Matrox **Iris GT**

with Matrox Design Assistant

Powerful smart cameras with an intuitive, versatile and extendable integrated development environment for machine vision applications

MATROX
IMAGING

Matrox Iris GT with Design Assistant

Powerful, configurable smart cameras

Matrox Iris GT is a line of powerful smart cameras with Matrox Design Assistant, an intuitive, versatile and extendable integrated development environment (IDE). Manufacturing engineers and technicians can easily and quickly configure and deploy machine vision applications on a highly integrated platform without the need for conventional programming. Video capture, analysis, location, measurement, reading, verification, communication and I/O operations, as well as a web-based operator interface are all set up within the single IDE.

Matrox Iris GT smart camera

Industries served

Matrox Design Assistant is used to put together solutions for the agricultural, aerospace, automotive, beverage, consumer, construction material, cosmetic, electronic, energy, food, flat panel display, freight, machining, medical device, medical diagnostic, paper, packaging, pharmaceutical, printing, resource, robotics, security, semiconductor, shipping, textile, and transportation industries.

Benefits

Simplify system integration by using a camera, processor and software development package from a single vendor with over 30 years of industry experience

Reliably handle typical production rates by way of an efficient Intel® Atom® embedded processor running Microsoft® Windows® Embedded CE

Conveniently administer, control and monitor application and device through a web-based user interface

Operate without a PC by way of built-in keyboard, video (monitor) and mouse (KVM) support

Tackle different image resolution, size and speed requirements through a choice of monochrome CCD sensors

Synchronize image capture and processing to the production process using the externally triggered electronic camera shutter

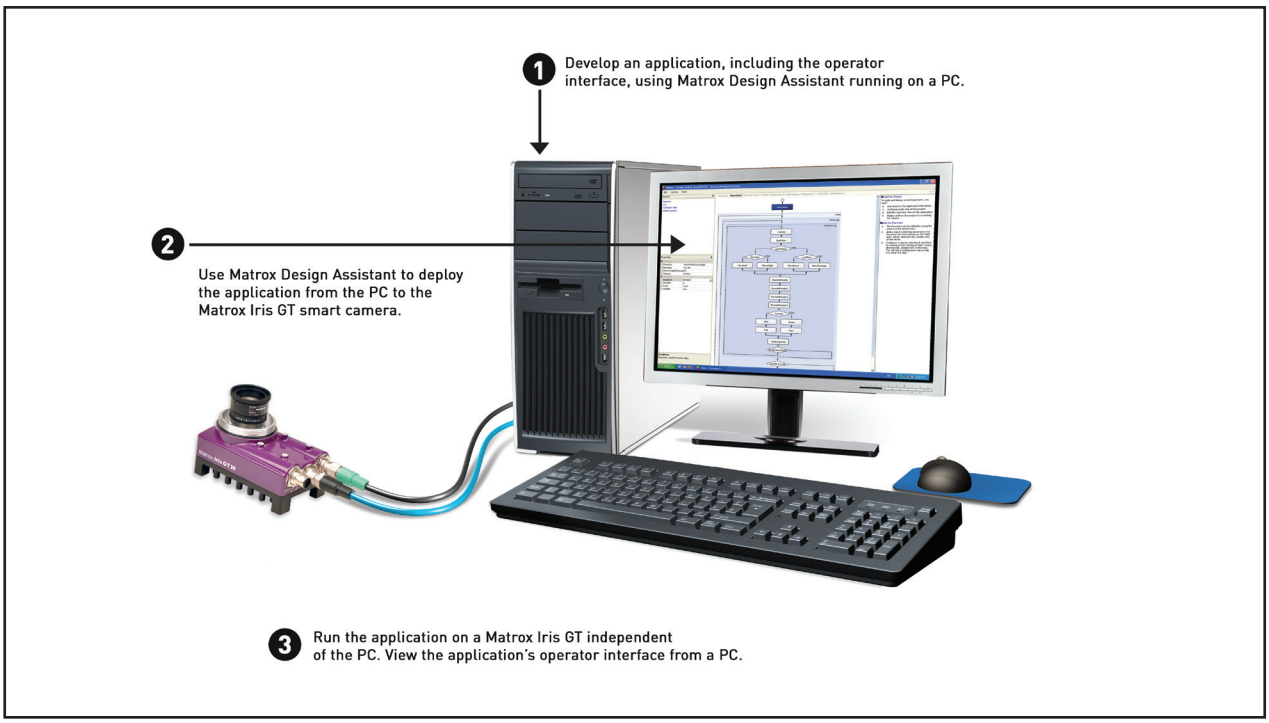
Directly interface to other automation equipment through the integrated digital I/Os, Ethernet and serial ports

Communicate over the factory-floor and enterprise networks by way of an Ethernet interface

Sturdy, dust-proof and washable IP67-rated casing that can be used in a variety of applications

Smart camera development platform

Develop and deploy your application



About Matrox Imaging

Founded in 1976, Matrox is a privately held company based in Montreal, Canada. Graphics, Video and Imaging divisions provide leading component-level solutions for commercial graphics, professional video editing and industrial imaging respectively. Each division leverages the others' expertise and industry relations to provide innovative timely products.

Matrox Imaging is an established and trusted supplier to top OEMs and integrators involved in the manufacturing, medical diagnostic and security industries. The components delivered consist of cameras, interface boards and processing platforms, all designed to provide optimum price-performance within a common software environment.

Matrox Design Assistant

Matrox Design Assistant

Matrox Design Assistant is an integrated development environment (IDE) where machine vision applications are created by constructing a flowchart instead of writing traditional program code. In addition to building a flowchart, the IDE enables users to directly design a graphical operator interface to the application.

Application design

Flowchart and operator interface design are performed within the Matrox Design Assistant IDE hosted on a PC running Microsoft® Windows®[1]. A flowchart is visually put together using a step-by-step approach, where each step is taken from an existing toolbox and is configured interactively. The toolbox includes steps for image analysis and processing, communication, flow-control, and I/O. Outputs from one step, which can be images and/or alphanumeric results, are easily linked to the appropriate inputs of any other step. Decision making is performed using a conditional step, where the logical expression is described interactively. Results from image analysis and processing steps are immediately displayed so as to enable the quick tuning of parameters. A contextual guide provides assistance for every step in the flowchart. Flowchart legibility is maintained through the ability of grouping steps into sub-flowcharts.

In addition to flowchart design, Matrox Design Assistant enables the creation of a custom, web-based operator interface to the application through an integrated HTML visual editor. Users alter an existing template using a choice of annotations (graphics and text), inputs (edit boxes, control buttons and image markers) and outputs (original or derived results, and status indicators). The operator interface can be further customized using a third-party HTML editor to add elements like tables.

Matrox Design Assistant can be used with a Matrox Iris GT smart camera or in emulation mode. The latter allows for the design and testing of a flowchart and the creation of an operator interface without the need to be connected to a smart camera. Matrox Design Assistant's emulation mode is used to enable parallel project work, resulting in greater development efficiency.

Matrox Design Assistant Benefits

Easily and quickly solve machine vision applications without writing program code using an intuitive flowchart-based methodology

Tackle machine vision applications with utmost confidence using field-proven tools for analyzing, locating, measuring, reading, and verifying

Learn and use a single program for creating both the application logic and operator interface

Maximize productivity by getting instant feedback on image analysis and processing operations

Get immediate pertinent assistance through an integrated contextual guide

Communicate actions and results to other automation and enterprise equipment through discrete I/Os, RS-232 and Ethernet (TCP/IP, EtherNet/IP™[2] and MODBUS®)

Maintain control and independence through the ability to create custom flowchart steps

Collaborative and simultaneous application development using the device emulation mode

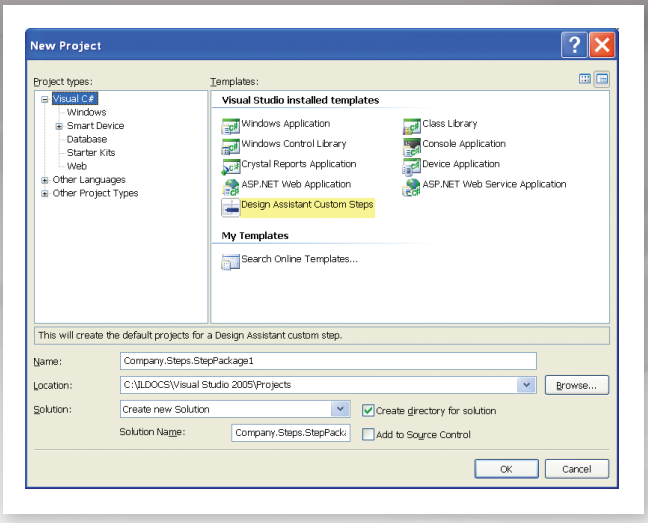
Why a flowchart?

The flowchart is a universally accessible, recognized and understood method of describing the sequence of operations in a process. Manufacturing engineers and technicians in particular have all been exposed to the intuitive, logical and visual nature of the flowchart.

Matrox Design Assistant (cont.)

Create custom flowchart steps

Users have the ability to extend the capabilities of Matrox Design Assistant by way of the included Custom Step software development kit (SDK). The SDK, in combination with Microsoft® Visual Studio® 2008, enables the creation of custom flowchart steps using the C# programming language. These steps can implement proprietary image analysis and processing as well as proprietary communication protocols. The SDK comes with numerous project samples to accelerate development.



Application deployment

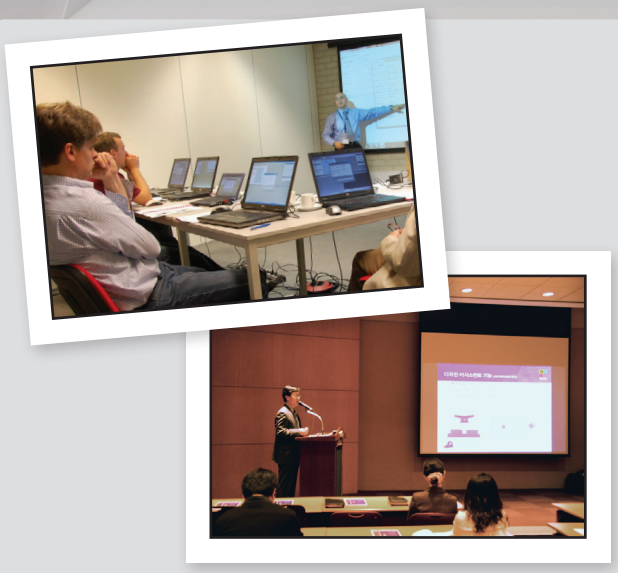
Once development is complete, the flowchart and operator interface are downloaded to, and stored locally on, the Matrox Iris GT smart camera. The flowchart is then executed on the smart camera independent of any PC. The operator interface is accessed directly through the smart camera's KVM capability or remotely from any PC using a web browser[3]. Alternatively, the smart camera can be accessed from a stand-alone application running on a PC and created using an application development environment like Microsoft® Visual Basic®.

Matrox Design Assistant maintenance program

Matrox Design Assistant provides registered users automatic enrollment in the maintenance program for one year. This maintenance program entitles registered users to technical support, free software upgrades and an emulation mode key from Matrox Imaging. Just before the expiration of the maintenance program, registered users will have the opportunity to extend the program for another year. For more information, refer to the Matrox Imaging Software Maintenance Programs brochure.

Release 2.3 highlights

- New Bead Inspection step
- Simplified fixturing for processing and analysis steps
- Additional flow-control (i.e., switch-case)
- Enhanced project switching capabilities
- MODBUS® master communication mode



Samples, tutorials and training

Matrox Design Assistant includes numerous sample projects and video tutorials to help new developers quickly become productive. Matrox Imaging also offers an instructor-led training course held at Matrox headquarters and select locations worldwide. Refer to the support section at **www.matrox.com/imaging** for more information.

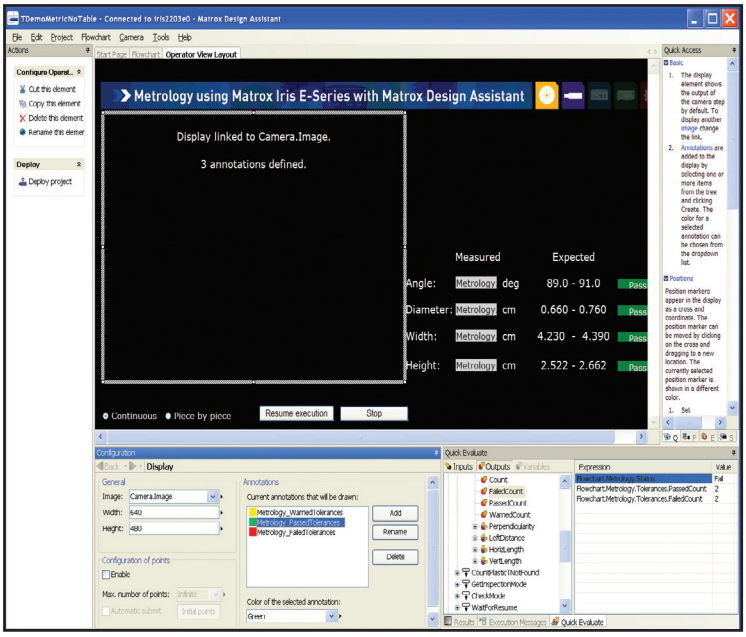
Integrated development environment (IDE)

Customizable developer interface

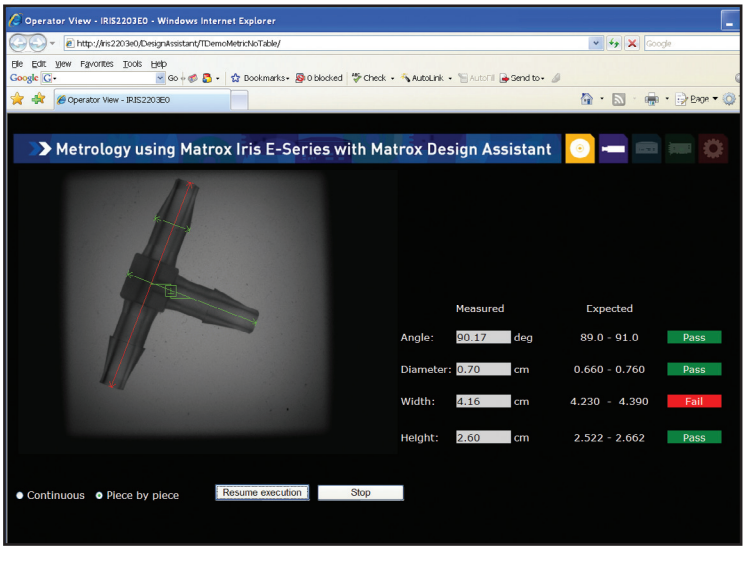
The Matrox Design Assistant user interface can be tailored by each developer. The workspace can be rearranged, even across multiple monitors, to suit individual preferences and further enhance productivity.

Operator view

Design a customized operator view



Resulting operator view as seen in a web browser



Operate with or without a PC

The web-based operator interface, or Operator View, can be accessed remotely through a web browser[3] running on a desktop, HMI or touch-panel PC. The Operator View can also be accessed through the web browser running on the Matrox Iris GT by way of a simple touch screen connected to the smart camera's video output and USB interface, eliminating the need for a PC. A project running on the Matrox Iris GT can also use the smart camera's video output to just show an image with graphical annotations.

Image analysis and processing tools

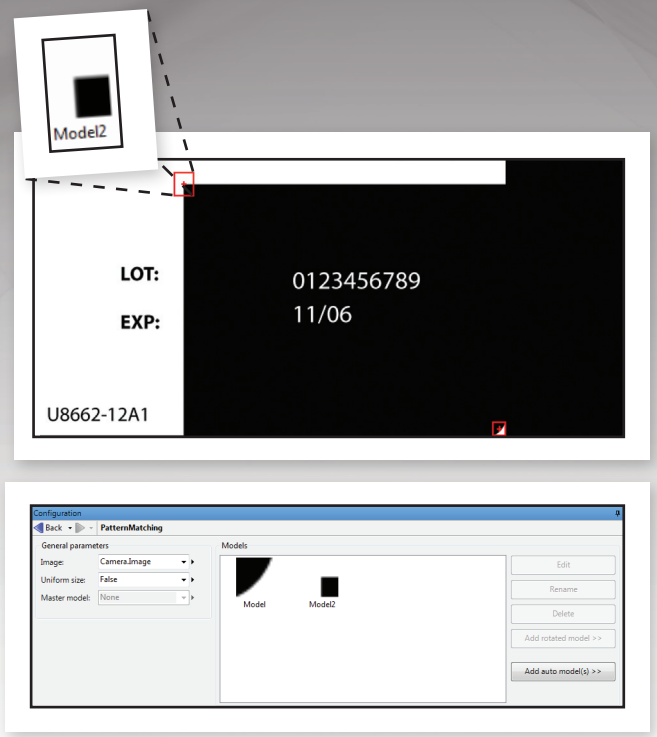
Image analysis and processing

Central to Matrox Design Assistant are flowchart steps for calibrating, enhancing and transforming images, locating objects, extracting and measuring features, reading character strings, and decoding and verifying identification marks. These steps are designed to provide optimum performance and reliability.

Pattern recognition

Matrox Design Assistant includes two steps for performing pattern recognition: Pattern Matching and Model Finder. These steps are primarily used to locate complex objects for guiding a gantry, stage or robot, or for directing subsequent measurement steps.

The Pattern Matching step finds a pattern by looking for a similar spatial distribution of intensity. The step employs a smart search strategy to quickly locate multiple patterns, including multiple occurrences, which are translated and slightly rotated. The step performs well when scene lighting changes uniformly, which is useful for dealing with attenuating illumination. A pattern can be trained manually or determined automatically for alignment. Search parameters can be manually adjusted and patterns can be manually edited to tailor performance.

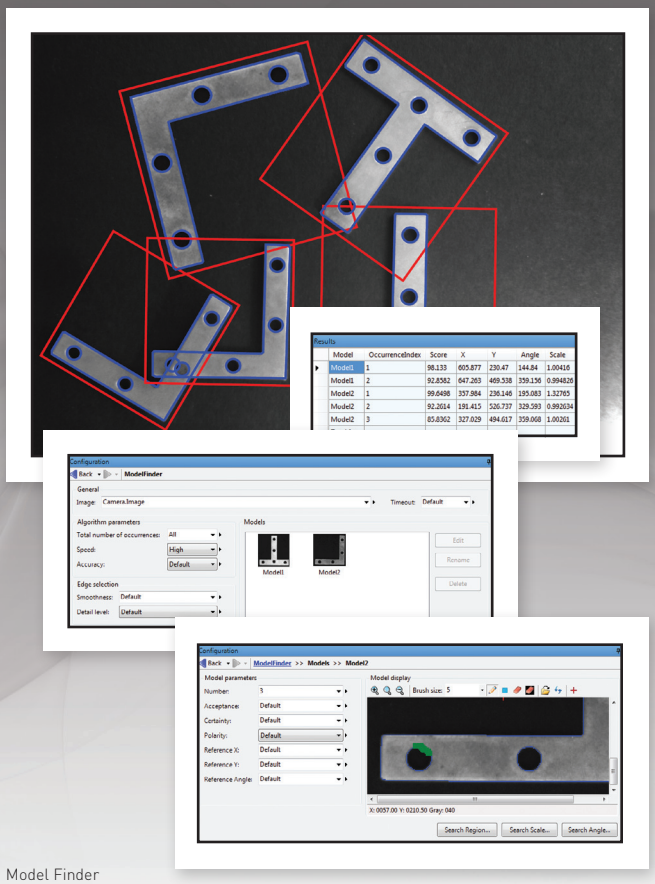


Pattern Matching

Image analysis and processing tools (cont.)

Pattern recognition (cont.)

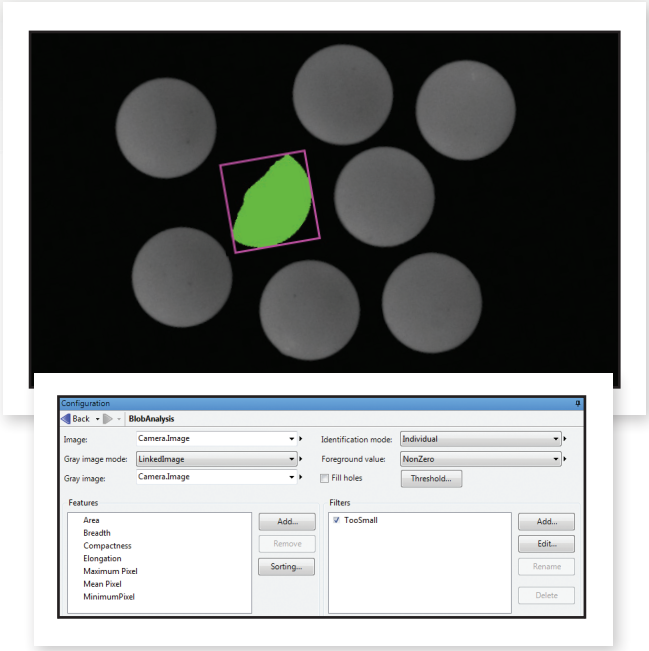
Model Finder[4] is a step that employs a patented[5] technique to find an object using geometric features (e.g., contours). The step finds multiple models, including multiple occurrences that are translated, rotated, and scaled. Model Finder locates an object that is partially missing and continues to perform when a scene is subject to uneven changes in illumination; relaxing lighting requirements. A model is manually trained from an image and search parameters can be manually adjusted and models can be manually edited to tailor performance.



Model Finder

Feature extraction and analysis

The Blob Analysis step is used to identify, count, locate and measure basic features and objects (i.e., blobs) to determine presence and position, and enable further inspection. The step works by segmenting images, where blobs are separated from the background and one another, before quickly identifying the blobs. Over 50 characteristics can be measured and these measurements can be used to eliminate or keep certain blobs.



Blob Analysis

Image analysis and processing tools (cont.)

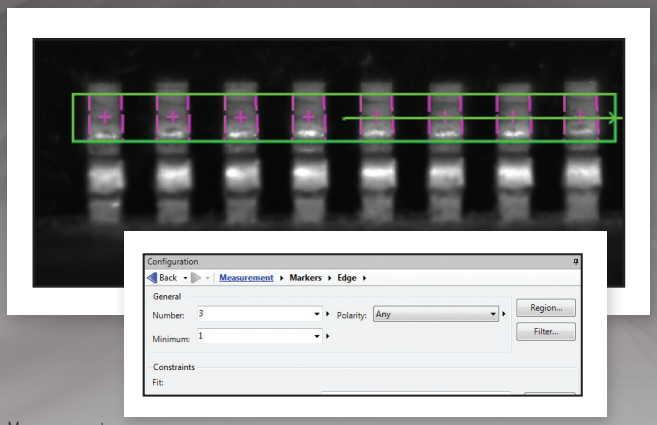
1D and 2D measurements

Matrox Design Assistant includes three steps for measuring: Measurement, Bead Inspection and Metrology. These tools are predominantly used to assess manufacturing quality.

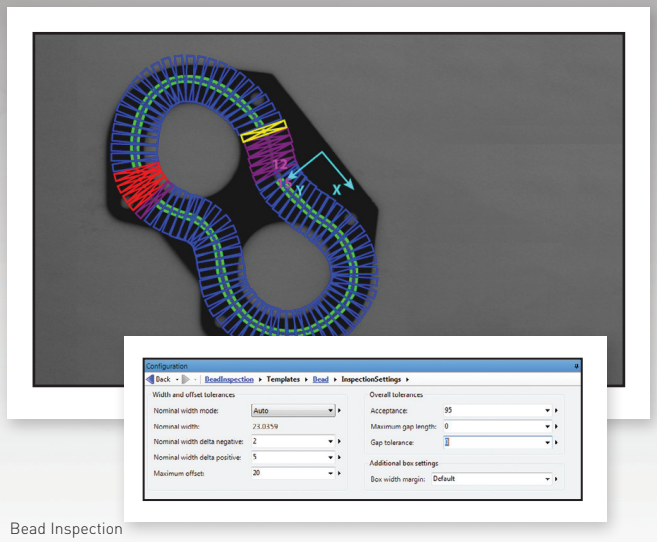
The Measurement step uses the projection of image intensity to very quickly locate and measure straight edges or stripes within a carefully defined rectangular region. The tool can make several 1D measurements on edges and stripes, as well as between edges or stripes.

The Bead Inspection step is for inspecting material that is applied as a continuous sinuous bead, such as adhesives and sealants, or its retaining channel. The step identifies discrepancies in length, placement and width, as well as discontinuities. The Bead Inspection step works by accepting a user-defined coarse path (as a list of points) on a reference bead and then automatically and optimally placing search boxes to form a template. The size and spacing of these search boxes can be modified to change the sampling resolution. The allowable bead width, offset, gap and overall acceptance measure can be adjusted to meet specific inspection criteria.

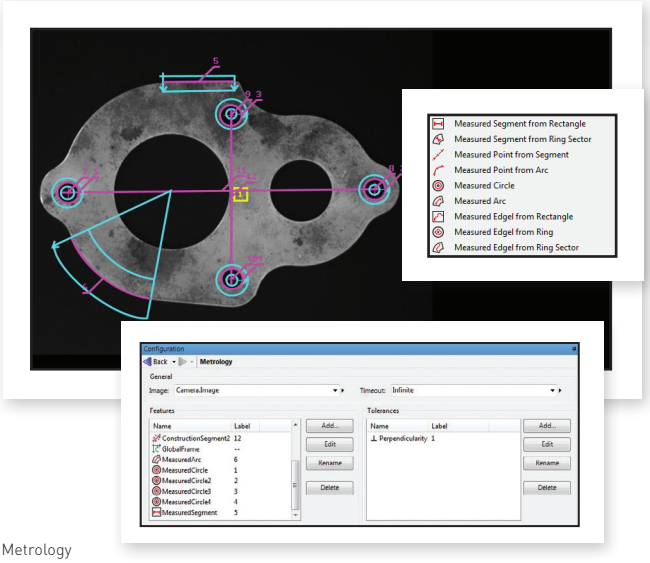
The Metrology step is intended for 2D geometric dimensioning and tolerancing applications. The step extracts edges within defined regions to best fit geometric features. It also supports the construction of geometric features derived from measured ones or defined mathematically. Geometric features include arcs, circles, points, and segments. The step validates tolerances based on the dimensions, positions, and shapes of geometric features. The step's effectiveness is maintained when subject to uneven changes in scene illumination, which relaxes lighting requirements. The expected measured and constructed geometric features, along with the tolerances, are kept together in a template, which is easily repositioned using the results of other locating steps.



Measurement



Bead Inspection

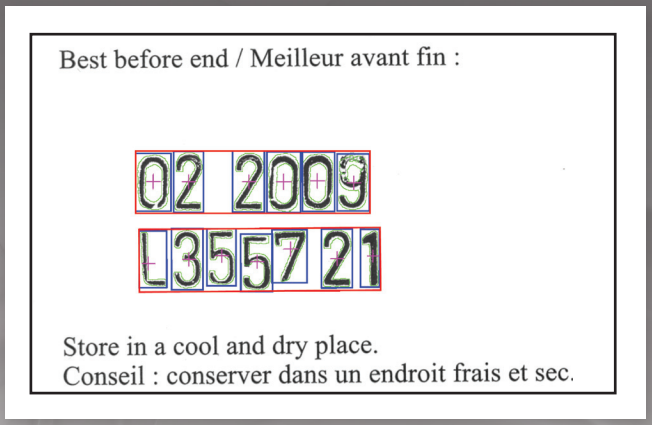


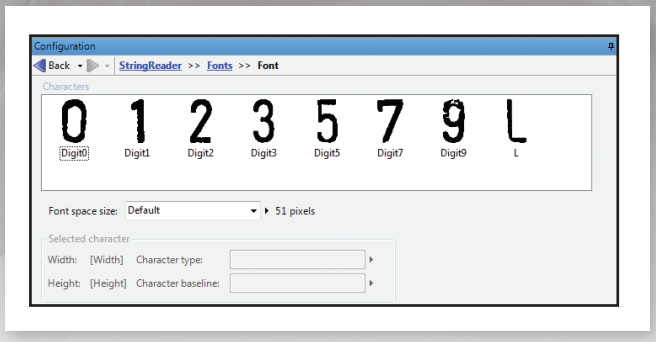
Metrology

Image analysis and processing tools (cont.)

Character recognition

String Reader[4] is a step for reading character strings that are engraved, etched, marked, printed, punched or stamped on surfaces. The step is based on a sophisticated OCR technique that uses geometric features to locate and read character strings where characters are well separated from the background and from one another. The step handles strings with a known or unknown number of evenly or proportionally spaced characters. It accommodates changes in character angle with respect to the string, aspect ratio, scale, and skew, as well as contrast reversal. Strings can be located across multiple lines and at a slight angle. The tool reads from multiple pre-defined or user-defined Latin-based fonts. In addition, character strings can be subject to user-defined grammar rules to further increase recognition rates.



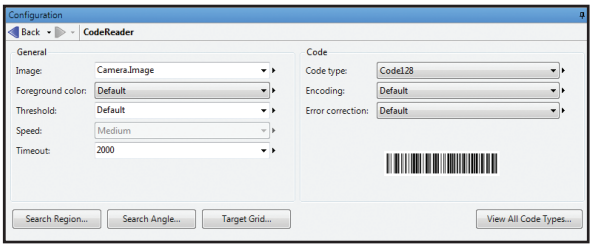


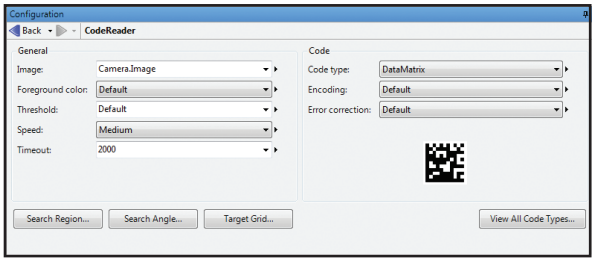
String Reader Configuration Font

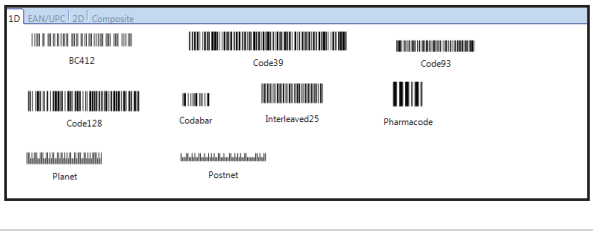
Image analysis and processing tools (cont.)

1D and 2D code reading

Code Reader is a step for locating and reading 1D, 2D and composite identification marks. The step handles rotated, scaled, and degraded codes in tough lighting conditions. The step can provide the orientation, position, and size of a code.







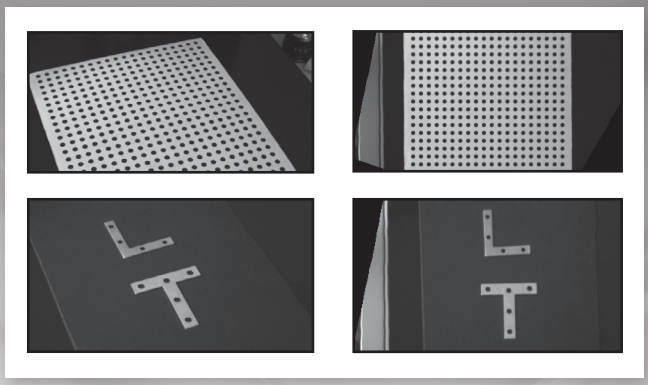
1D Code Reading

2D Code Reading

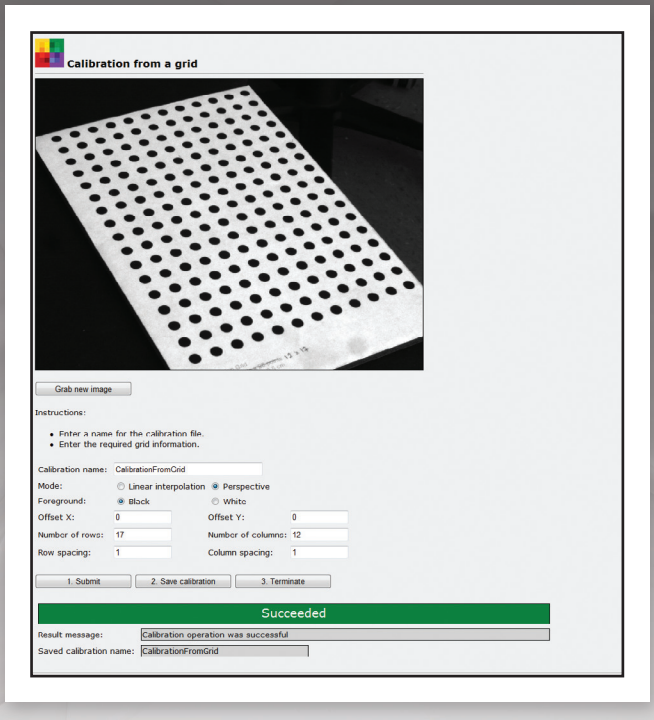
Image analysis and processing tools (cont.)

Calibration

Calibration is a routine requirement for machine vision. Matrox Design Assistant includes a 2D Calibration step to convert results (i.e., positions and measurements) from pixel to real-world units and vice-versa. The tool can compensate results and even an image itself for camera lens and perspective distortions. Calibration is achieved using an image of a grid or just a list of known points and is performed through a utility web page running on the smart camera.



Calibration



Basic image processing

Matrox Design Assistant includes the Image Processing step for enhancing and transforming images in preparation for subsequent analysis. Supported operations include arithmetic, filtering, geometric transformations, logic, LUT mapping, morphology and thresholding.

Matrox Design Assistant also includes Edge Locator and Intensity Checker. Edge Locator finds objects by locating straight edges and Intensity Checker is used to analyze an object using image intensity.

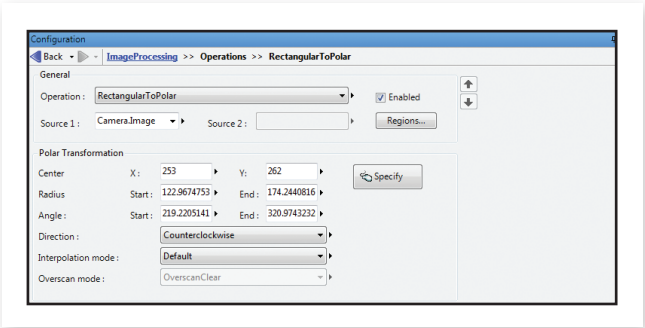
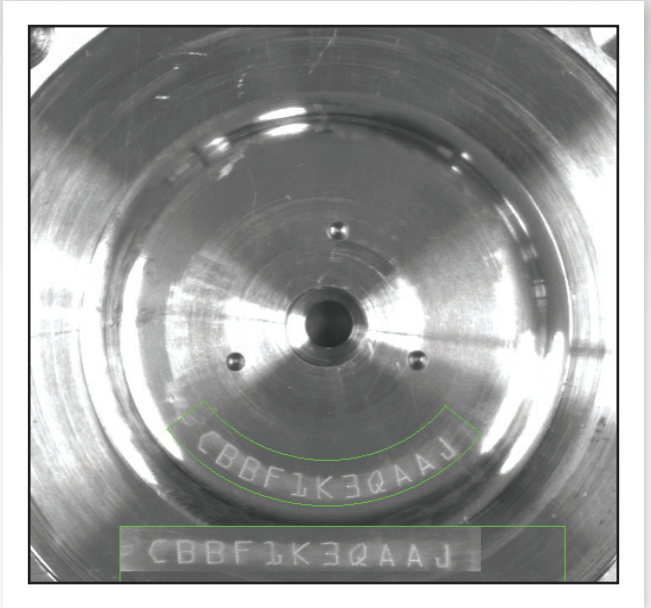


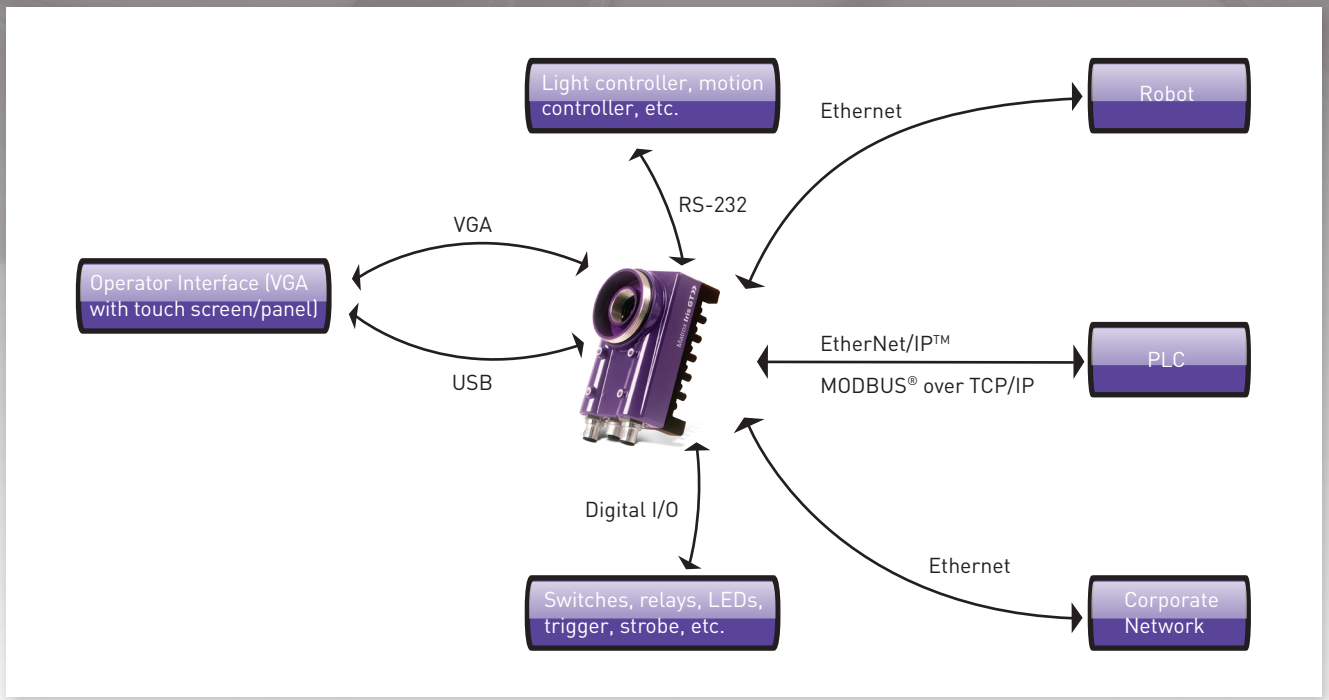
Image Processing



Connectivity

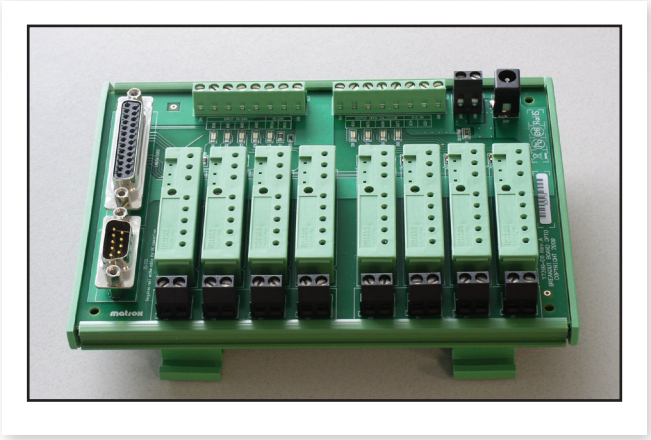
Connection to devices and networks

Matrox Iris GT features a 10/100/1000 Mbit Ethernet interface for connecting over factory-floor and enterprise networks. Communication over these networks is configured through Matrox Design Assistant and can employ the TCP/IP as well as the EthertNet/IP™[2] and MODBUS® over TCP/IP protocols. The latter two enable interaction with automation controllers and robots. The Matrox Iris GT can also be configured to directly interact with automation devices through an RS-232 serial interface as well as 8 industrial digital I/Os (4 input and 4 output).



Industrial I/O breakout box

An industrial I/O breakout box is available to simplify the connection of a Matrox Iris GT to an electrical panel. The breakout box is DIN-rail mountable and connects power, trigger, strobe, RS-232 and GPIOs to the camera. It has status LEDs to easily monitor the state of each input and output. A M12 to DB-25 cable is included. If the 0-24V open-collector outputs or the opto-coupled inputs are not appropriate for a given installation, then optional, third-party modules (e.g., Opto 22) can be used to electrically connect to almost any device.



Industrial I/O breakout box

Compare Models

Specifications

Sensor		GT300*	GT1200*	GT1900*
CCD sensor[6]	Geometry	diagonal 6 mm (1/3"-type)	diagonal 6 mm (1/3"-type)	diagonal 8.9 mm (1/1.8"-type)
	Format	monochrome	monochrome	monochrome
	Make and model	Kodak KAI-0340S	Sony ICX445AL	Sony ICX274AL
Effective resolution (H x V)		640 x 480	1280 x 960	1600 x 1200
Frame rate		110 fps	22.5 fps	15 fps
Pixel size (H x V)		7.4 µm x 7.4 µm	3.75 µm x 3.75 µm	4.4 µm x 4.4 µm
Gain range		0 to 36 dB	0 to 36 dB	0 to 36 dB
Shutter speeds		34 µs to 1.19 s	58 µs to 2.91 s	88 µs to 3.50 s
External trigger latency		1.1 µs	1.4 µs	7.2 µs
External trigger to output strobe delay		1.1 µs	1.4 µs	7.2 µs
Processing				
CPU		1.6GHz Intel® Atom® (Z530)		
Volatile memory		512MB DDR2		
Non-volatile memory		1GB flash disk		
I/Os				
Network interface		10/100/1000Mbit Ethernet		
UI interface		VGA, USB (keyboard & mouse)		
Serial interface		RS-232		
Digital I/Os		4 inputs, 4 outputs (including a strobe output), 1 opto-coupled trigger		
Current-controlled		0-500 mA in 255 steps for LED illuminators		
Mechanical, electrical and environmental information				
Dimensions		refer to Matrox Iris GT with Design Assistant Installation and Technical Reference		
Lens type		C-mount		
Connectors		M12-8 pins for Ethernet, M12-17 pins for power, RS232 and digital I/Os, M12-12 for VGA and USB ports		
Weight		0.7 kg or 1.5 lbs		
Power consumption		425 mA @ 24VDC or 10 W (typical)		
Operating temperature		0 °C to 50 °C (32 °F to 122 °F)		
Ventilation requirements		natural convection		
Certifications		FCC class A, CE class A, RoHS-compliant , IP67 enclosure (IEC 60529-dust tight and protected against temporary immersion), EN 60721-3-3 Category 3M8 (operating vibration up to 5g and shock up to 25g)		
Software environment				
PC development tools		Matrox Design Assistant IDE – Matrox Iris Edition		
PC requirements		Microsoft® Windows® XP Professional (32-bit) with Service Pack 2, Vista® (32-bit) or 7 (32/64-bit), Microsoft® Internet Explorer 7 / 8, 800 MB hard drive space, 10/100/1000 Mbit Ethernet port and DVD drive		

Order

Hardware

Part number	Description
GT300*	Matrox Iris GT smart camera with monochrome 640x480 110 fps CCD sensor, 1.6 GHz Atom CPU, 512MB DRAM, 1GB flash disk. Includes Design Assistant.
GT1200*	Matrox Iris GT smart camera with monochrome 1280x960 22 fps CCD sensor, 1.6 GHz Atom CPU, 512MB DRAM, 1GB flash disk. Includes Design Assistant.
GT1900*	Matrox Iris GT smart camera with monochrome 1600x1200 15 fps CCD sensor, 1.6 GHz Atom CPU, 512MB DRAM, 1GB flash disk. Includes Design Assistant.
GT-STARTER-KIT*	Matrox Iris GT starter kit. Includes power supply, 12mm C-mount lens, Ethernet cable, power cable, VGA/USB cable and breakout board for digital I/Os and RS-232
GT-CBL-PWR/3*	9.8' or 3m cable for Matrox Iris GT to connect power, RS-232 and I/Os. M12 to open end.
GT-CBL-ETH/5*	16.4' or 5m Ethernet cable for Matrox Iris GT. M12 to RJ45 plug.
GT-CBL-VGAUSB*	3.2' or 1m cable for Iris GT to connect VGA and USB. M12 to HD-15 and USB socket.
BREAKOUT-BOX*	Breakout box for GPIOs, trigger, strobe, RS-232 and power input for Matrox Iris GT. Includes M12 to DB25 cable

Software

Matrox Design Assistant for Matrox Iris GT flowchart-based integrated environment (IDE) DVD is bundled with every Matrox Iris GT smart camera. Moreover, each Matrox Iris GT smart camera includes a license for the Bead Inspection, Blob Analysis, Code Reader, Edge Locator, Image Processing, Intensity Checker, Measurement, Metrology, Pattern Matching, calibration, I/O and communication features. Additional features like Model Finder and/or String Reader require the installation of an additional license(s).

Software Maintenance Program

Part number	Description
DA IRIS MAINT	One year program extension to Matrox Design Assistant for Matrox Iris GT maintenance program.

Endnotes:

1. Microsoft® Windows® XP (32-bit), Vista® (32-bit) or 7 (32/64-bit).
2. Certification pending.
3. Microsoft® Internet Explorer® 7 / 8.
4. Requires a supplemental license.
5. Protected by U.S. Patents 7,027,651; 7,319,791; 7,327,888.
6. Interline transfer progressive scan with square pixels.