

COGNEX

PRODUCT GUIDE

IN-SIGHT Vision Systems



Vision has never been easier

The Cognex Advantage

Industry Leading Performance

Since the inception of Cognex over a quarter century ago, we've recognized that the true test of a vision system is that it works under real world conditions on the factory floor. Performance is not just related to high-speed image acquisition and processing, but also to the combined power of the vision hardware and software. And that's what Cognex delivers. This assures users reliable, repeatable performance even in the most challenging vision applications.



Exceptional Flexibility

The flexibility of the In-Sight family of vision systems can be defined in a number of ways: processing power, resolution, vision tools, connectivity, and operator interface. Whether you are a system integrator, machine builder, or end user, In-Sight vision systems come equipped with a seamless application builder and networking environment. And, Cognex offers the widest range of vision systems found in the industry with the In-Sight product family, which means that you can match the correct platform to your application at the right price.



Unmatched Ease-of-Use

Ease-of-use is built into the heart of In-Sight vision systems starting with smart vision tools that automatically select features, set parameters, and operate in real world conditions without adjustment. Our EasyBuilder® software interface offers everything required to easily set up reliable applications. With no programming needed, applications are deployed quickly. In addition, In-Sight offers the most comprehensive and easiest to use connectivity suite of communications capabilities to interface to PLCs, robots, the factory network, and HMI devices.



Extreme Ruggedness

All In-Sight systems are self-contained, compact vision systems requiring no external processor or separate camera. In-Sight is the only family of vision systems available today that provide industrial grade features as standard. That means rugged, die-cast aluminum and stainless steel cases that can withstand punishment of vibration, and sealed M12 connectors and protective lens covers that provide IP67 and IP68 rated protection against dust and moisture. It all adds up to peace of mind on the factory floor.



In-Sight... for All Applications

Inspect

Cognex In-Sight vision systems help companies reduce scrap and re-work—which ultimately saves time and money—by inspecting products throughout the manufacturing process.

Industries from pharmaceutical to automotive to electronics rely on Cognex vision systems to ensure the end products they deliver to their customers meet the highest standards.

Guide

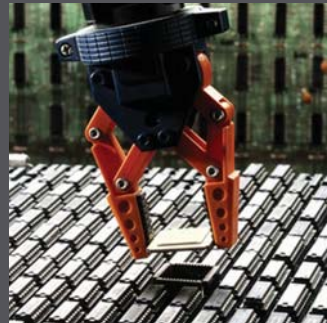
In-Sight vision systems are widely used with material handling systems and robots for general alignment and pick-and-place guidance in assembly and inspection applications with speed and accuracy, eliminating the need for expensive fixturing and enabling a new generation of flexible manufacturing.

The power of our patented PatMax® geometric pattern finding tool and the support for many robot controller protocols makes integrating In-Sight vision systems into robotic applications faster and easier.

Identify

Whether identifying parts using barcodes, alphanumeric characters, or by shape or color, Cognex In-Sight vision systems reliably and accurately identify parts, even on the fastest production lines.

In-Sight vision systems provide unmatched 1D and 2D code reading performance and handle a wide range of degradation to the appearance of the code with the industry's most reliable read rates. Our powerful OCR tool reads text strings, even under varying conditions such as rotation, uneven lighting and confusing scenes. And, our advanced color recognition tools can reliably distinguish between similar colors with high precision.



In-Sight Micro Series

Make it small. Make it smart. Make it easy.

That's what Cognex has achieved with the In-Sight Micro series vision system. In-Sight Micro packs a complete vision system into a remarkably small package that measures just 30mm x 30mm x 60mm. Powered by In-Sight Explorer software with the intuitive EasyBuilder interface, the In-Sight Micro can be used for single-point inspection tasks or for building an entire factory-wide network of vision systems.



IN-SIGHT MICRO MODELS

Standard Resolution	High Resolution	ID	Color
Offering a range of performance choices, the In-Sight Micro models handle even the highest speed manufacturing lines in the smallest vision system footprint available.	When large parts need to be inspected for small defects or precise measurements, turn to the high resolution models for greater accuracy.	In-Sight Micro ID Readers readers use our unmatched identification software tools for reading and verifying 1D and 2D codes, and advanced OCR/OCV tools for reading and verifying text.	Includes the powerful ExtractColor software tool to inspect color features of a part and the robust MatchColor software tool to recognize parts based on their color.
Models: 1020, 1050, 1100, 1400	Models: 1403, 1403C	Models: 1110, 1410, 1413	Models: 1100C, 1400C, 1403C

For more information on In-Sight Micro models, please refer to page 12.

In-Sight 5000 Series

Rugged, reliable and powerful.

In-Sight 5000 series vision systems offer users the highest level of performance and are the only vision systems available that are equipped with industrial-grade features as standard. Powered by In-Sight Explorer software with the intuitive EasyBuilder interface, the In-Sight 5000 series can be used for single-point inspection tasks or for building an entire factory-wide network of vision systems.

Resolution

Available in 640x480, 1024 x 768 and 1600x1200 formats. Accepts standard C-mount lenses.



Standard Housing

Die-cast and steel cases are IP67 (NEMA 6) rated and have a protective lens cover.

Stainless Steel Housing

IP68-rated case stands up to caustic environments.

Connectors

Ethernet, power and I/O connect via the industrial M12 connectors.

IN-SIGHT 5000 MODELS

<p>Standard Resolution</p> <p>Built of rugged, die-cast aluminum, with sealed M12 connectors, and an included protective lens cover, the In-Sight 5000 Series models offer a wide array of performance choices, all with IP67 (NEMA 6) rated protection.</p> <p>Models: 5100, 5400, 5600</p>	<p>High Resolution</p> <p>When large parts need to be inspected for small defects or precise measurements, turn to the high resolution models for greater accuracy.</p> <p>Models: 5401, 5403, 5603</p>	<p>ID</p> <p>In-Sight ID readers use our unmatched identification tools for reading and verifying 1D and 2D codes, and advanced OCR/OCV tools for reading and verifying text.</p> <p>Models: 5110, 5410, 5411, 5413, 5610, 5613, 5614</p>
<p>Color</p> <p>Includes the powerful ExtractColor tool to inspect color features of a part and the robust MatchColor tool to recognize parts based on their color.</p> <p>Models: 5100C, 5400C</p>	<p>Line Scan</p> <p>The In-Sight line scan builds an image line-by-line, as a product moves past the system. This alternative method for acquiring images is suited to applications such as inspecting 360° around a cylindrical object, building high quality, high resolution images, and inspecting parts on a web.</p> <p>Models: 5604, 5614</p>	<p>High-Performance</p> <p>The high-performance series offers a 1GHz processor running the Cognex vision tool library at the highest speeds to keep up with the fastest production lines. The 5600 is available in standard, high-resolution, and line scan, for ultimate acquisition flexibility.</p> <p>Models: 5600, 5610, 5603, 5613, 5604, 5614</p>

For more information on In-Sight 5000 models, please refer to page 12.

Vision has Never Been Easier

The most powerful In-Sight vision tools are now the easiest to use and are presented more simply than ever before with the EasyBuilder interface in our In-Sight Explorer Software. This easy-to-use interface walks you through the process of setting up your vision application, step by step.

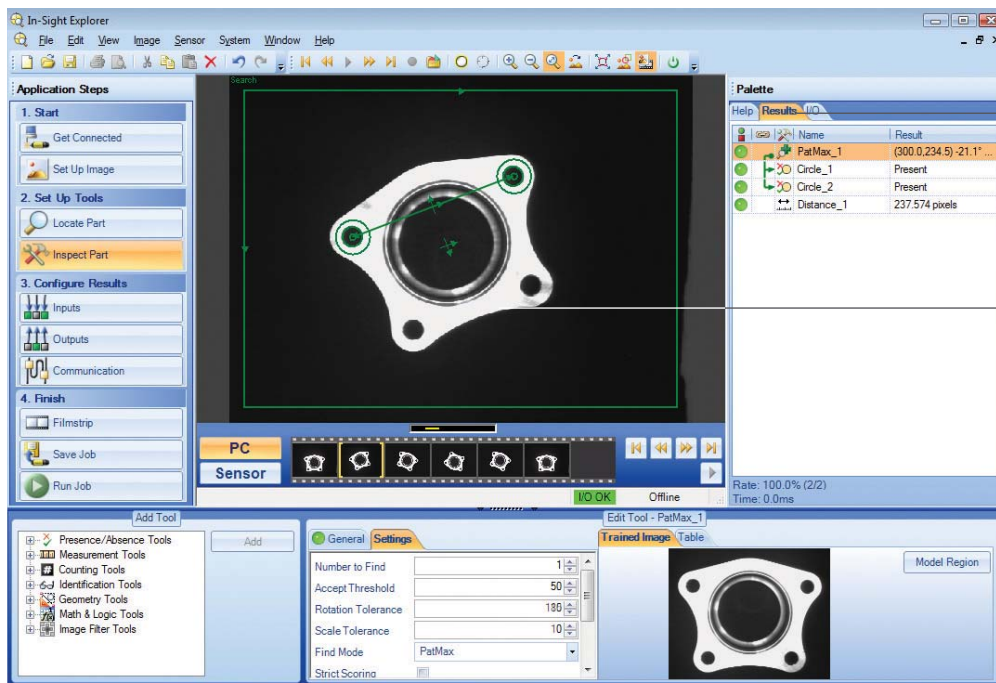
Great for first time vision users, EasyBuilder doesn't require you to learn programming, allowing you to get the application deployed and running in a very short time and enabling you to focus on what's most familiar... your part! Plus, the advanced vision tools and logic make EasyBuilder a powerful interface for the experienced vision user too!

For advanced vision users, In-Sight Explorer gives you access to the power and flexibility of the spreadsheet to allow you to program solutions for the most challenging applications.

Four simple steps guide you through the setup process.

- 1
- 2
- 3
- 4

A library of vision tools are configured with the click of a mouse.



The palette provides quick access to tool results, I/O status and built-in help.

Point-and-Click Setup Drop in tools quickly by simply clicking on the features of interest.

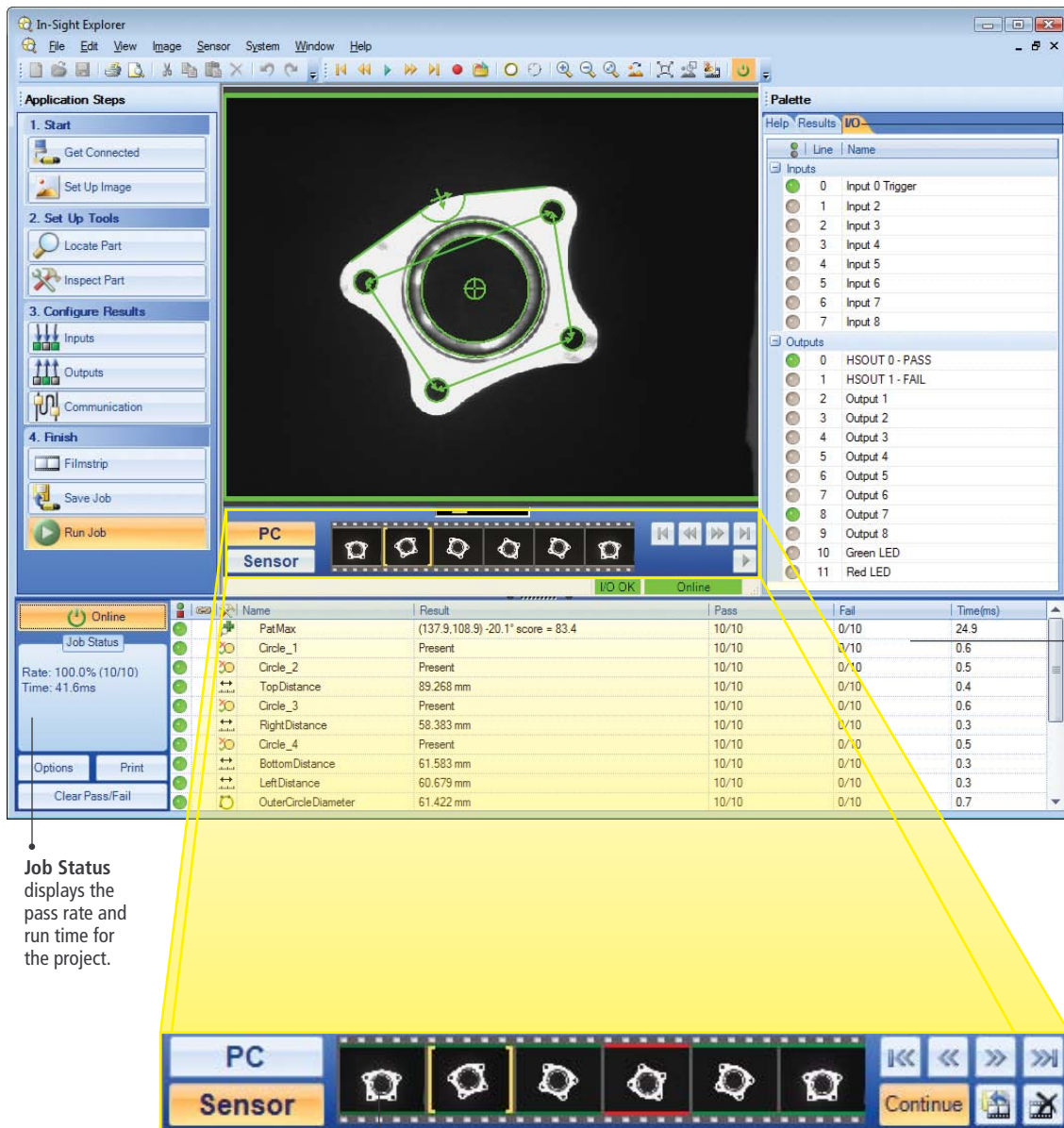
Intuitive, Easy to Use

Working from an image of the part, four simple steps complete the application setup:

- 1 START** Connect your In-Sight vision system on your network and set up the image to inspect.
- 2 SET UP TOOLS** Locate and inspect the part using a library of over 40 industry proven vision tools.
- 3 CONFIGURE RESULTS** Point-and-click setup for inputs, outputs, and communication to PLCs, robots and HMIs.
- 4 FINISH** Choose the images to record while inspecting, and put your In-Sight vision system online.

That's all it takes to complete an application! In a fraction of the time that you would normally spend learning how to set up a vision system, you can have your entire solution configured and deployed.

Run-Time View



I/O Tab allows the user to monitor the input and output signals.

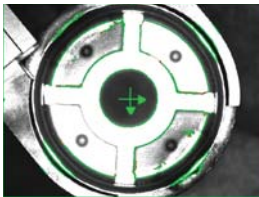


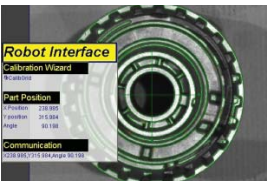
Results table consolidates tool results for easy viewing and helps users understand tool references and performance timing.

Job Status displays the pass rate and run time for the project.

- The **Filmstrip** enables users to understand how their vision tools perform and to even troubleshoot manufacturing line issues:
 - Recording up to 10,000 images to a PC—sorted by pass/fail results—provides robust process metrics on how vision tools will perform over time in changing conditions and boosts reliability when deploying vision to the line.
 - Recording images directly to the vision system allows operators and technicians to understand why parts are passing or failing in real time, without halting the vision system.

Powerful Vision Tools

The industry-leading Cognex vision tool library provides reliable, repeatable performance in even the most challenging vision applications. Regardless of the application, In-Sight vision tools have the reliability and accuracy that is required to solve even the most difficult applications.

Tool Category	Advantages	Applications
PART LOCATION TOOLS... LOCATE PARTS IN WIDELY-VARYING CONDITIONS RELIABLY AND ACCURATELY		
	<ul style="list-style-type: none"> • PatMax, the industry's accuracy and reliability standard for part and feature location, utilizes patented geometric pattern matching technology to locate parts under difficult conditions • Simplifies mechanical fixturing and lighting, making vision projects easier and less expensive to implement 	<ul style="list-style-type: none"> • Locate automotive, electronic, pharmaceutical, and consumer parts and assemblies for inspection • Identify locations of parts for robotic handling, tolerating changes in rotation, scale, and lighting variations • Precision part alignment
INSPECTION TOOLS... VERIFY THE CORRECT ASSEMBLY OF COMPONENTS AND FIND FLAWS IN PART APPEARANCE		
	<ul style="list-style-type: none"> • Provides robust, repeatable inspection results despite changes in part orientation • Allows users to easily classify defects by defect type 	<ul style="list-style-type: none"> • Verify correct assembly of automotive parts • Verify the contents and seals of packaged goods for food, consumer, and pharmaceuticals • Inspect correct assembly of electronics
MEASUREMENT TOOLS... MEASURE CRITICAL PART DIMENSIONS AND VERIFY TOLERANCES		
	<ul style="list-style-type: none"> • Enables high-accuracy gauging of critical part dimensions despite changes in part orientation and lighting • Built-in geometry tools make complex measurements easy 	<ul style="list-style-type: none"> • Measure and verify tolerances of automotive parts, assemblies, and product labels • Measure critical tolerances of medical and surgical devices
ROBOT GUIDANCE TOOLS... ELIMINATE PART FIXTURING		
	<ul style="list-style-type: none"> • Combines part location tools with communication protocols for total guidance capability • Eliminates costly fixtures in pick-and-place applications • Allows processing multiple part types at the same robotic station 	<ul style="list-style-type: none"> • High-speed precision pick-and-place. Place or remove parts on pallets • Locate unfixtured parts on conveyor, and place them in package • Use robot to manipulate part or camera to inspect critical features of part

Tool Category

Advantages

Applications

COLOR VISION TOOLS... INSPECT AND IDENTIFY PARTS BASED ON COLOR



- The powerful ExtractColor tool learns simple or complex colors for color based inspection, location, and identification applications
- 24-bit resolution MatchColor tool reliably distinguishes between even subtle shade differences
- Point-and-click color training with simple adjustments make color application development easy
- External retraining enables color retraining on the factory floor without a PC

- Identify and sort products based on their color
- Monitor part color to ensure consistent quality
- Identify labels to ensure proper labeling of products
- Verify assembly of products based on the colors of components
- Inspect pharmaceutical blisterpack for the correct color tablets
- Verify color and proper assembly of LEDs

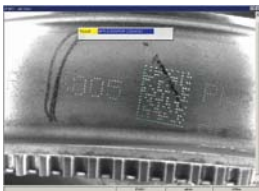
ADVANCED OCV/OCR TOOLS... VERIFY AND READ ALPHANUMERIC TEXT STRINGS



- Handles low-contrast characters, as well as confusing or unevenly-spaced characters
- Inspection speeds of faster than 1ms per character
- Font editor improves the readability of poorly-trained fonts or degraded characters

- Read or verify date/lot codes and SKUs of food and beverage, pharmaceutical, and consumer items
- Verify character legibility and proper printer operation
- Read direct-marked numbers and characters on automotive components

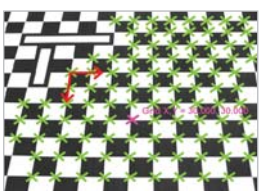
INDUSTRIAL CODE READING TOOLS... RELIABLY READ 1D AND 2D CODES ON LABELS OR DIRECTLY MARKED ON PARTS



- Handles low-contrast and poorly formed codes resulting from process degradation and marking techniques such as dot peen and laser etch. Damaged codes, such as the example at left, can be read with Cognex ID tools
- Reads up to 7200 parts per minute

- Read direct-marked 2D codes on automotive, aerospace, and pharmaceutical parts
- Read and track 1D and 2D codes, and verify print quality to industry standards for consumer, food, beverage, and pharmaceutical products

NON-LINEAR CALIBRATION FOR THE MOST ACCURATE RESULTS



- Non-Linear Calibration improves accuracy and repeatability by correcting lens and perspective distortion
- Step-by-step wizard makes calibration simple, guiding users through the process of turning pixels into robot or real world coordinates
- Maintain accuracy even when the vision system is mounted off-axis

- High-accuracy robotic pick-and-place for standard mounting and off-axis mounting due to space constraints or robot motion constraints
- High-accuracy dimensions of critical measurements of medical devices

Flexible Display Options

Cognex offers a variety of visualization options that can be tailored to fit into any industrial application. The VisionView® operator display panel is ideal for monitoring and controlling vision systems on the factory floor, and allows operator controls specific to the application. Integration into common third-party HMI devices is quickly achieved using the In-Sight ActiveX Display Control and into custom HMI environments using the In-Sight Software Development Kit.

VisionView Operator Interface Panel

This powerful, low-cost operator interface panel facilitates monitoring the production process, making operator decisions easier than ever. In addition, VisionView allows the operator, with password protection, to adjust vision tool parameters and positions without a PC!



Features

- “Plug-and-Go” configuration. No PC required. Just use the simple setup from within VisionView
- Automatic detection of any Cognex vision system on your network
- Mix and match Cognex vision systems. View up to nine vision systems in a tiled view
- Displays full color images, with graphic overlays and operator controls
- Fast image updates provide the most recent inspection images
- CustomViews, operator controls created in the spreadsheet, automatically appear in VisionView
- EasyView display. Items selected from In-Sight EasyBuilder will appear on the VisionView screen, with impressive ease of use

VisionView PC Software

Monitor and control the vision application with the VisionView interface on a PC. The VisionView PC software has all of the features of the operator panel, and provides the flexibility of different display sizes.

VisionView 700 Operator Interface

Models supported	In-Sight Micro Series (firmware 4.1.0 and later), In-Sight 5000 Series (firmware 3.1.0 and later)
Languages	Chinese (Simplified), English, French, German, Italian, Japanese, Korean, and Spanish

TOUCH SCREEN

Size	7-inch diagonal (16:9 aspect ratio)
Type	TFT LCD
Resolution (pixels)	800x480 WVGA (384,000 pixels)
Number of colors	18 bits/pixel (262,144)

MEMORY

System	64MB SDRAM
Program	128MB non-volatile flash memory
Video	16MB Video SDRAM

COMMUNICATIONS

Ethernet	10/100 BaseT TCP/IP, Full Duplex
LAN Port	1, for connection to wide area network
Direct sensor ports	4, for connection to Cognex vision systems. Provides Power over Ethernet (PoE) for In-Sight Micro Series.

POWER

Voltage	24VDC ±10%
Current	2A maximum (1A maximum when not supplying PoE to four In-Sight Micro Vision Systems)

MECHANICAL

Dimensions	170.3mm (6.70in) H x 205.9mm (8.10in) W x 52.5mm (2.07in) D
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ENVIRONMENTAL

Operating temperature	0°C (32°F) to 45°C (113°F)
Storage temperature	-30°C (-22°F) to 80°C (176°F)
Protection	NEMA4 when panel mounted

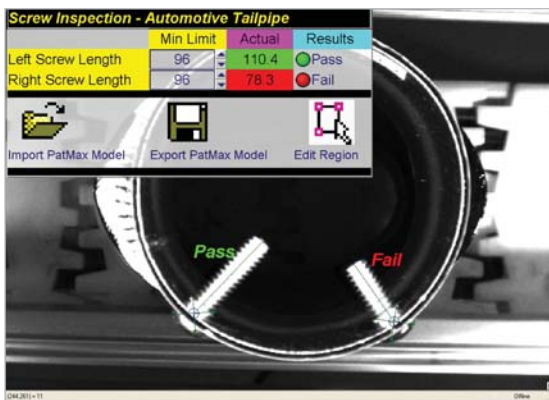
CERTIFICATIONS	CE, FCC, TUV SUD NRTL, RoHS
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Customized Visualization and Control

From CustomViews integrated directly into the In-Sight Explorer software environment, to ActiveX controls for integration into third-party HMI systems, to custom-built standalone applications, Cognex provides a full suite of tools for users needing highly customized operator interfaces.

In-Sight Explorer CustomView

Integrated into the In-Sight Explorer software, the CustomView allows sophisticated operator interaction to be configured in the vision application. Graphical controls such as indicator lights, buttons, data displays and entries, trend charts and message boxes are placed in the spreadsheet view to create the operator display. The CustomView is also designed to be displayed automatically on VisionView.



The CustomView interface is created easily, and is a cost-effective way to monitor single or networked In-Sight vision systems from a PC.

In-Sight Software Development Kit

A highly customized, stand-alone user interface can be tailored to your exact needs using the In-Sight Software Development Kit. This package provides the ultimate level of flexibility via programmatic methods for viewing data and images, changing parameters, and loading new jobs or recipes.

In-Sight Display Control

Integrating data and images from an In-Sight vision system into third-party, Windows-based HMI software is quickly achieved using the In-Sight ActiveX Display Control. Tested with the most common HMI software packages, the Display Control integrates the vision experience into the rest of the machine control with drag-and-drop simplicity.



Factory Floor Communications

Integrating In-Sight vision systems into your existing automation control system is easy with Cognex Connect™, the most comprehensive suite of communications capabilities ever available in a vision system. Whether you're connecting In-Sight directly to a PLC or robot controller, or managing multiple In-Sight vision systems remotely from a networked PC or HMI, Cognex Connect assures seamless communication between In-Sight and all of your equipment on the factory floor.



- Cognex Connect supports open-standard protocols used by the leading PLC manufacturers including CC-Link, MELSEC protocol, EtherNet/IP, PROFINET, and Modbus TCP. Whether connecting to Mitsubishi, Rockwell, Siemens, or any other brand of PLC, Cognex integrates into the control system with point-and-click simplicity.
- For interfacing to robots, Cognex Connect provides pre-configured communication tools for ABB, Denso, Kawasaki, Kuka, Motoman and Staubli. Communication with Mitsubishi, Adept, Epson, IAI, Nachi, Yamaha and many other robot manufacturers is also supported.
- For interfacing to HMIs, PCs and file servers, Cognex Connect provides an OPC Server, ActiveX Display Controls, In-Sight SDK, and support for TCP/IP, FTP, SFTP, Telnet and SMTP over Ethernet.

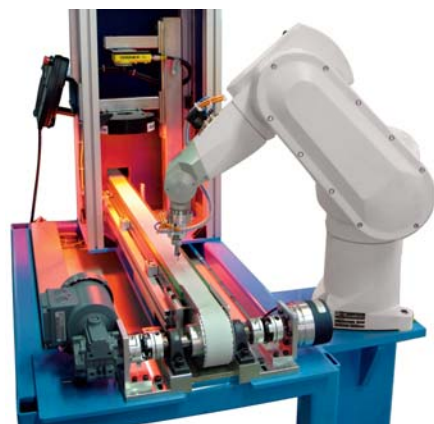
Because Cognex Connect is built with dedicated tools, developed to exacting standards, you can be confident that solutions based on In-Sight communication technology will be highly reliable and effective. And with Cognex Connect this will be the fastest and easiest integration you have ever experienced—saving you both time and money.



MODBUS TCP



Modbus



A Full Range of Accessories

To simplify and complete system integration, Cognex offers a variety of optional accessories designed specifically for use with In-Sight vision systems.

Lighting



LED array provides economical bright light for many applications.

In order to achieve the highest quality images possible, Cognex offers a wide array of lighting accessories. When basic lighting works for the application, integrated ring lights are ideal for In-Sight vision systems. Easily mounted directly to the vision system, these lights provide basic front lighting without having to purchase and install a separate light. Integrated ring lights are available in red LEDs, red diffuse LEDs, and white LEDs.

Lenses

Cognex offers a full range of high-quality compact lenses designed specifically for machine vision applications.

And, for In-Sight ID models, image formation systems are available in seven different lens focal lengths.



Cables

In-Sight cables provide superior performance with rugged, stainless steel M12 connectors and are rated for ten million linear and thirty thousand torsional flex cycles... ideal for robot-mounted applications.



VisionView Operator Interface Panel



Allows operators to monitor multiple vision systems simultaneously, and the intuitive interface allows password controlled adjustment of tools and parameters — without a PC!

See page 8 for additional VisionView information.

I/O Modules

In-Sight I/O modules are designed to simplify connections and expand the I/O capabilities of In-Sight vision systems.

They allow easy access to power, acquisition triggers, and light strobe, and provide convenient general-purpose input and output wiring. Rugged quick-connect cables ensure reliable connections to the In-Sight vision system.

Additionally, I/O modules provide an RS-232 communications port for serial devices.



Your Cognex sales engineer or certified Cognex partner can provide information on these and other accessories that enhance In-Sight vision systems.

In-Sight Model Comparison

In-Sight Micro Series

Model ¹	Speed Rating ²	Acquisition ³ (fps)	Color Model	Available in Stainless Steel	Resolution				User Interface		Supported Tools ⁴					Part Number
					640 x 480	1024 x 768	1600 x 1200	1K Line Scan	EasyBuilder	Spreadsheet	Essential Tools	Extended Tools	ID Tools	Color Tools	PatMax Available	
1020	1x	60			•				•		E					ISM1020-00
1050	1x	60			•				•	•	E					ISM1050-00
1100	4x	60			•				•	•	E	X	I		P	ISM1100-00 ISM1100-10 (PatMax)
1100C	4x	58	•		•				•	•	E	X	I	C	P	ISM1100-C00 ISM1100-C10 (PatMax)
1110	4x	60			•				•	•			I			ISM1110-00
1400	10x	60			•				•	•	E	X	I		P	ISM1400-00 ISM1400-10 (PatMax)
1400C	10x	58	•		•				•	•	E	X	I	C	P	ISM1400-C00 ISM1400-C10 (PatMax)
1410	10x	60			•				•	•			I			ISM1410-00
1403	8x	14					•		•	•	E	X	I		P	ISM1403-00 ISM1403-10 (PatMax)
1403C	8x	7.5	•				•		•	•	E	X	I	C	P	ISM1403-C00 ISM1403-C10 (PatMax)
1413	8x	14					•		•	•			I			ISM1413-00

Notes:

- 1) All In-Sight vision systems have an input trigger and 2 high speed outputs built in. I/O modules are available for additional I/O on all In-Sight systems.
- 2) Speed rating compared to In-Sight Micro 1020 model and does not include image acquisition rate. The 5604 and 5614 models have acquisition speed rated in lines per second.
- 3) Acquisition rate is based on 1ms exposure, and a full image frame capture.
- 4) Supported Tools:

- E** - Essential Tool Set includes blob, edge, curve and line finding, histogram and geometry tools, image filters, pattern matching, and standard calibration.
- X** - Extended Tool Set includes non-linear calibration and caliper tool.
 - PatMax is an option available on extended models
- I** - ID tool set includes: 1D/2D barcode reading and verification, text reading and verification (OCR/OCV) and image filters.
- C** - Color tool set includes MatchColor, ExtractColor, color histogram, color to greyscale filters and color to greyscale distance filter.

For additional In-Sight technical information, please visit www.cognex.com/support/insight

In-Sight 5000 Series

Model ¹	Speed Rating ²	Acquisition ³ (fps)	Color Model	Available in Stainless Steel	Resolution				User Interface		Supported Tools ⁴					Part Number
					640 x 480	1024 x 768	1600 x 1200	1K Line Scan	EasyBuilder	Spreadsheet	Essential Tools	Extended Tools	ID Tools	Color Tools	PatMax Available	
5100	4x	60			•				•	•	E	X	I		P	IS5100-00 IS5100-10 (PatMax)
5100C	4x	60	•		•				•	•	E	X	I	C	P	IS5100-C00 IS5100-C10 (PatMax)
5110	4x	60			•				•	•			I			IS5110-00
5400	10x	60		•	•				•	•	E	X	I		P	IS5400-00 IS5400-10 (PatMax) IS5400-S00 (Stainless Steel) IS5400-S10 (Both)
5400C	8x	60	•	•	•				•	•	E	X	I	C	P	IS5400-C00 IS5400-C10 (PatMax) IS5400-CS00 (Stainless Steel) IS5400-CS10 (Both)
5410	10x	60		•	•				•	•			I			IS5410-00 IS5410-S00 (Stainless Steel)
5401	8x	20				•			•	•	E	X	I		P	IS5401-00 IS5401-10 (PatMax)
5411	8x	20				•			•	•			I			IS5411-00
5403	10x	15		•			•		•	•	E	X	I		P	IS5403-00 IS5403-10 (PatMax) IS5403-S00 (Stainless Steel) IS5403-S10 (Both)
5413	10x	15					•		•	•			I			IS5413-00
5600	20x	60			•				•	•	E	X	I		P	IS5600-00 IS5600-10 (PatMax)
5610	20x	60			•				•	•			I			IS5610-00
5603	20x	15					•		•	•	E	X	I		P	IS5603-00 IS5603-10 (PatMax)
5613	20x	15					•		•	•			I			IS5613-00
5604	20x	44k lines ²						•	•	•	E	X	I		P	IS5604-00 IS5604-10 (PatMax)
5614	20x	44k lines ²						•	•	•			I			IS5614-00

For additional In-Sight technical information, please visit www.cognex.com/support/insight

COGNEX

Companies around the world rely on Cognex vision to optimize quality and drive down costs.

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