I/O, combined with choice of camera resolution and software user interface, make these vision appliances ideal for a range of industrial applications.

VA4X

The VA4X controllers offer greater performance for high speed inspections. Available with different processor grades, these Vision Appliances include the resources required to tackle demanding applications without compromising overall deployment cost. VA4X solutions interface up to 3 mono analog cameras with low to high resolution sensors. They include industrial I/O, Ethernet and display connections for enhanced system design flexibility.

VA5X – Line Scan

For applications that require cylindrical unwrapping of parts or large format imaging of a moving surface, the VA5X controllers combined with Teledyne DALSA's line scan cameras and Sherlock inspection software offer an excellent solution. Available with choice of processing grade, the VA5X platforms support up to 2 mono or color line scan cameras with base or medium Camera Link interfaces.

GEVA – GIGABIT ETHERNET

The GEVA platform, along with the VA61, offers maximum camera expandability with lowest overall system cost. Multiple high bandwidth GigE camera ports are compatible with a resolution range of mono or color, area and line scan GigE cameras, which can be mixed to suit the application need.



Camera expansion is easily accommodated using commercially available network technologies, allowing large configurations to be realized for a variety of applications, such as final inspection of large assemblies. Configurations from 4 to 32 cameras are easily achievable with GEVA.

GEVA is equipped with multi-core processing and high-speed memory resources to tackle the most demanding applications. External interfaces for system integration include:

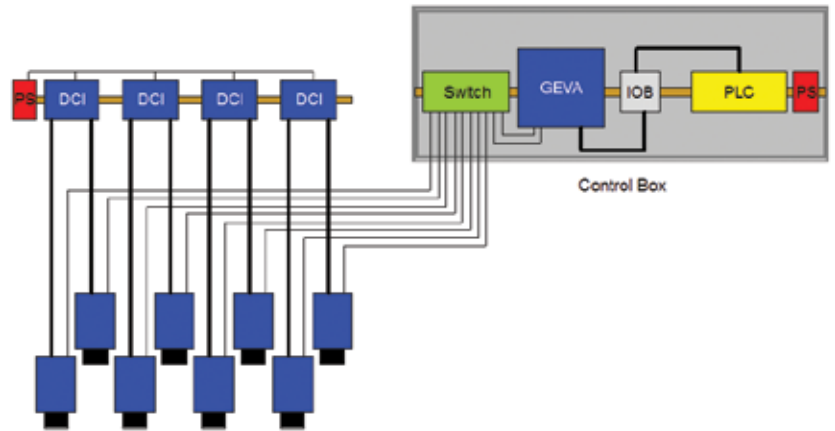
- Display and USB ports for application setup and runtime monitoring
- Ethernet and Serial ports for factory communication
- Trigger and strobe I/O for inspection timing and lighting control
- Opto-isolated I/O for 3rd party equipment interfacing

GigE vision technology is state of the art for multi camera configurations that share a centralized processor. The use of Ethernet for image transport reduces system costs and facilitates cable lengths up to 100 meters.



DCI-100

The DCI-100 provides an interface between Teledyne DALSA Genie cameras and industrial power, triggers and I/O. The module is used for remote or expandable configurations using the VA61 or GEVA Vision Appliance.



APPLICATION		VA15	VA30/31	VA40E/41	VA51/52	VA61	GEVA
Processing Scale	Relative	1X	2X	3X/8X	8X/10X	8X	10X
Memory	Program	128MB	512MB	512MB/1GB	1GB/3GB	1GB	2GB
	Storage	64MB Flash	128MB/4GB Flash	80GB	80GB/320GB	80GB	320GB
Image	Sensor Type	Analog	Analog	Analog	CameraLink	GigE	GigE
	# Sensors	1	2	3	2	2 expandable	2 expandable
	Sensor Format	Area	Area	Area	Area/Line	Area/Line	Area/Line
	Color Support	No	No	No	Yes	Yes	Yes
	Sensor Size Min	640x480	640x480	640x480	1024 x 1	640x480	640x480
	Sensor Size Max	640x480	1600x1200	1600x1200	User Defined	User Defined	User Defined
Communication	USB	2 x (1.1)	2 x (2.0)	2 x (2.0)	2 x (2.0)	2 x (2.0)	2 x (2.0)
	Ethernet (Mbps)	1000	1000	100/1000	100/1000	1000	1000
	Serial (RS232)	1	1	1	1	1	1
	Visual (LEDs)	26	26	7	7	7	3
Display Options	Setup GUI	Remote	Remote/Local	Local	Local	Local	Local
	Operator	Local	Local	Local	Local	Local	Local
I/O	Access	Direct	Direct	Breakout	Breakout	Breakout	Local
	Type	24V Opto	24V Opto	24V	24V Opto	24V	24V
	# Inputs	10	10	8	12	8	8 + 2 triggers
	# Outputs	8	8	8	8	8	8 + 2 strobes
Software	Application	iNspect Lite	iNspect Sherlock (31 only)	iNspect Sherlock	Sherlock	iNspect Sherlock	iNspect Sherlock
Power		24V @ 1A	24V @ 1A	24V @ 2.5A	24V @ 2.5A	24V @ 2.5A	24V @ 2.5A
Dimensions	Centimeters	9.5H x 16L x 5D	9.5H x 16L x 5D	7.6 x 20 x 21.5	7.6 x 20 x 21.5	7.6 x 20 x 21.5	20 x 12 x 8
Approvals		CE, RoHS	CE, RoHS	CE, RoHS	CE, RoHS	CE, RoHS	CE, RoHS

Sherlock software

THE CHOICE AMONG INTEGRATORS

Sherlock is advanced machine vision software that can be easily configured to resolve a wide variety of automated inspection applications. 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 both power and flexibility to solve your vision applications while providing the assurance that comes with this popular product.

USER DEVELOPMENT INTERFACE

01. SOLUTION MANAGEMENT

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

02. IMAGE WINDOW CONTROLS

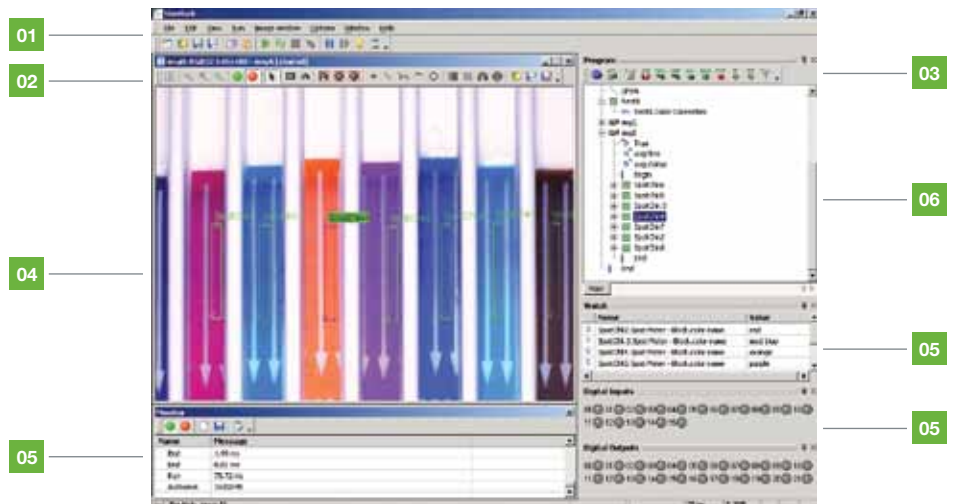
Load, acquire, save and zoom images. Select Region-Of-Interest shapes and apply image preprocessors and algorithms.

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.

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

RICH SUITE OF TOOLS FOR ANY APPLICATION

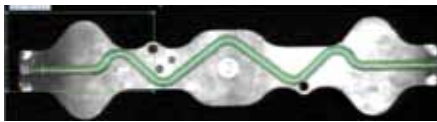
Sherlock provides a comprehensive set of vision tools and capabilities that can be applied to applications across all industries. You can quickly build a solution using Sherlock's extensive library of preprocessors and advanced algorithms or if you need something special, you can write custom scripts,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

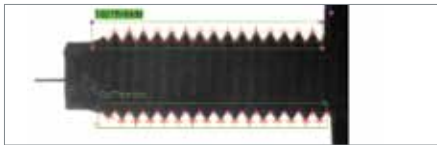
The bead tool algorithm inspects a bead (thin line) of material. A typical application is inspecting beads of glue that attach gaskets to automotive assemblies.



BEAD TOOL

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.



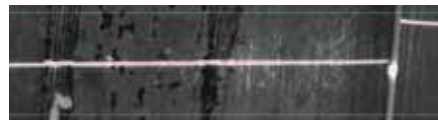
CORNER FINDER TOOL

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.

LASER LINE TOOL

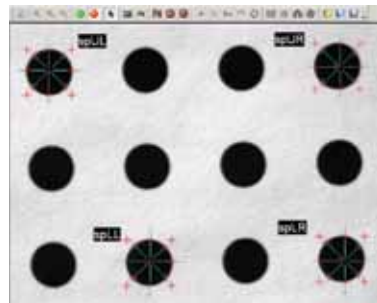
Laser tools are used to measure the profile of parts or to detect irregularities such as the placement of protective wrapping on this high-pressure pipe. At the right, a gap in the wrapping is followed by lifting of the wrapping, as shown by the upward step in the reflected laser line points.



LASER LINE TOOL

CALIBRATION TOOL

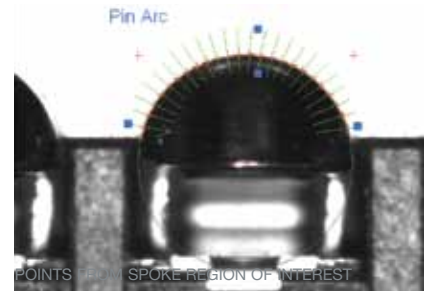
Sherlock offers several methods for translating pixel to real-world coordinates. Calibration tools also correct for lens and perspective distortion.



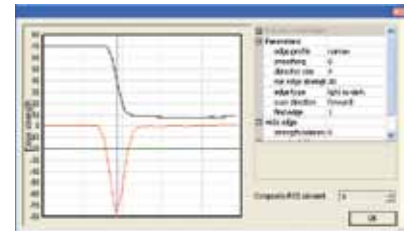
CALIBRATION TOOL

COMMUNICATION

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



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 software

MACHINE VISION MADE SIMPLE

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

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

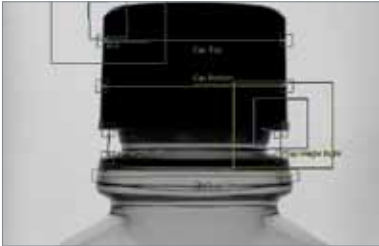
3. INTEGRATE



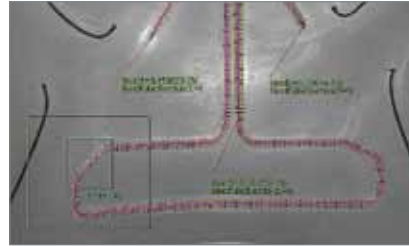
- SETUP COMMUNICATION CHANNEL
- CREATE SCRIPTS IF REQUIRED
- ASSIGN INPUTS AND OUTPUTS

iNspec FEATURES

- Multiple cameras and image sizes
- Same interface for set up and runtime
- Access control
- Solution switching via I/O or network
- FREE updates
- Emulator for offline development
- Support for custom local interfaces
- Direct connect to 3rd party interfaces
- Image logging and playback



CAP VERIFICATION



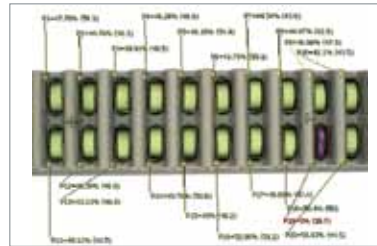
BEAD MEASUREMENT



PRODUCT IDENTIFICATION



POSITIONING



COLOUR VERIFICATION



CHARACTER READING

INSPECTION CAPABILITIES

iNspec 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)

iNspec 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. iNspec 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. iNspec offers the ability to log access and change information to a secure drive on the company network.

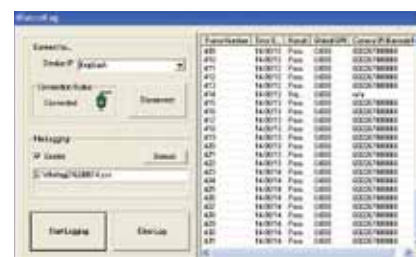


FACTORY INTEGRATION

iNspec supports digital I/O, serial and Ethernet communications for interfacing 3rd party equipment, operators and the factory enterprise. Compatible protocols, such as Modbus, Profibus 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

iNspec 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.



iNspec PROVIDES LOGGING OF IMAGES AND INSPECTION RESULTS

01. 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.

FIND AND VERIFY PARTS



MODEL EDITING



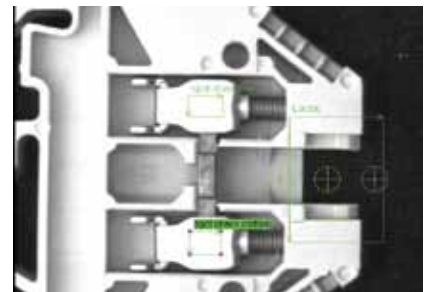
Advanced tools in Teledyne DALSA's Sherlock software support editing of the trained models that positioning tools look for. This has the benefit of eliminating noise or unimportant detail and improving speed and robustness.

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.

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.

ENGINEERED FOR INDUSTRY



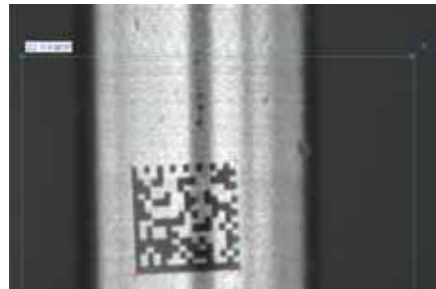
Direct part marking of data matrix codes present many challenges for industrial identification. With a range of printing methods available, from direct etching and stamping to laser scribing and peening, direct part marking on metal, plastic and other materials offer manufacturers extensive printing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

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



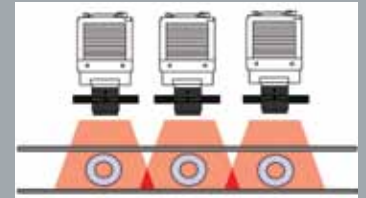
POOR CONTRAST

02.CASE STUDY

HIGH SPEED 2D READING

A Pharmaceutical company needs to locate and read 2D product codes on round plastic containers after packaging. The code contains a product description, batch lot, and expiry date that must be verified for each product.

The company produces 450 containers a minute, in any orientation.



Containers are indexed between pockets of a conveyor, three pieces at a time across the field of view of three 640 x 240 imagers connected to a single VA40. After moving into the field of view, the products are held and spun to ensure that an image of the 2D code is located and captured by the system. The cameras capture 25 images of each spinning container for the VA40 to process within a 150 ms allotted inspection window.

The application requires operator visualization for each inspected container.



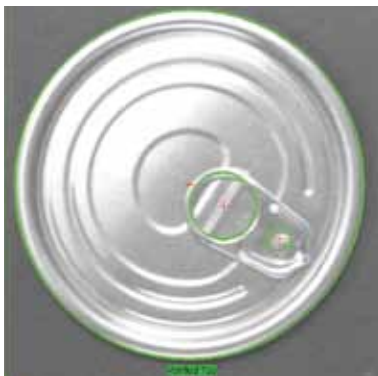
03. verification

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 barcode, to render 100% product inspection.

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.



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

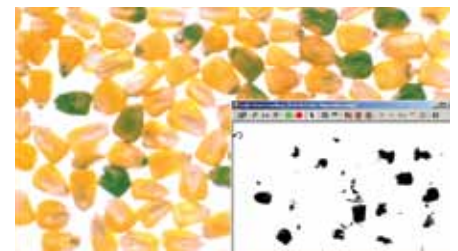
TEETH VERIFICATION ON GEAR



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



VERIFICATION OF PACKAGE SEAL

VERIFICATION APPLICATIONS

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

EASY SET-UP AND TRAINABILITY

Teledyne DALSA's Vision Appliances 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.

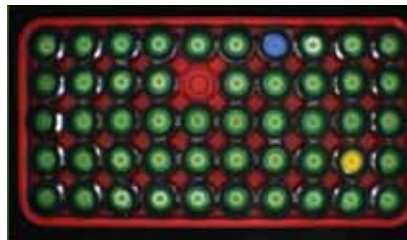


ASSEMBLY VERIFICATION USING COLOR



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 AUTOMOTIVE

Automotive manufacturers require verification checks at every stage of the production process. Machine vision verification tools provide reliable automation of mundane repetitive tasks:



2D Code Verification



Glue Bead Verification



Presence Verification



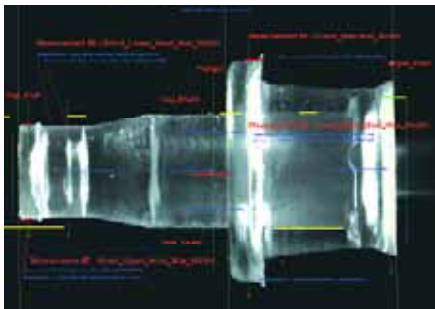
Fuse Verification

04. 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.

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.

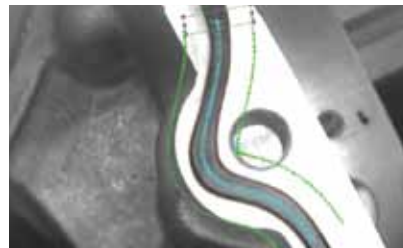


GLAND INSPECTION



STAPLE INSPECTION

GAUGING FOR QUALITY CONTROL



BEAD INSPECTION

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

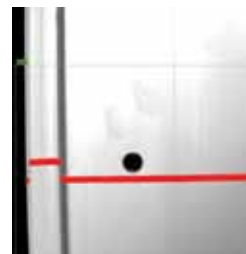
Using Teledyne DALSA measurement solutions, production quality can be monitored at any stage in the body shop. Results can be sent to the factory enterprise and documented for step-by-step quality control.

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

MEASUREMENT APPLICATIONS

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

IMAGE CAPTURE TO IMAGE ANALYSIS



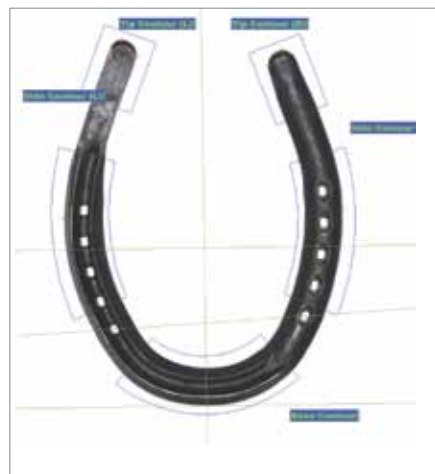
Teledyne DALSA offers image capture, acquisition, processing, and analysis solutions. From both area and line scan technology, bundled with our Vision Appliances to standalone all-in-one smart camera vision systems, there is a solution to suit almost any application.

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

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

04.CASE STUDY

METAL CONNECTOR INSPECTION

A ribbon of coiled metal enters a high-speed press where parts are stamped, bent or folded with every punch of the press. The presses run at a top speed of 660 strokes per minute, creating 2 parts with every stroke.

A dual camera VA41 Vision Appliance is used to inspect 2 parts at a time for an effective throughput of 1320 parts per minute.



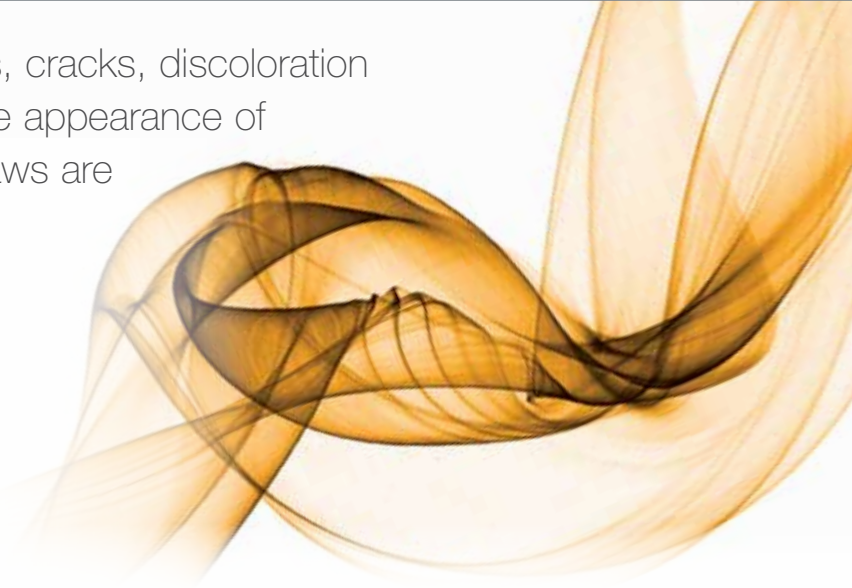
Frontal Camera View

Measurements are being held to ± 0.0002 at speed. Each camera uses our designed collimated back light. The VB interface reads out dimensions in thousandths of an inch.

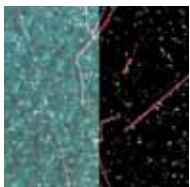


05. flaw detection

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.



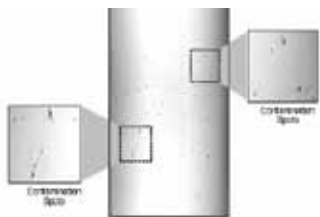
SPLIT IMAGE SHOWING FLAW DETECTION ON TEXTURED TILE INSPECTION



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.

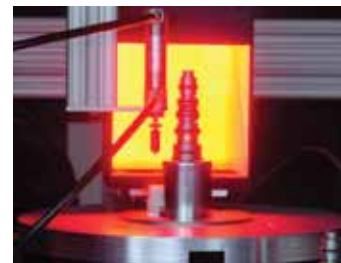
Teledyne DALSA surface flaw tools are able to adjust for natural discoloration of surface coatings to extract true defects.

IMAGE SHOWING CONTAMINATION SPOTS ON MEDICAL INSTRUMENT

274180653

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



VALVE BEING IMAGED

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.



UNWRAPPED IMAGE INSPECTED

FLAW DETECTION APPLICATIONS

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

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.



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

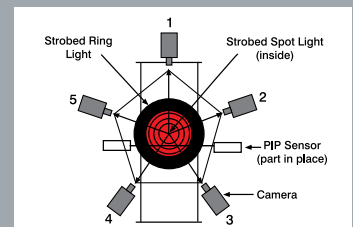
- Edge and segment finders for crack and scratch detection
- Color measurement and monitoring tools for detecting discoloration
- Texture analysis tools used to detect changes in visual texture, usually caused by flaws, process problems, or mismatched parts
- Label inspection tools for detecting print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

05.CASE STUDY ROLLED 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 VA40 Vision Appliances 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.



complementary technology

A vision application requires the integration of several components including the vision system, cameras, optics and lighting. Our expertise is in building vision systems and cameras. We source the related components from reputable 3rd party companies. This strategy allows us to concentrate on what we do best, while providing our customers with complete, high quality solutions from a single source.

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.

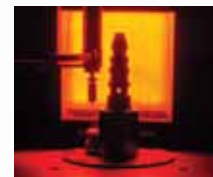


LED LIGHTING

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

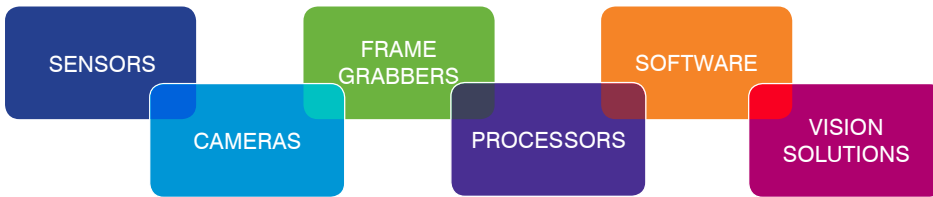
- Ring lights
- DOAL
- Dome Lights
- Spot Lights
- Back lights
- Indirect Ring Lights
- Line Lights
- Low Angle Ring Lights

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 inspected.

TELEDYNE DALSA'S INTEGRATED TECHNOLOGY PATH



Teledyne DALSA is the only industrial imaging company in the world to offer a fully integrated technology path.

- a secure and dependable supply of image sensors from our wholly-owned and operated semiconductor foundry
- a single source for your system build - from image sensors to fully integrated solutions - with service and support for image capture, analysis, processing and vision software
- coherent, synergistic technology design and development across our suite of products to allow ease of integration and performance optimization.

CAMERAS

Teledyne DALSA offers powerful, innovative CCD and CMOS cameras combining industry leading performance with industry leading feature sets and value. Our selection of GigE Vision compliant line and area scan cameras are available in a wide range of resolutions, speed and dynamic range to meet a wide range of challenging applications.



Teledyne DALSA Spyder3 line scan cameras bring unprecedented responsivity and throughput to bear on your industrial inspection challenges. With DALSA's dual-linescan sensor technology for a 3x sensitivity boosting and double the line rates from previous Spyderys, Spyder3 offers easy programmability, flat field correction, and a GigE Vision standard interface.

- 1k, 2k, and 4k resolutions, 100% fill factor
- Broadband responsivity up to 408 DN / (nJ/cm²) @ 10 dB gain
- Line rates up to 68 kHz
- Fully programmable gain, offset
- Flat field correction



Teledyne DALSA's Genie cameras are based on high quality, highly sensitive CCD and CMOS image sensors with global shutters and are available in a variety of resolutions ranging from VGA to 1600 x 1400 in both color and monochrome. Color Genie cameras feature white balancing and advanced Bayer conversion to produce crisp and accurate color images. With lensing options that include mounts for C- or CS-type lenses and right-angle lens, the Genie family offers flexibility for almost any application.

TELEDYNE DALSA GENIE CAMERA SERIES

MONOCHROME SERIES

Genie M640-1/2	640 x 480 @ 64 fps - 9.9µm
Genie M640-1/3	640 x 480 @ 64 fps - 7.4µm
Genie M1024	1024 x 768 @ 20 fps - 4.65µm
Genie M1400-1/2	1360 x 1024 @ 15 fps - 4.65µm
Genie M1410-2/3	1360 x 1024 @ 21.8 fps - 6.45µm
Genie M1600	1600 x 1200 @ 15 fps - 4.4µm

COLOR SERIES

Genie C640-1/2	640 x 480 @ 64 fps - 9.9µm
Genie C640-1/3	640 x 480 @ 64 fps - 7.4µm
Genie C1024	1024 x 768 @ 20 fps - 4.65µm
Genie C1400-1/2	1360 x 1024 @ 15 fps - 4.65µm
Genie C1410-2/3	1360 x 1024 @ 21.8 fps - 6.45µm
Genie C1600	1600 x 1200 @ 15 fps - 4.4µm

HIGH SPEED SERIES

Genie HM640	640 x 480 @ 300 fps - 7.4µm
Genie HM1024	1024 x 768 @ 117 fps - 7.4µm
Genie HM1400	1400 x 1024 @ 64 fps - 7.4µm
Genie HM1400XDR	1400 x 1024 @ 64 fps - 7.4µm



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