MACHINE VISION

VISION SYSTEMS ▪ VISION SENSORS ▪ DEEP LEARNING ▪ VISION SOFTWARE

COGNEX

THE GLOBAL LEADER

IN MACHINE VISION AND INDUSTRIAL BARCODE READING

Cognex® the leading supplier of machine vision and industrial barcode reading solutions.

With over 3 million systems installed in facilities around the world and over forty years of experience, Cognex is focused on industrial machine vision and image-based barcode reading technology. Deployed by the world's top manufacturers, suppliers and machine builders, Cognex products ensure that manufactured items meet the stringent quality requirements of each industry.

Cognex solutions help customers improve manufacturing quality and performance by eliminating defects, verifying assembly and tracking information at every stage of the production process. Smarter automation using Cognex vision and barcode reading systems means fewer production errors, which equates to lower manufacturing costs and higher customer satisfaction. With the widest range of solutions and largest network of global vision experts, Cognex is the best choice to help you **Build Your Vision.™**

$811 MILLION
2020 REVENUE

OVER 40
YEARS IN THE BUSINESS

500+
CHANNEL PARTNERS

GLOBAL OFFICES IN
20+ COUNTRIES

3,000,000+
SYSTEMS SHIPPED

OPTIMIZE QUALITY, MINIMIZE WASTE, MAXIMIZE THROUGHPUT

Tens of thousands of applications worldwide inspect billions of products each day, many products that simply could not be manufactured without machine vision technology. Whether verifying the fill levels of soda bottles traveling on a conveyor, reading oil-stained codes on automotive parts or positioning touch screens on smartphones to micron-level accuracy, machine vision technology performs highly-detailed tasks on high-speed production lines.

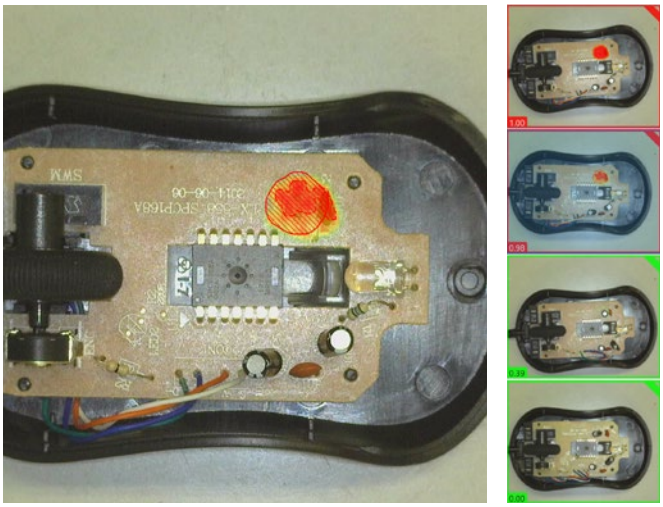
Cognex comprehensive line of vision sensors and 2D and 3D vision systems all use machine vision technology to perform inspections but are engineered for different tasks.

	Vision Sensors	2D Vision	3D Vision
Presence/Absence	✓	✓	✓
Defect Detection	✓	✓	✓
Assembly Verification	✓	✓	✓
Gauge/Measure	✓	✓	✓
Cosmetic Inspection		✓	✓
Guide/Align		✓	✓
OCR/OCV	✓	✓	
Code Reading		✓	

INDUSTRY-LEADING VISION TECHNOLOGY

Deep Learning

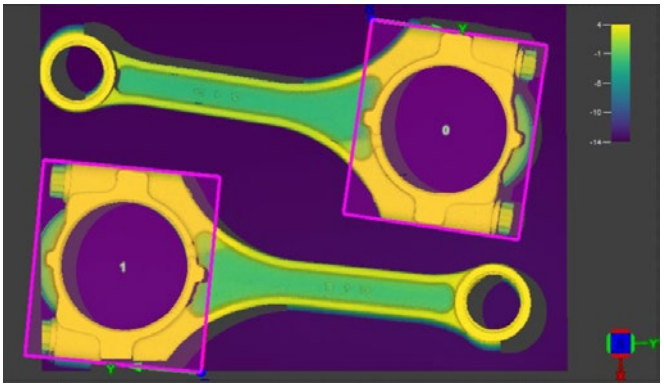
Deep learning technology uses neural networks that mimic human intelligence to distinguish anomalies, locate deformed parts, and read challenging characters while tolerating natural variations in complex patterns. Deep learning complements traditional machine vision approaches, which struggle to appreciate variability and deviation between visually similar parts. In factory automation, Cognex Deep Learning can now perform judgment-based part location, inspection, classification, and character recognition more effectively than humans or traditional machine vision solutions.



Industry Leading Object Location

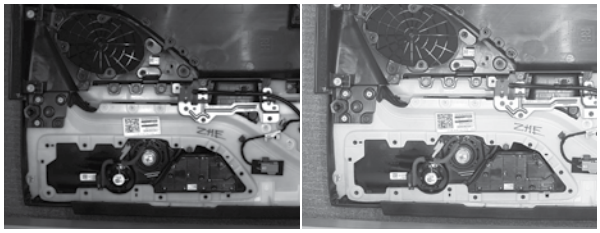
PatMax RedLine® is an accurate, highly repeatable tool that locates trained patterns no matter the size, rotation, or location of the target part. It is ideal for industries and applications that require large fields of view, high accuracy, large angle and scale tolerances, and multiple targets.

PatMax® 3D is an accurate 3D vision tool that locates trained patterns based on its 3D geometry under 6 degrees of freedom (X, Y, Z, Rx, Ry, Rz). It finds 3D objects within a 3D point cloud image and is ideal for locating and identifying objects which are tilted, stacked or not properly seated with a fixture.

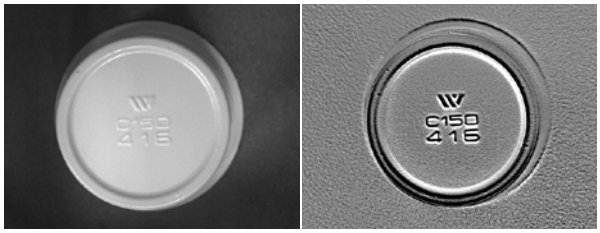


Advanced Image Formation Technology

HDR+ is a patent-pending technology that delivers a high-contrast, uniform image in a single acquisition for multi-point inspections of parts with varying depths of field and lighting conditions.

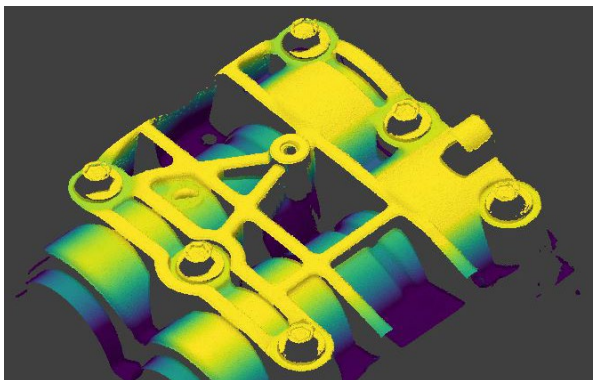


SurfaceFX™ uses lighting and software algorithms to remove noise and clutter from the surface background and isolate features and defects that are recessed or embossed on parts. It highlights surface defects such as chips, wrinkles, punctures, stamped text, and codes so other vision tools can perform their tasks.



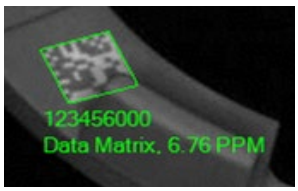
High-Performance 3D Vision

Patented, speckle-free blue laser optical system enables 3D vision systems to capture higher quality images than traditional laser displacement sensors in real-world factory settings.



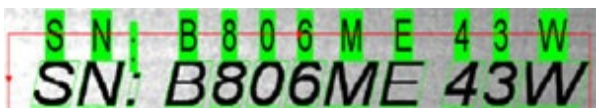
Code Reading

2DMax® with PowerGrid® is a breakthrough algorithm and technology designed to read 2D codes with significant damage to or complete elimination of a code's finder or clocking pattern, or quiet zone.



1DMax™ with Hotbars® is an algorithm and technology optimized for omnidirectional 1D barcode reading, decoding up to 10X the speed of a conventional barcode reader.

OCRMax,™ a font-trainable Optical Character Recognition and Verification (OCR and OCV) tool, has set industry records for ease of use, read rates and speed in complex images. This powerful algorithm prevents misreads, handles process variations, and provides easy font management.



DEEP LEARNING

Cognex Deep Learning solutions learn to spot patterns and anomalies from reference image examples, which automates and scales complex inspection applications that until now still required human inspectors.

In-Sight D900 Vision System with In-Sight ViDi

In-Sight® ViDi™ deep learning applications are deployed on the In-Sight D900 smart camera without the need for a PC, making deep learning technology accessible to non-programmers. It uses the familiar and easy-to-use In-Sight software platform which simplifies application development and factory integration.

RESOLUTION

Up to 5MP

FEATURES

IP67 | Additional Storage | Integrated Lighting | Autofocus

See pages 14–15 for specifications.

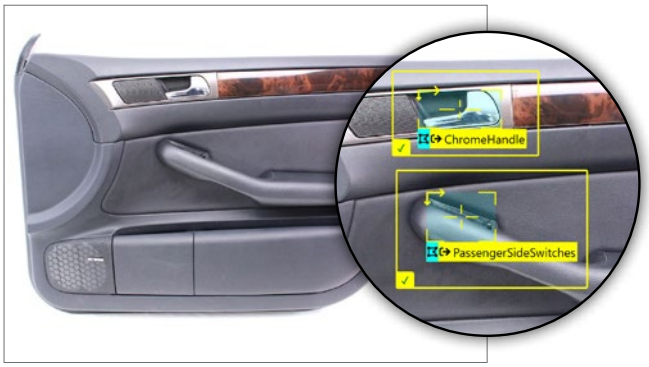
VisionPro Deep Learning

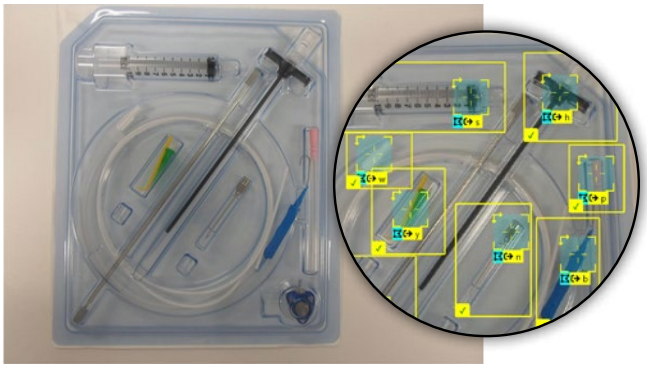
Best-in-class, deep learning image analysis software for complex and human-like inspection applications created in the same environment as traditional machine vision tools. Deep learning solves complex applications that are too difficult for traditional machine vision or too inconsistent and time-consuming for manual inspection. These include assembly verification, defect detection, classification, and challenging OCR.

DEEP LEARNING TOOLS

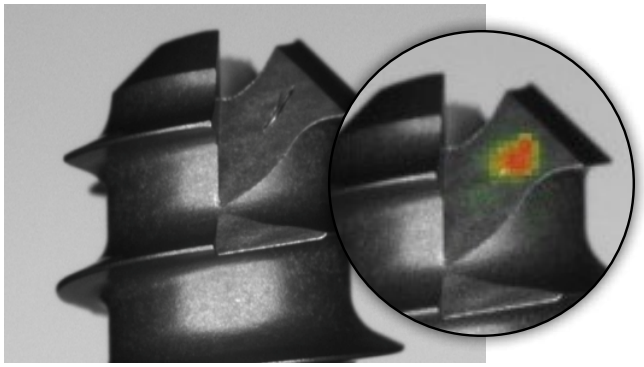
Cognex Deep Learning tools solve complex manufacturing applications that are too difficult or time consuming for rule-based machine vision systems, and too fast for reliable, consistent results with human visual inspection.

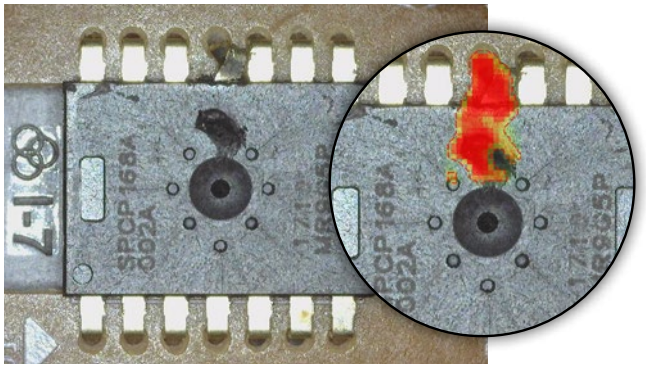
Feature Location and Assembly Verification



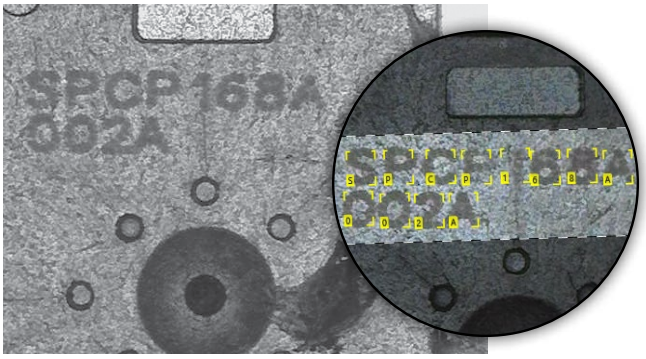


Defect Detection

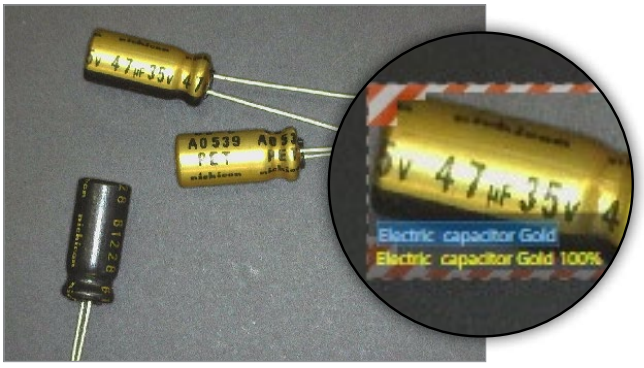


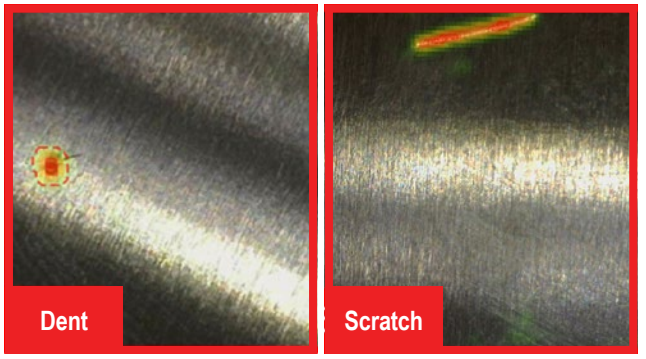


Complex OCR



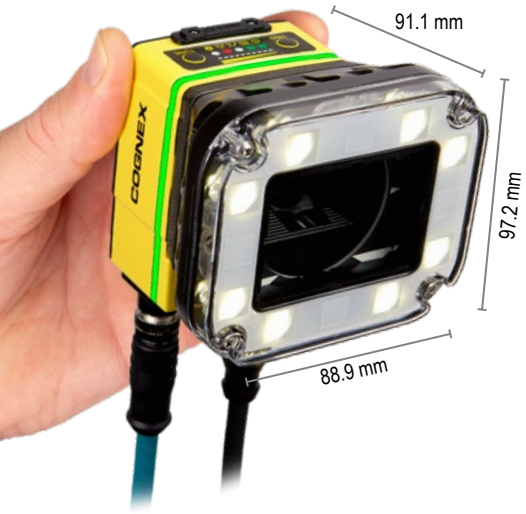
Classification





2D VISION SYSTEMS

Cognex In-Sight 2D vision systems are unmatched in their ability to inspect, identify, and align parts. These self-contained, industrial-grade vision systems combine a library of advanced vision tools with high-speed image acquisition and processing. A wide range of models, including line scan and color systems, meet most price and performance requirements.



In-Sight 7000 Series

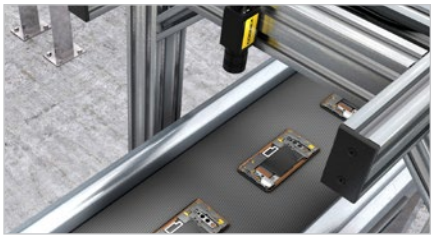
Combines modular integrated lighting and optics for optimal image formation with powerful vision tools and ease of use in a compact footprint for fast, accurate inspections on space-constrained production lines.

RESOLUTION

Up to 5MP

FEATURES

IP67 · HDR+ · Integrated Lighting · Autofocus



In-Sight 8000 Series

Ultra-compact standalone vision systems deliver industry-leading vision-tool performance in the micro form factor of a typical GigE vision camera.

RESOLUTION

Up to 5MP

AVAILABLE FEATURES

Micro · PoE · HDR+

In-Sight 9000 Series

Rugged, ultra-high-resolution standalone vision systems equipped with a full suite of In-Sight vision tools solve high accuracy part location, measurement, and inspection applications. Line scan and area scan image acquisition options are available for imaging large continuously moving or stationary objects.

RESOLUTION

Area Scan: Up to 12MP
Line Scan: Up to 32MP

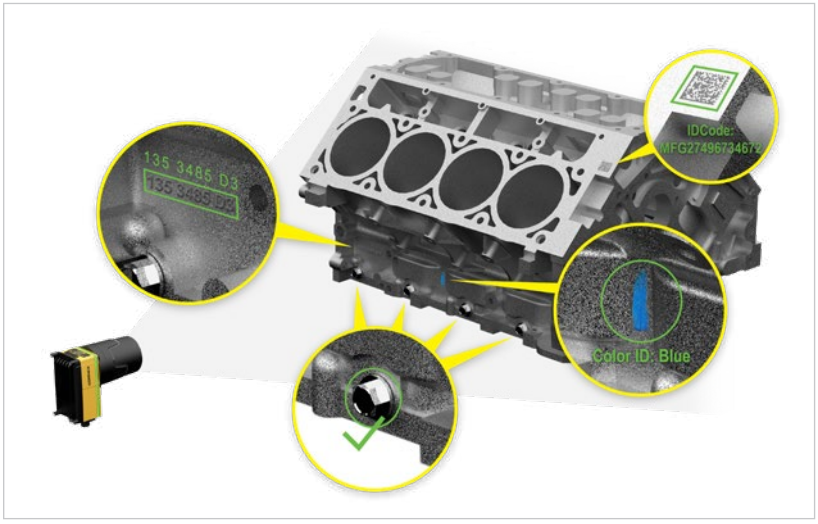
FEATURES

IP67

Additional Storage

In-Sight 9912 Area Scan

Standalone, ultra-high-resolution 12MP, vision system acquires and processes exceptionally detailed images for high accuracy part location, measurement, and inspection over a large area—even when mounted at longer distances.



In-Sight 9902 Line Scan

Self-contained vision systems ideal for detailed inspections of large, cylindrical, or continuously moving objects. 1K and 2K modes deliver high-resolution images that can used to detect even the smallest features and defects.

VISION SENSORS

Vision sensors perform simple pass/fail applications that help ensure products and packaging manufactured on an automated production line are error-free and meet stringent quality standards. Cognex vision sensors provide highly reliable inspections thanks to powerful vision tools, integrated lighting, modularity, and an easy-to-use setup environment.

In-Sight 2000 Series

Ideal for solving error-proofing applications, these vision sensors set new standards for value, ease of use, and flexibility and can adapt to virtually any production line environment.

In-Sight 2000 Mini

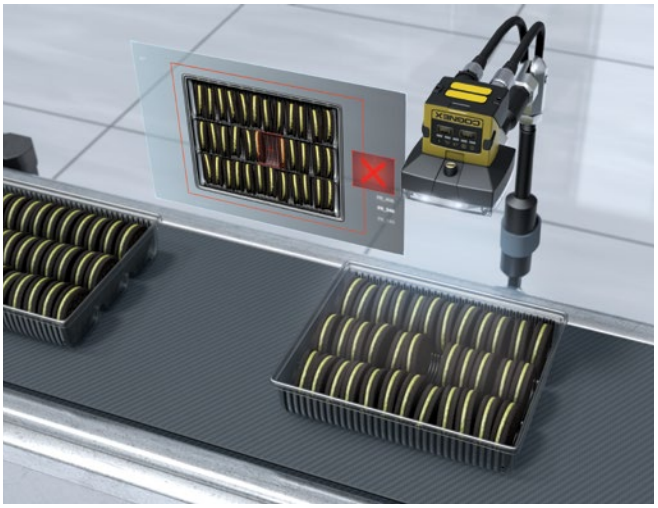
All the power of the In-Sight 2000 vision sensor in an ultra-compact form factor allows users to deploy vision sensors in machines or production lines with limited mounting space.

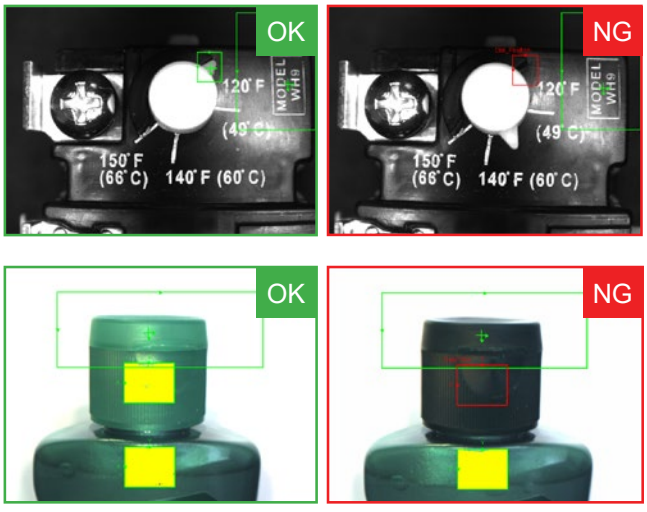
RESOLUTION

Up to 1.2MP

FEATURES

Monochrome · Color · Integrated Lighting · Autofocus · IP65 · PoE

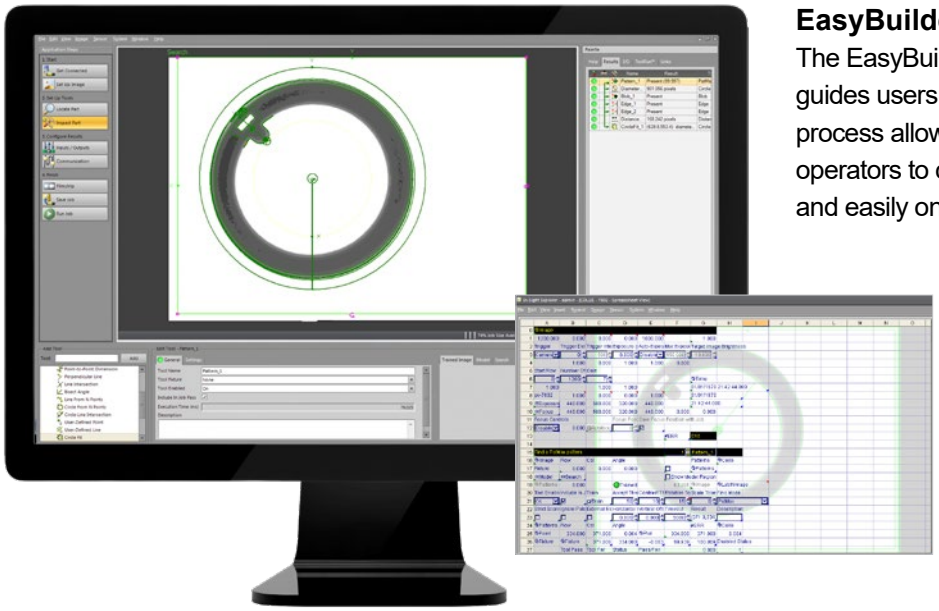




IN-SIGHT
2D VISION SOFTWARE

In-Sight Explorer

All In-Sight 2D products, from vision sensors to vision systems, are configured with the powerful, yet intuitive In-Sight Explorer® software. The easy-to-use interface walks you step by step through the setup process and provides the power and flexibility of the vision spreadsheet for more difficult applications. In-Sight Explorer also offers the widest range of built-in communication protocols that interface directly to any PLC, robot, or HMI on the factory network.



EasyBuilder

The EasyBuilder® configuration environment guides users through a step-by-step setup process allowing both novice and experienced operators to configure vision applications quickly and easily on vision sensors and vision systems.

Spreadsheet

Access to the spreadsheet provides ultimate application development flexibility without programming.

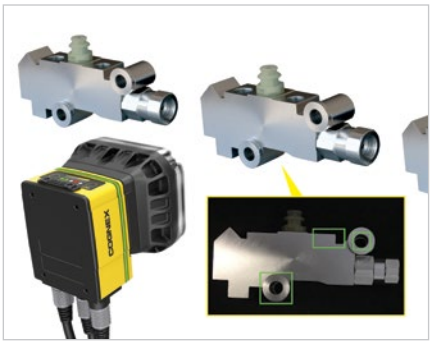
Easy-to-deploy HMI

Cognex In-Sight sensors and systems offer multiple runtime visualization options, including VisionView® — available as a ready-to-deploy LCD touch panel and as a PC application — and a platform independent Web HMI that runs in any internet browser. Both VisionView and the Web HMI allow users to view inspection images and results and to modify setup parameters.

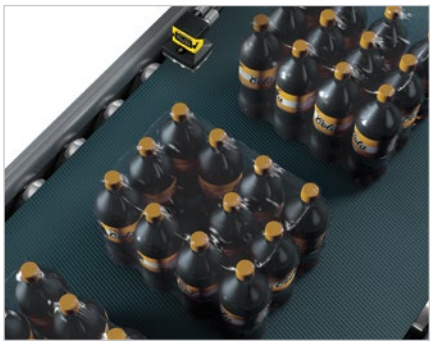
Visit www.cognex.com/explorer

2D VISION APPLICATIONS

Automotive



Food & Beverage



Electronics

Pharmaceutical

MODULAR DESIGN
FOR MAXIMUM FLEXIBILITY

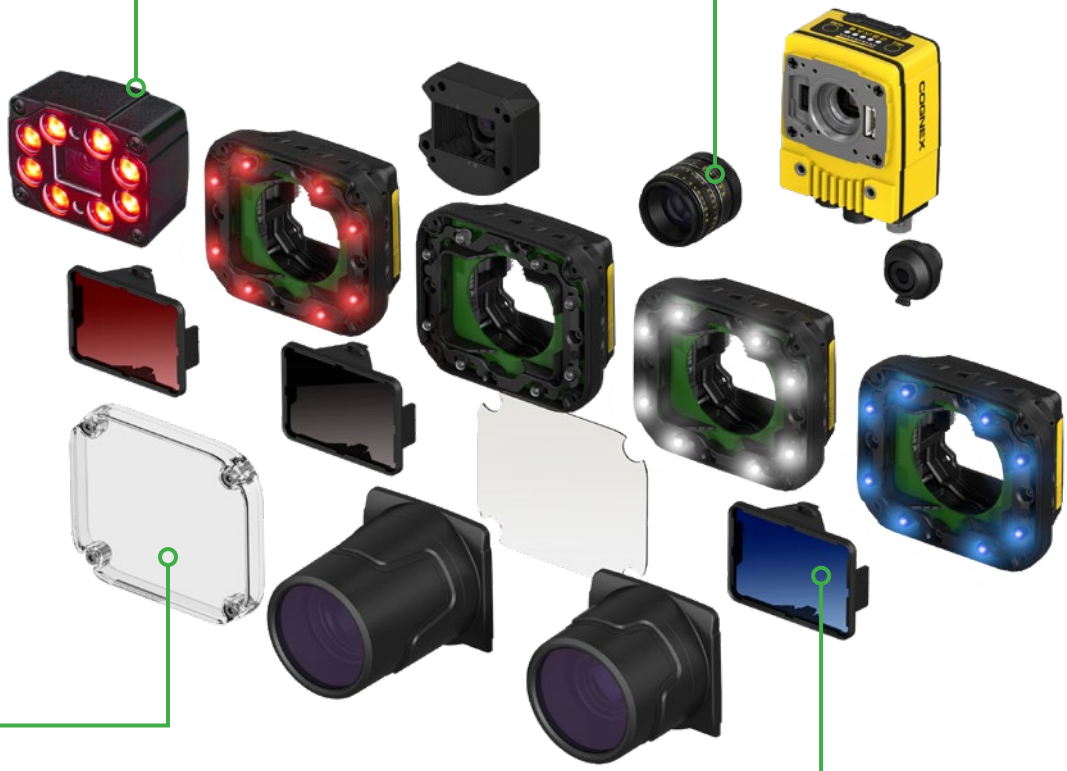
When it comes to factory automation, one size rarely fits all. That's why many In-Sight vision systems and vision sensors are designed with modular lights, lenses, and filters. These field-changeable and user-configurable options provide users with ultimate flexibility to customize the system for their specific application and easily adjust as needs change.

White, blue, red, and IR **LED lights** minimize the need for expensive external lighting and enhance specific features or text.

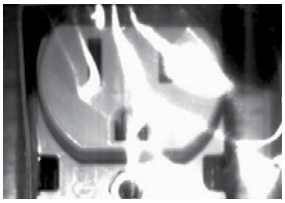
Original color image, ambient light

Monochrome camera image with blue light

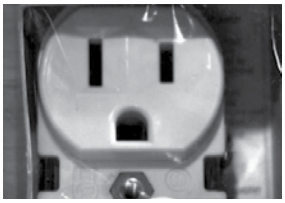
Field changeable C-mount, S-mount, and autofocus lenses for best image resolution based on working distance.



Polarizers reduce glare or hot spots and enhance contrast so entire objects can be recognized.

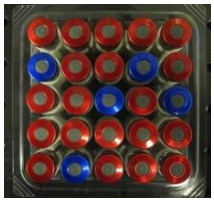


No filter specular glare



With a linear polarizer

Color filters create contrast to lighten or darken features of the object.



Original color image

No filter

Blue Bandpass Filter

2D VISION SENSORS AND VISION SYSTEMS SPECIFICATIONS

	2000 Series	5705 Series	7000 Series	8000 Series	9000 Series	D900 Series
Image						
Imager Type	Monochrome/Color Area Scan	Monochrome/Color Area Scan	Monochrome/Color Area Scan	Monochrome/Color Area Scan	Monochrome/Color Area Scan, Monochrome line scan	Monochrome/Color Area Scan
Resolution	Up to 1.2MP (1280 x 960)	5MP (2448 x 2048)	Up to 5MP (2448 x 2048)	Up to 5MP (2448 x 2048)	12MP (4096 x 3000), 32MP (2048 x up to 16,384 lines) for line scan	Up to 5MP (2592 x 1944)
Acquisition Speed (Max)	75 fps	16 fps	Up to 217 fps	Up to 217 fps	Up to 14 fps, 66K lines per second for line scan	Up to 51 fps
Options						
Lenses	S-Mount, Autofocus	C-Mount	C-Mount, S-Mount, Autofocus	C-Mount	C-Mount	C-Mount, S-Mount, Autofocus
Lighting	Integrated	N/A	Integrated, External light via light control connector	N/A	External light via light control connector (area scan only)	Integrated, External lights via light control connector
Networking						
Speed	Gigabit Ethernet (10/100/1000 Mbps)					
General Protocols	TCP/IP, UDP, FTP, Telnet, RS-232C	TCP/IP, UDP, FTP, SFTP, Telnet, SMTP				TCP/IP, FTP
Industrial Protocols	OPC UA, EtherNet/IP with AOP, PROFINET Class B, iQSS, Modbus TCP, SLMP/ SLMP Scanner, CC-Link IE Field Basic	OPC UA, EtherNet/IP with AOP, PROFINET Class B, iQSS, Modbus TCP, SLMP/SLMP Scanner, CC-Link IE Field Basic, IEEE 1588 (CIP Sync)		OPC UA, EtherNet/IP with AOP, PROFINET Class B, iQSS, Modbus TCP, SLMP/ SLMP Scanner, CC-Link IE Field Basic	OPC UA, EtherNet/IP with AOP, PROFINET Class B, iQSS, Modbus TCP, SLMP/ SLMP Scanner, CC-Link IE Field Basic, IEEE 1588 (CIP Sync)	Ethernet/IP with AOP, Profinet Class A, Profinet Class B
I/O						
Trigger input	1	1	1	1	1	1
General purpose input	1		1		1	1
General purpose output	4	2	2	2	2	2
Bi-Directional			2		2 (area scan only)	2
Encoder					2 (line scan only)	
Expansion I/O	CIO-1400	CIO-1400, CIO-Micro	CIO-1400, CIO-Micro	CIO-Micro	CIO-1400, CIO-Micro	
Serial	RS-232C					

	2000 Series	5705 Series	7000 Series	8000 Series	9000 Series	D900 Series
Mechanical						
Length	In-line: 92 mm (3.61 in), Right-angle: 61 mm (2.42 in)	124.1 mm (4.88 in)	90.1 mm (3.54 in)	75.5 mm (2.97 in)	121.0 mm (4.77 in)	121.0 mm (4.77 in)
Width	60 mm (2.38 in)	61.4 mm (2.42 in)	60.5 mm (2.38 in)	35 mm (1.38 in)	60.5 mm (2.38 in)	60.5 mm (2.38 in)
Depth	52 mm (2.05 in)	52 mm (2.05 in)	Up to 2MP: 35.7 mm (141 in), 5MP: 49.4 mm (1.94 in)	32 mm (1.26 in)	53.4 mm (2.10 in)	53.4 mm (2.10 in)
Protection	IP65	IP67	IP67	IP40	IP67	IP67
Vision Tools						
Deep Learning						✓
Pattern Matching	✓	✓ Available PatMax and PatMax RedLine				
Blob	✓	✓	✓	✓	✓	✓
Edge	✓	✓	✓	✓	✓	✓
Measurement	✓	✓	✓	✓	✓	✓
1D/2D Code Reading		✓ IDMax®	✓ IDMax, PowerGrid, Hotbars	✓ IDMax, PowerGrid, Hotbars	✓ IDMax, PowerGrid, Hotbars	✓ IDMax
OCR	✓	✓	✓	✓	✓	✓
Flaw Detection		✓	✓	✓	✓	✓
Color Verification	✓	✓	✓	✓	✓	✓
Color Identification		✓	✓	✓	✓	✓
Histogram		✓	✓	✓	✓	✓
Brightness	✓	✓	✓	✓	✓	✓
Pixel Counting	✓	✓	✓	✓	✓	✓
Contrast	✓	✓	✓	✓	✓	✓
Image Filters	✓	✓	✓	✓	✓	✓

3D VISION SYSTEMS

Whether performing a single profile measurement or scanning an entire surface in 3D, Cognex has the most powerful and robust 3D vision tools. Manufacturers in all industries trust Cognex technology to deliver high accuracy surface feature measurements that go beyond the capabilities of 2D vision technology.

In-Sight 3D-L4000 Series

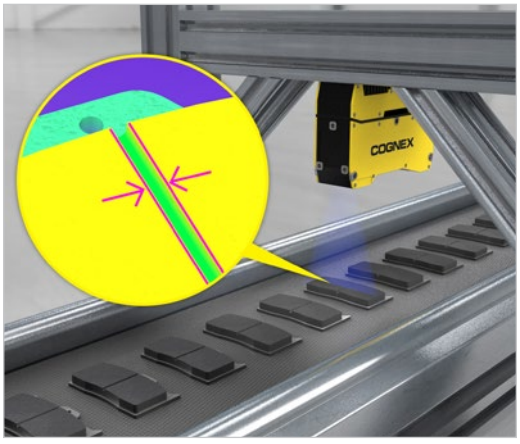
A unique vision system combining 3D laser displacement technology with a high-performance smart camera allowing factory engineers to quickly, accurately, and cost effectively solve a wide variety of inspections thanks to a comprehensive suite of true 3D vision tools, easy setup, and speckle-free blue laser optics.

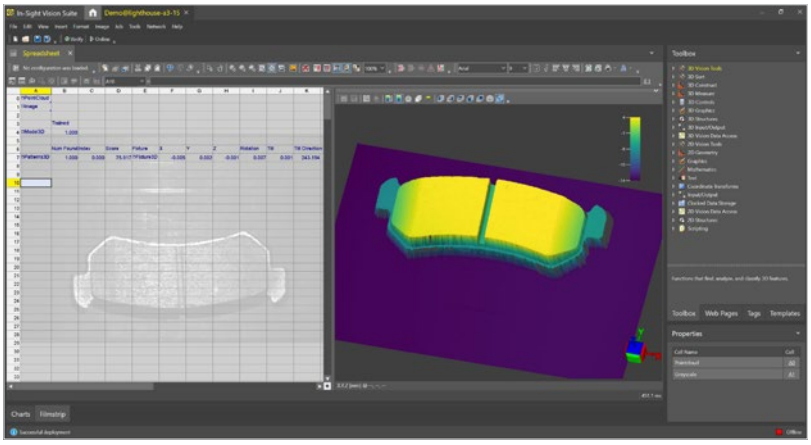
3D RESOLUTION

2000 points

FEATURES

3D · ESD-Safe · Factory Calibrated · IP65





3D-A5000 Series

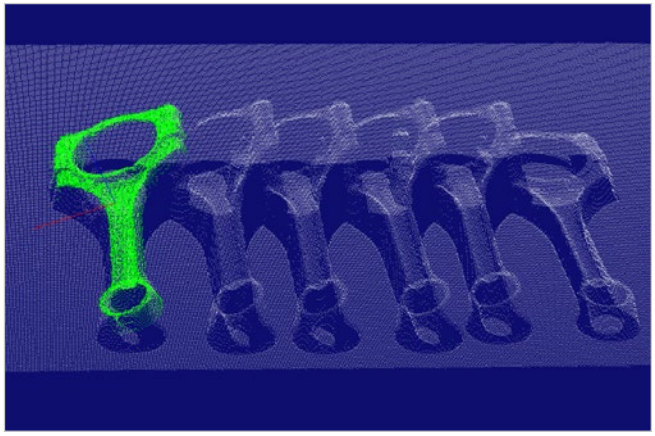
State-of-the-art area scan 3D camera captures high-resolution 3D point cloud images in a fraction of the time of current methods. Using unique 3D imaging technology, it solves challenging assembly verification, in-line metrology, and robotic guidance applications.

3D RESOLUTION

1.5 million points

FEATURES

LightBurst · Factory Calibrated · IP65



DSMax

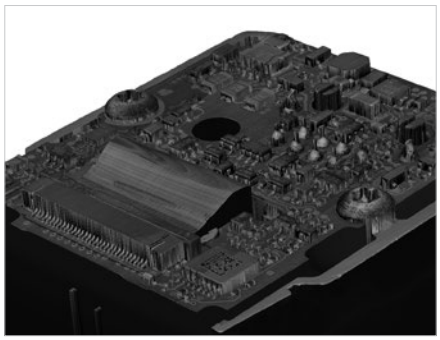
Fast, high-definition laser displacement sensor for accurate 3D inspections of small, detailed parts. Ideal solution for electronic components which can contain highly reflective or dark features.

3D RESOLUTION

2000 points

FEATURES

ESD-Safe · IP65



3D VISION SYSTEMS SPECIFICATIONS

In-Sight 3D-L4000 Series

	IS3D-L4050	IS3D-L4100	IS3D-L4300
3D Technology	Displacement Sensor		
Clearance Distance (CD)	92.00 mm (3.6 in)	130.00 mm (5.1 in)	180.00 mm (7.1 in)
Measurement Range (MR)	106.00 mm (4.2 in)	235.00 mm (9.3 in)	745.00 mm (29.3 in)
Near FOV	55.00 mm (2.2 in)	75.00 mm (3.0 in)	95.00 mm (3.7 in)
Far FOV	90.00 mm (3.5 in)	180.00 mm (7.1 in)	460.00 mm (18.1 in)
Resolution XY	30.2–49.5 µm	41.7–99.0 µm	54.2–260.4 µm
Resolution Z	2.5–6.9 µm	4.4–25.9 µm	6.9–147.5 µm
Acquisition Rate	4 kHz		
Protection	IP65		
Software	In-Sight Vision Suite		

3D-A5000 Series

	3D-A5120	3D-A5060	3D-A5030	3D-A5005
3D Technology	3D LightBurst Area Scan			
Clearance Distance (CD)	1000.0 mm (39.4 in)	1400.0 mm (55.1 in)	1465.0 mm (57.7 in)	299.3 mm (11.8 in)
Measurement Range (MR)	1000.0 mm (39.4 in)	400.0 mm (15.7 in)	80.0 mm (3.1 in)	12.0 mm (0.5 in)
Near FOV	900 x 675 mm (35.4 x 26.6 in)	520 x 390 mm (20.1 x 15.4 in)	280 x 210 mm (11.0 x 8.3 in)	60 x 44 mm (2.4 x 1.7 in)
Far FOV	1760 x 1320 mm (69.3 x 52 in)	645 x 490 mm (25.4 x 19.3 in)	285 x 216 mm (11.2 x 8.5 in)	65 x 46 mm (2.6 x 1.8 in)
Resolution XY	626–1223 µm	361–454 µm	195–200 µm	42–44 µm
Resolution Z	414–1656 µm	338–690 µm	178–213 µm	7–8 µm
Acquisition Time	200 msec			
Protection	IP65			
Software	VisionPro® & Cognex Designer			

DSMax

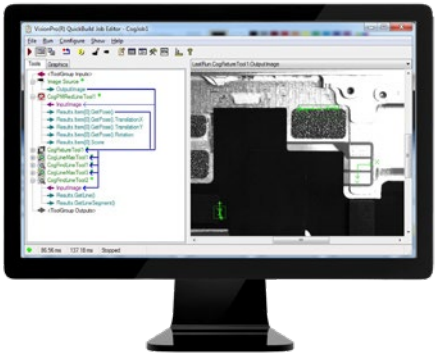
	DSMax32T
3D Technology	Laser Displacement Sensor
Clearance Distance (CD)	51.4–62.3 mm (2.0–2.5 in)
Measurement Range (MR)	10.9 mm (0.4 in)
Near FOV	30 mm (1.2 in)
Far FOV	31.5 mm (1.2 in)
Resolution XY	14.6–15.4 µm
Resolution Z	2.5–2.8 µm
Acquisition Rate	Up to 18 KHz
Protection	IP67
Software	VisionPro & Cognex Designer

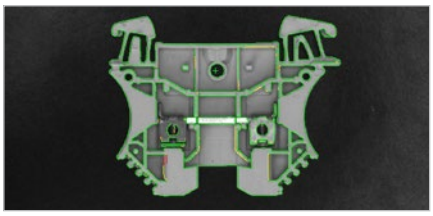
VISION SOFTWARE

Cognex vision software provides the power and flexibility to solve your most challenging machine vision applications in a PC environment. It enables the highest speed applications with the flexibility to choose the camera needed for your vision application. It addition to the programmatic interfaces provided across the vision software products, VisionPro and Cognex Designer make application development easier than ever through their graphical development environments.

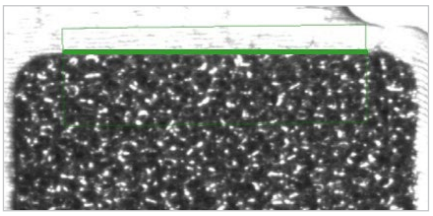
VisionPro

A powerful development environment to tackle any vision challenge. VisionPro enables the rapid development of sophisticated vision software through its extensive tool prototyping that allow you to visually define and tune your application. VisionPro's seamlessly integrated programming interface enables the deployment of highly-customizable applications on your PC platform.

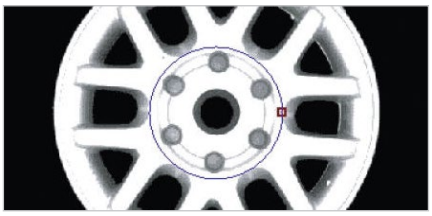




PatMax
Object location



LineMax
Line finding



Blob Analysis
Geometric analysis

Cognex Designer

Cognex Designer combines the power and flexibility of VisionPro with an intuitive graphical interface. Cognex Designer enables developer efficiency by simplifying HMI creation and application integration.

Vision Accessories

A wide variety of industrial cameras, frame grabbers, and I/O factory communication cards for system flexibility.

BUILD YOUR VISION

2D VISION SYSTEMS

Cognex machine vision systems are unmatched in their ability to inspect, identify and guide parts. They are easy to deploy and provide reliable, repeatable performance for the most challenging applications.

www.cognex.com/machine-vision

3D VISION SYSTEMS

Cognex In-Sight laser profilers and 3D vision systems provide ultimate ease of use, power and flexibility to achieve reliable and accurate measurement results for the most challenging 3D applications.

www.cognex.com/3D-vision-systems

VISION SOFTWARE

Cognex vision software provides industry leading vision technologies, from traditional machine vision to deep learning-based image analysis, to meet any development needs.

www.cognex.com/vision-software

BARCODE READERS

Cognex industrial barcode readers and mobile terminals with patented algorithms provide the highest read rates for 1D, 2D and DPM codes regardless of the barcode symbology, size, quality, printing method or surface.

www.cognex.com/barcodereaders

COGNEX

Companies around the world rely on Cognex vision and barcode reading to optimize quality, drive down costs and control traceability.

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