Matrox **Iris E-Series** »

with Matrox Design Assistant 2.0

Camera

IntensityChecker

OperatorInputs

Condition — true — Metrology

Eject — Condition2 — true

FailCounter

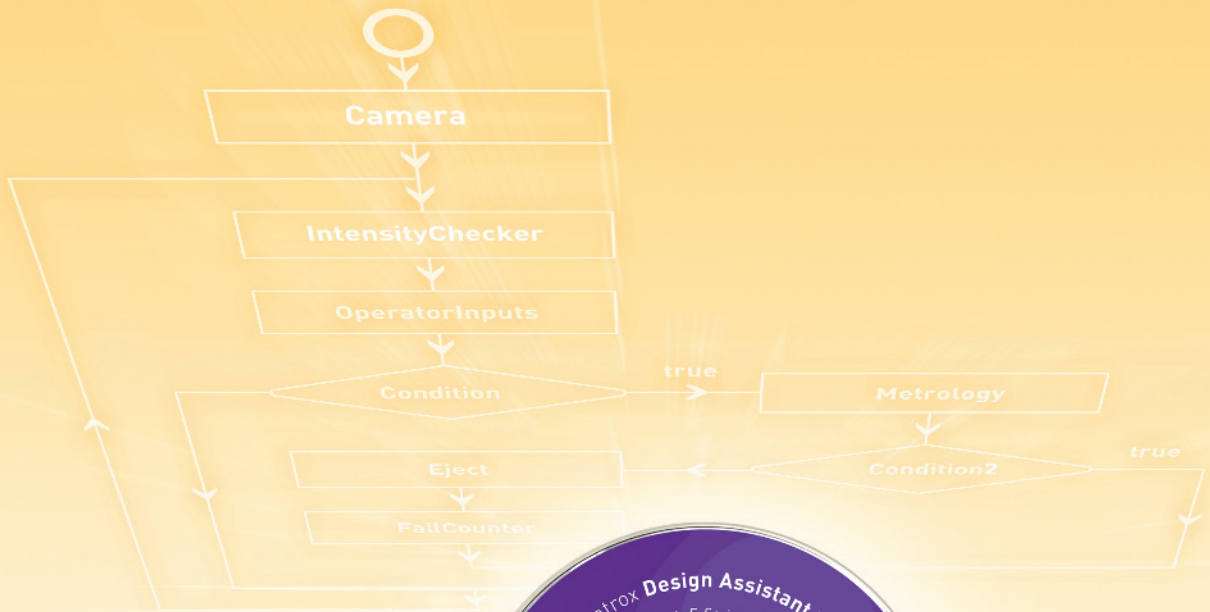Matrox **Design Assistant** »
Matrox Iris E-Series Edition

Including documentation

Matrox **Iris E-Series** »
With Design Assistant

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

MATROX
IMAGING

Matrox Iris E-Series with Design Assistant

Powerful, configurable smart cameras

Matrox Iris E-Series is a line of powerful smart cameras with Matrox Design Assistant 2.0, 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 setup within the single IDE.

Matrox Iris E-Series smart camera (uni-body version).

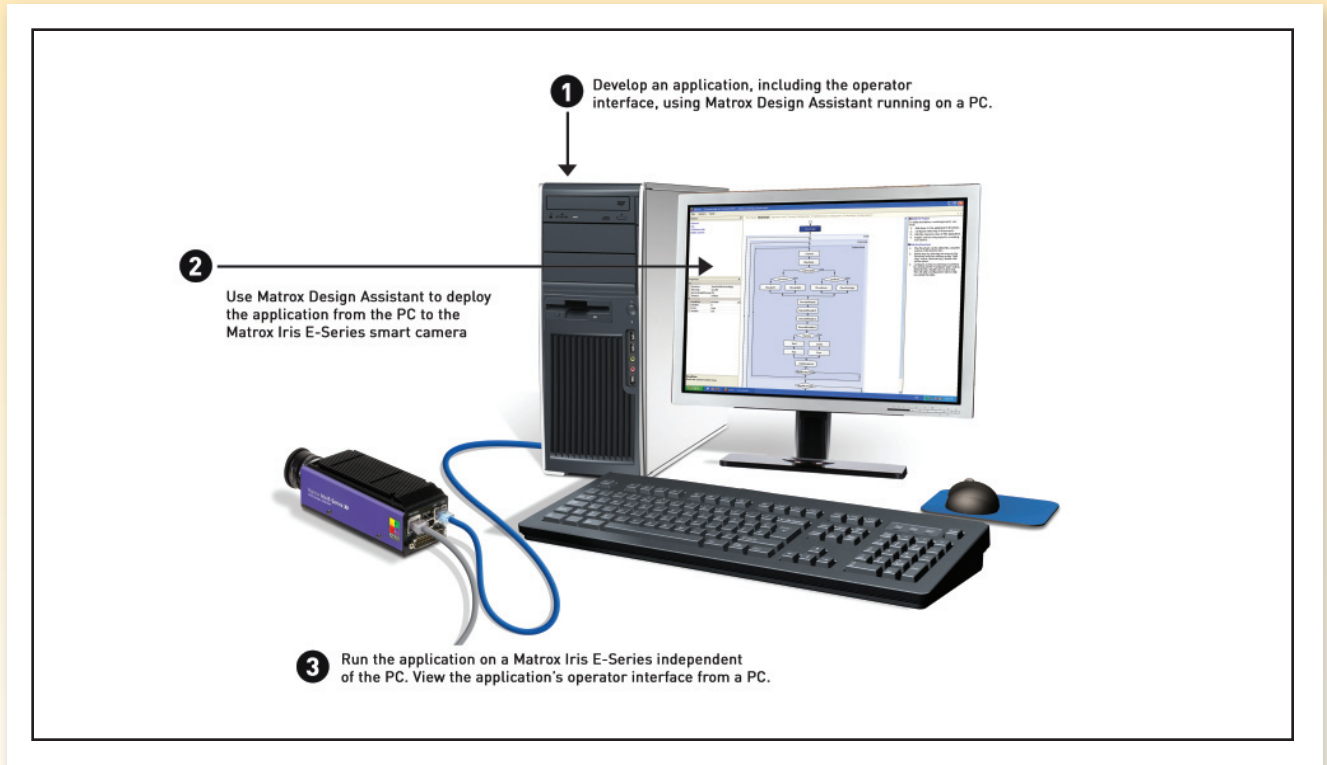Matrox Iris E-Series smart camera (remote head version).

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 a powerful embedded Intel® architecture processor running Microsoft® Windows® CE real-time operating system

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

> **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

> **Contend with different mechanical arrangements** using either a uni-body or two-piece model

Industries served

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

Smart camera development platform

Develop and deploy your application

1. Develop an application, including the operator interface, using Matrox Design Assistant running on a PC.

2. Use Matrox Design Assistant to deploy the application from the PC to the Matrox Iris E-Series smart camera

3. Run the application on a Matrox Iris E-Series independent of the PC. View the application's operator interface from a PC.

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 more 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®[2]. 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 Benefits

> **Easily and quickly solve machine vision applications without writing program code** using a 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™[1] and MODBUS®)

> **Maintain control and independence** through the ability to create custom flowchart steps
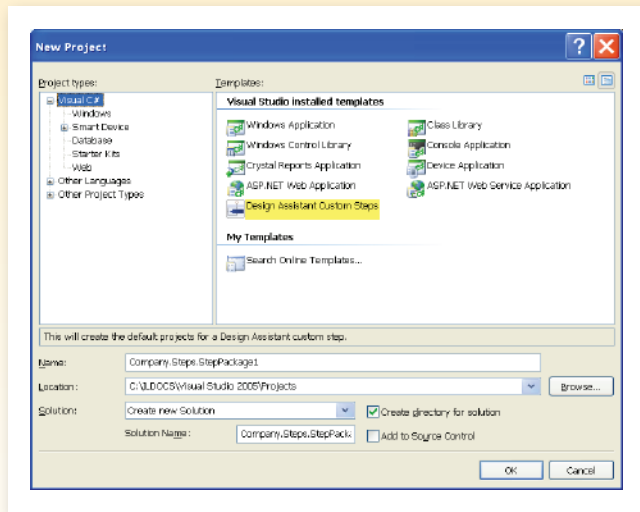
Why a flowchart?

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® 2005, 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 E-Series smart camera. The flowchart is then executed on the smart camera independent of any PC. The operator interface is viewed 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®.

Release 2 highlights

> New image analysis and processing steps

- Blob Analysis
- Image Processing (image enhancement and transformation)
- Pattern Matching
- String Reader (feature-based OCR)

> EtherNet/IP™[1] and MODBUS® over TCP/IP support

> Sub-flowcharts
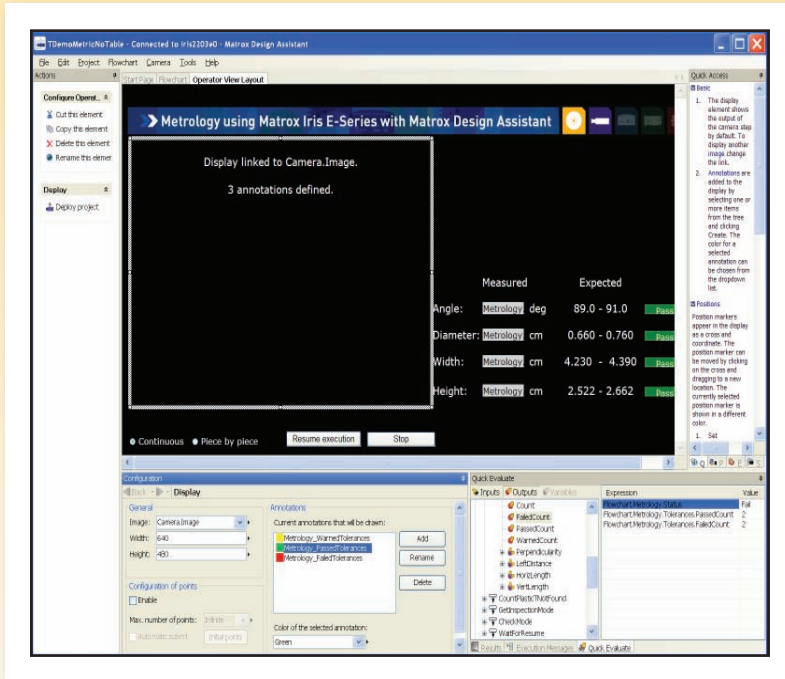
> Custom step SDK

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.

Select the action to perform from a context-based list

Conveniently switch between the flowchart and image, or operator views

Get quick access to context sensitive help

Track and navigate the flowchart execution history without losing sight of the image

Configure each step without losing sight of flowchart and image

Instantly view results after each step

Operator view

Design a customized operator view

Resulting operator view as seen in a web browser
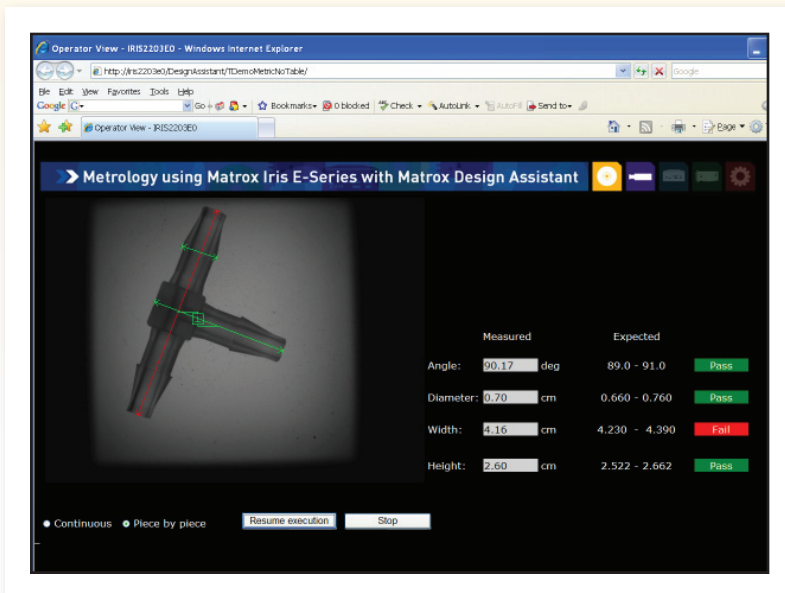
Image analysis and processing tools

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.
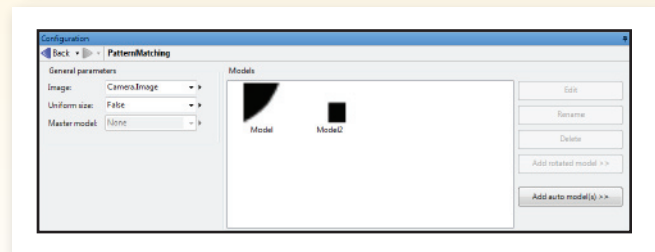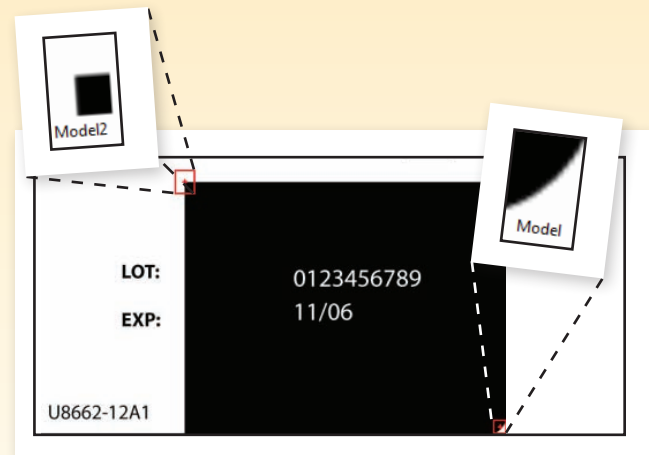
Pattern Matching

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.
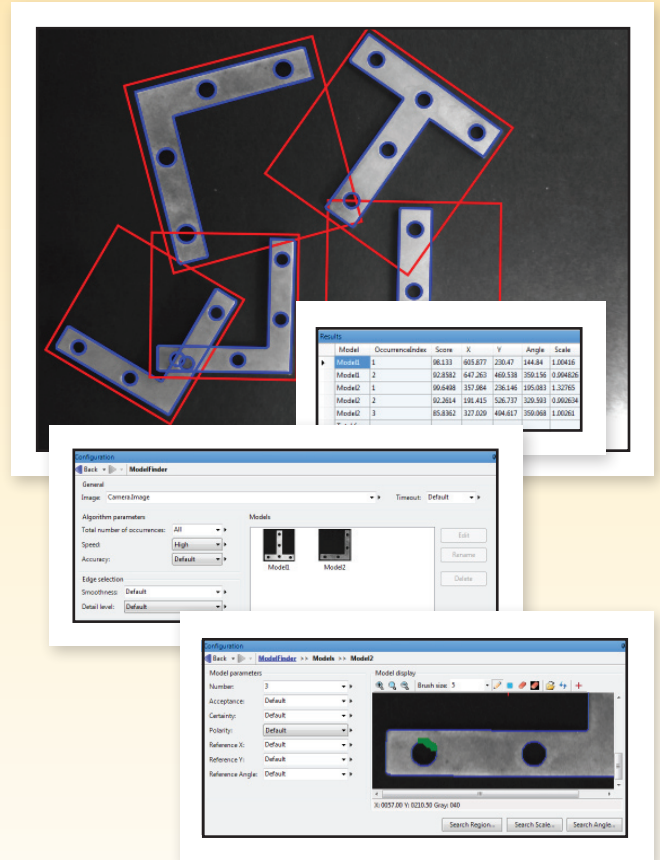
Model Finder

Feature extraction and analysis

The Blob Analysis step is used to identify, count, locate and measure basic features and objects (i.e., blobs) in order 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.
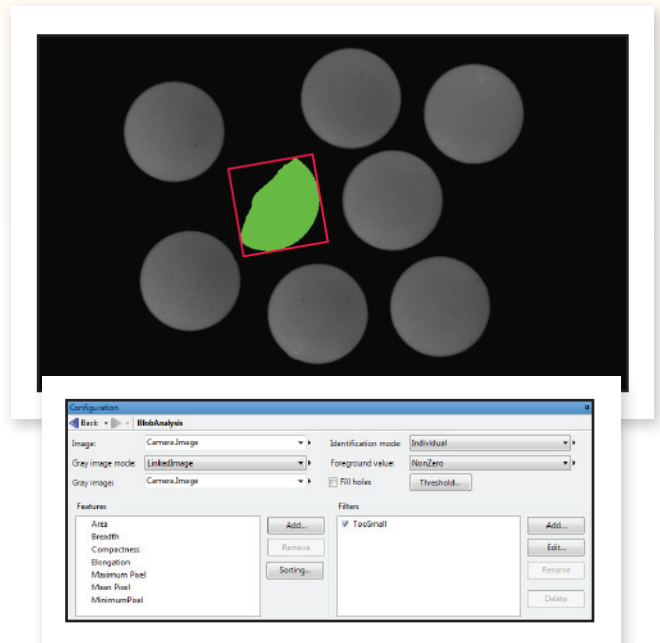

Blob Analysis

Image analysis and processing tools (cont.)

2D measurements

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.
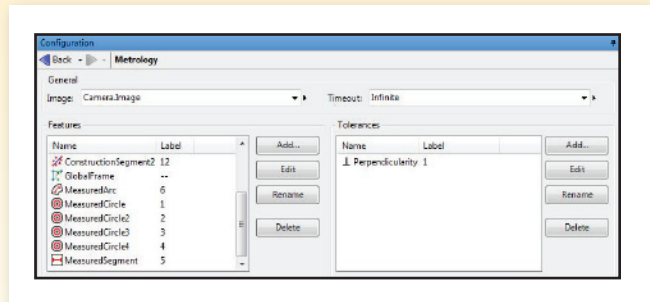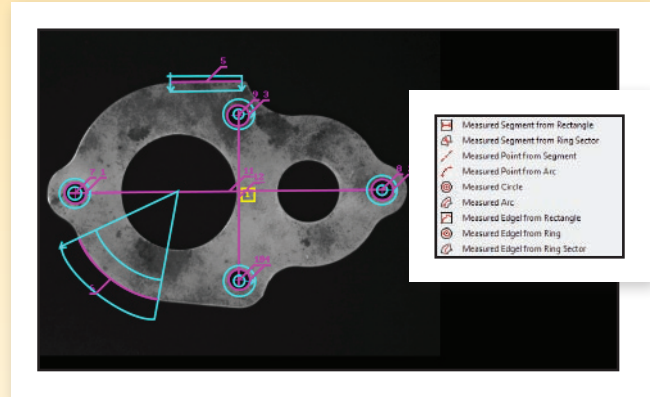
Metrology

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 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.
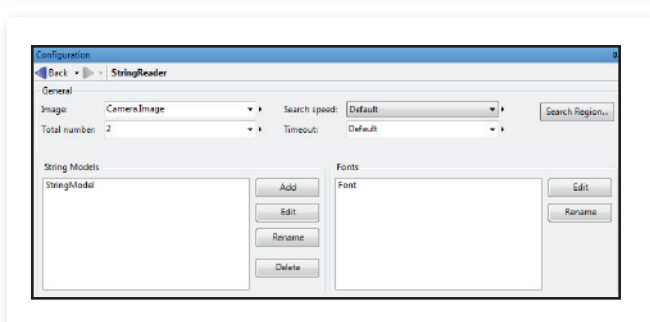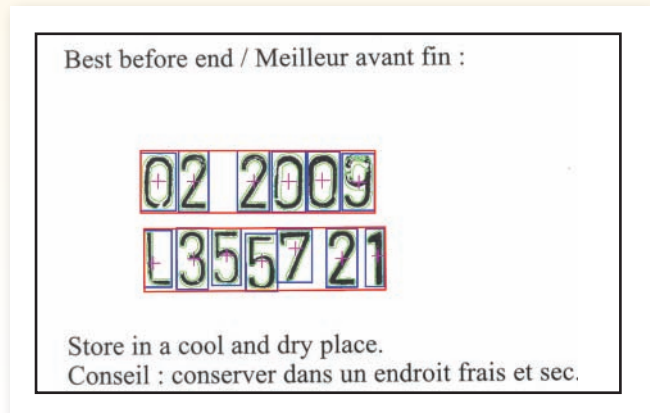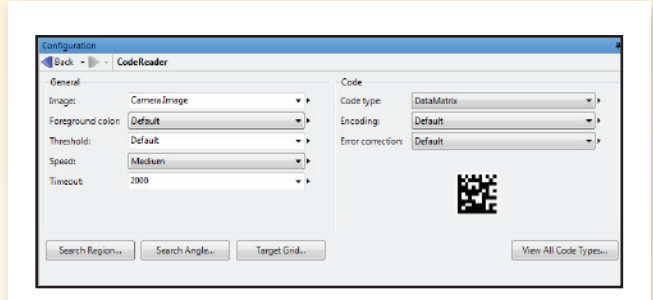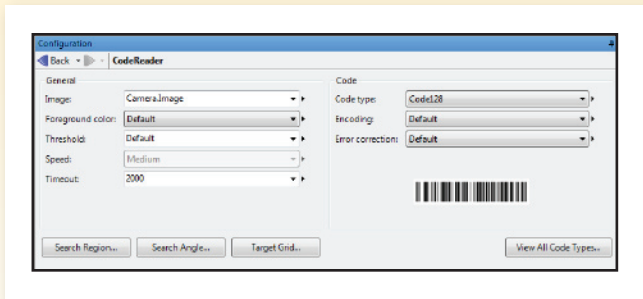

String Reader

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.
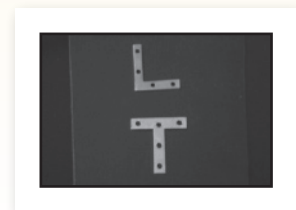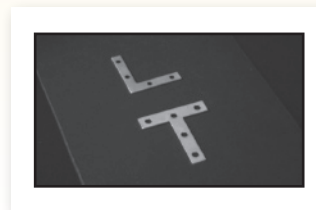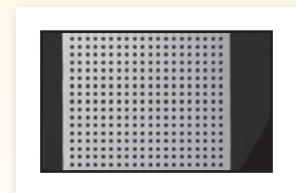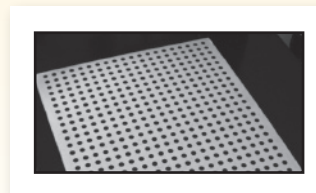
Calibration

Image analysis and processing tools (cont.)

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.
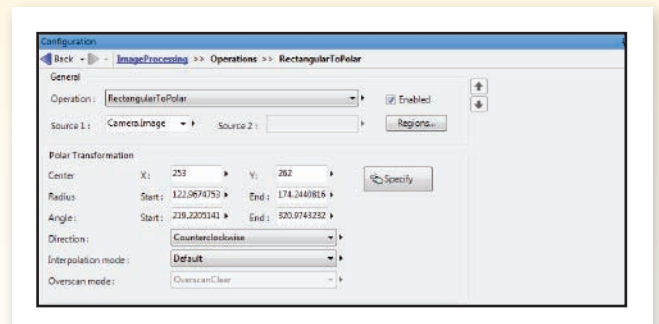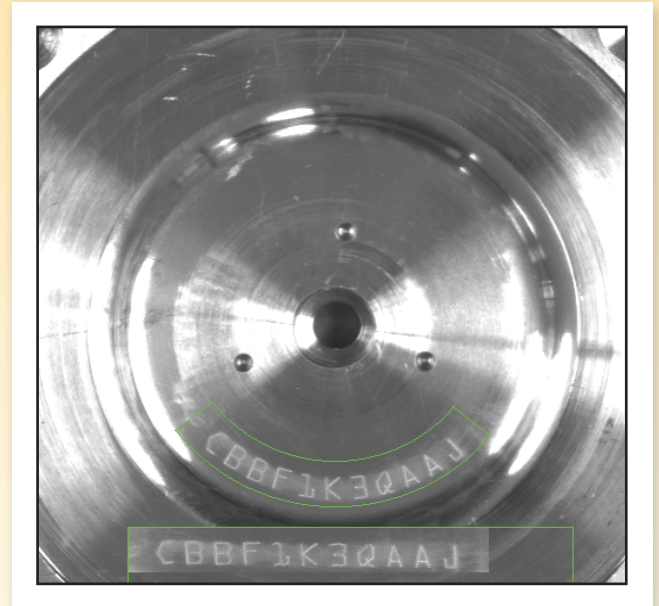

Image Processing

Connectivity

Connection to devices and networks

Matrox Iris E-Series features a 10/100 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™[1] and MODBUS® over TCP/IP protocols. The latter two enable interaction with automation controllers and robots. The Matrox Iris E-Series can also be configured to directly interact with automation devices through an RS-232 serial interface as well as 16 industrial digital I/Os (8 input and
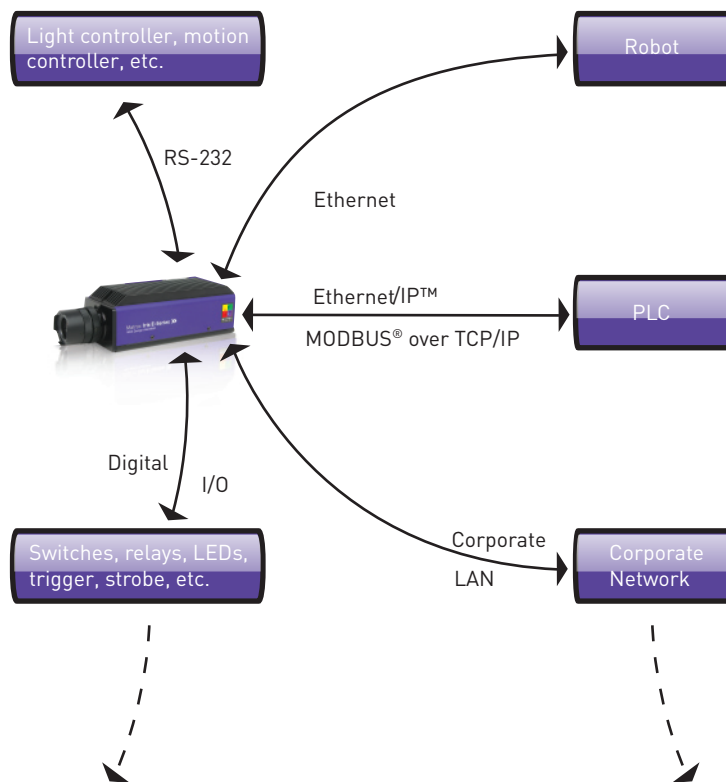
Standard I/O
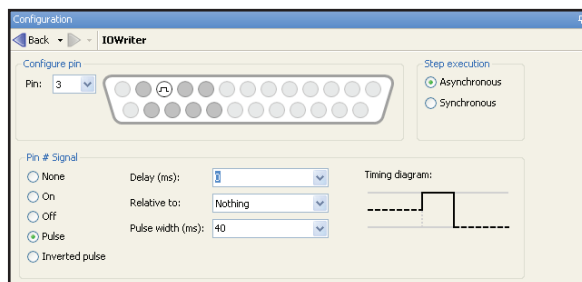
Networking method

Compare models

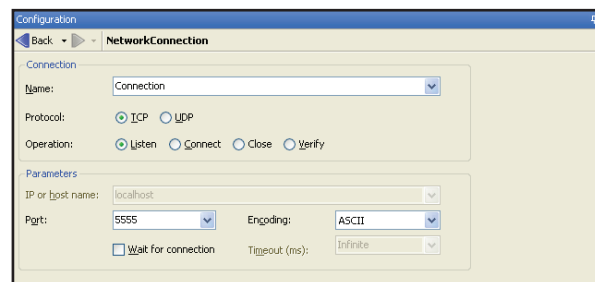|		Iris E300(R)*	Iris E300H(R)*	Iris E700(R)*	Iris E1200(R)*	Iris E1200H(R)*
Sensor board						
CCD sensor[6]	Geometry	diagonal 4.5 mm (1/4"-type)	diagonal 6 mm (1/3"-type)	diagonal 6 mm (1/3"-type)	diagonal 8 mm (1/2"-type)	diagonal 8 mm (1/2"-type)
	Format	monochrome	monochrome	monochrome	monochrome	monochrome
	Make and model	Sony ICX098BL	Kodak KAI-0340S	Sony ICX204AL	Sony ICX205AL	Sony ICX267AL
Effective resolution (H x V)		640 x 480	640 x 480	1024 x 768	1280 x 1024	1280 x 1024
Frame rate		up to 30 fps	up to 100 fps	up to 20 fps	up to 7.5 fps	up to 15 fps
Pixel size (H x V)		5.6 µm x 5.6 µm	7.4 µm x 7.4 µm	4.65 µm x 4.65 µm	4.65 µm x 4.65 µm	4.65 µm x 4.65 µm
Gain range		2 to 36 dB	6 to 42 dB	2 to 36 dB	2 to 36 dB	2 to 36 dB
Shutter speeds		100 µs to 0.5 s	45 µs to 83 ms	100 µs to 0.5 s	100 µs to 0.5 s	100 µs to 0.5 s
External trigger latency		85 µs	25 µs	75 µs	155 µs	80 µs
External trigger to output strobe delay		2µs (minimum)				
CPU board						
CPU		400MHz Intel® ULP Celeron®				
Volatile memory		128 MB SDRAM				
Non-volatile memory		128 MB flash disk				
I/O board						
Network interface		10/100 Mbit Ethernet				
Serial interface		RS-232				
Digital I/Os		8 inputs and 8 outputs				
Mechanical, electrical and environmental information						
Dimensions		refer to Matrox Iris E-Series with Design Assistant Installation and Technical Reference				
Lens type		CS mount[7]				
Connectors		RJ-45 for power and RS-232, RJ-45 for Ethernet and DB-25 for digital I/Os, and MDR26 for remote head to main body connection[8]				
Remote head distance		up to 5 meters (16.4 feet)				
Weight		435 g (15.3 oz.) for uni-body / 185 g (6.5 oz.) for remote head and 435 g (15.3 oz.) for main body				
Power consumption		375 mA @ 24 VDC or 9 W (typical)				
Digital I/O ratings		100 mA max. @ 5 to 24 VDC				
Operating temperature		0 °C to 45 °C (32 °F to 113 °F)				
Ventilation requirements		natural convection				
Operating humidity		up to 95% (non-condensing)				
Certifications		FCC class A, CE class A and RoHS-compliant				
Software environment						
PC development tools		Matrox Design Assistant IDE - Matrox Iris E-Series Edition				
PC requirements		Microsoft® Windows® XP Professional with Service Pack 2 or Microsoft® Vista, Microsoft® Internet Explorer 7.0, 310 MB hard disk space, 10/100 Mbit Ethernet port, and DVD drive				

Order

Hardware

Part number	Description
IE300*	Matrox Iris E-Series smart camera with monochrome 640 x 480 30 fps CCD sensor, 400 MHz ULP Celeron, 128MB DRAM, 128 MB flash disk.
IE300R*	Same as above but with remote head and 2 m cable.
IE300H*	Matrox Iris E-Series smart camera with monochrome 640 x 480 100 fps CCD sensor, 400 MHz ULP Celeron, 128MB SDRAM, 128 MB flash disk.
IE300HR*	Same as above but with remote head and 2 m cable.
IE700*	Matrox Iris E-Series smart camera with monochrome 1024 x 768 20 fps CCD sensor, 400 MHz ULP Celeron,128MB SDRAM, 128 MB flash disk.
IE700R*	Same as above but with remote head and 2 m cable.
IE1200*	Matrox Iris E-Series smart camera with monochrome 1280 x 1024 7.5 fps CCD sensor, 400 MHz ULP Celeron,128MB SDRAM, 128 MB flash disk.
IE1200R*	Same as above but with remote head and 2 m cable.
IE1200H*	Matrox Iris E-Series smart camera with monochrome 1280 x 1024 15 fps CCD sensor, 400 MHz ULP Celeron, 128 MB SDRAM, 128 MB flash disk.
IE1200HR*	Same as above but with remote head and 2 m cable.
IRIS-PWR+CBL*	Matrox Iris power supply and cables kit. Includes power supply with all power cords (North America, Europe and UK), power supply/RS-232 cable, DB-25 to open end cable for digital I/Os (requires customization) and mounting block.
IRIS-LENSES*	Matrox Iris lenses kit. Includes one CS-mount 4 mm lens and one CS-mount 8 mm lens (kit does not apply for IE1200[H][R]).
IRIS-1200LENS*	Matrox Iris IE1200[H][R] lens. Includes one C-mount 12 mm lens and a C to CS-mount adapter ring.

CS-mount lenses are also available from PENTAX Precision Co., Fujinon or other third parties.

Software

Matrox Design Assistant for Matrox Iris E-Series flowchart-based integrated development environment (IDE) DVD is bundled with every Matrox Iris E-Series smart camera. Moreover, each Matrox Iris E-Series smart camera includes a license for the Blob Analysis, Code Reader, Edge Locator, Image Processing, Intensity Checker, 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). Included in the original purchase price of the Matrox Iris E-Series is a one year enrollment in the Matrox Design Assistant maintenance program, which provides access to technical support and software updates.

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

Endnotes:
1. Certification pending.
2. Microsoft® Windows® XP or Vista® 32-bit editions.
3. Microsoft® Internet Explorer® 7.
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.
7. Can also accommodate a C mount lens when using a 5 mm extension tube.
8. Use standard Camera Link® cables

For more information, please call: 1-800-804-6243 (toll free in North America) or (514) 822-6020
or e-mail: imaging.info@matrox.com or http://www.matrox.com/imaging

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