

In-Sight VISION SENSORS



**PRODUCT GUIDE
2003-2**

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In-Sight® vision sensors from Cognex®, the world's leading machine vision company, are low-cost, high-performance online inspection devices that are used to automatically identify and measure parts, verify the correct assembly of products, and guide production equipment. Delivering unprecedented vision power and ease-of-use, In-Sight sensors are the standard for machine vision on the factory floor, and are helping manufacturers around the world improve productivity, ensure product quality, and lower manufacturing costs.

**MACHINE VISION
THAT WORKS**

In-Sight vision sensors provide a variety of models to meet the specific cost and functionality requirements of the application. Each sensor is equipped with a full library of proven Cognex vision tools, a spreadsheet interface for quick set-up, and the tools with which to administer a vision sensor network. Additionally, Ethernet communication is built into most models, so that multiple In-Sight sensors can be linked across the factory, vision activity can be managed from remote locations, and inspection results can be shared among all levels of the organization.

Whether for experienced machine vision users or for those just getting started, In-Sight vision sensors help solve inspection tasks more efficiently, reliably, and affordably than ever before. Very simply, it's machine vision that works.

VISION SENSORS FOR EVERY MANUFACTURING LINE

Whether it's for solving a single-point inspection task or building an entire factory-wide network of vision sensors, the In-Sight product family provides a choice of platforms to help meet the cost and functionality requirements of the application.

GENERAL-PURPOSE VISION SENSORS



IN-SIGHT 1000

- All-in-one, fully integrated vision sensor offering exceptional price/performance
- Lowest cost general purpose In-Sight vision sensor
- Built-in Ethernet 10/100BASE-T communications port
- Configured through PC



IN-SIGHT 1000C

- Color vision sensor with powerful color image processing and analysis tools
- Simplifies monitoring of color parts
- Built-in Ethernet 10/100BASE-T communications port
- Configured through PC



IN-SIGHT 4000

- High-performance In-Sight vision sensor offering fast frame rates and accelerated tool performance
- Built-in Ethernet 10/100BASE-T communications port
- Configured through PC



IN-SIGHT 4001

- High-resolution version (1024 x 768) of In-Sight 4000
- Ideal for applications that require increased resolution for inspecting small objects, or capturing images of larger parts
- Built-in Ethernet 10/100BASE-T communications port
- Configured through PC



IN-SIGHT 4100

- Compact, remote head camera (1.18" dia. x 1.54" D) version of the In-Sight 4000.
- Ideal for applications where a small and/or lightweight camera head is required, or in harsh industrial environments where protection from dust and wash down is necessary.
- Compatible with Ethernet display
- Built-in Ethernet 10/100BASE-T communications port
- Configured through PC

GENERAL-PURPOSE STANDALONE VISION SENSORS



IN-SIGHT 2000

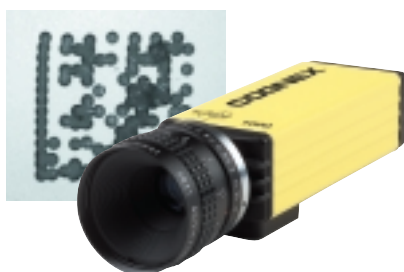
- Cost-effective, standalone vision sensor
- Features built-in light control and discrete I/O
- Compatible with VGA display
- Configured with hand-held control pad, no PC required



IN-SIGHT 3000

- High-performance In-Sight vision sensor featuring separate vision and networking processors
- Features built-in light control and discrete I/O
- Compatible with Ethernet or VGA displays
- Configured with hand-held control pad, no PC required

APPLICATION-SPECIFIC READERS

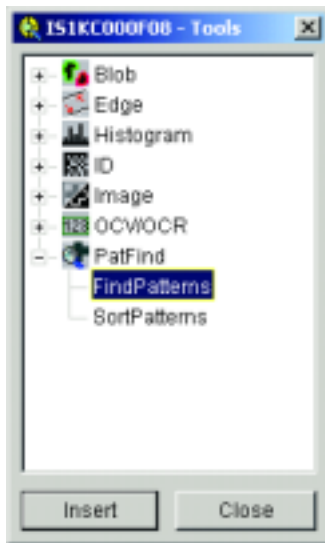


IN-SIGHT 1010

- ID code reader for 1D and 2D codes
- Compact, integrated camera, ID software, and processor
- Reads the toughest codes; provides verification metrics
- Built-in Ethernet 10/100BASE-T communications port
- High-speed reading (up to 30 reads per second)

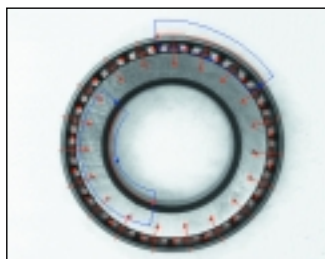
ADVANCED VISION SYSTEM CAPABILITY

Most smart cameras and low-cost vision systems available today are capable of solving only the simplest vision tasks – and only under the most ideal manufacturing conditions. As a result, many of these products prove unreliable when confronted with real-world manufacturing conditions such as inconsistent lighting and normal part-to-part variations.



In-Sight vision sensors feature a full library of proven Cognex vision tools, for a wide range of vision tasks.

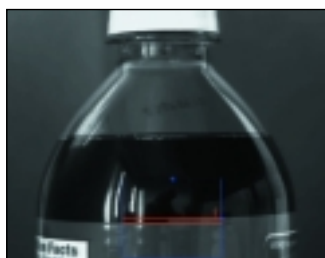
In-Sight provides low-cost vision that really works – even under the most challenging conditions. Each model is equipped with a full library of Cognex image processing and grey-scale analysis tools, including *PatFind™*, a supertool for locating parts. All tools are based on the same robust, reliable vision technology found in high-performance Cognex programmable systems.



INSPECTION



PART LOCATION

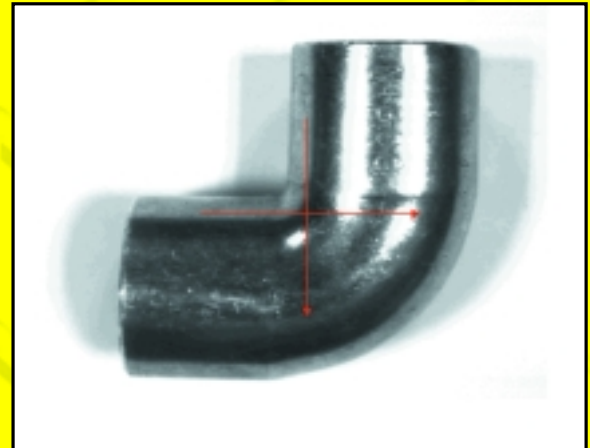


GAUGING



PART IDENTIFICATION

TRAIN... AND FIND!



TRAINED REFERENCE IMAGE

With *PatFind*, training a reference image is as simple as placing the subject part under the In-Sight camera and acquiring an image. *PatFind* then finds the parts at runtime under even the most challenging conditions.



ROTATION AND SCALE

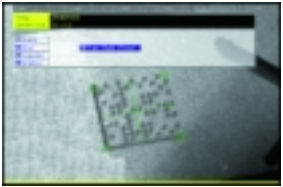
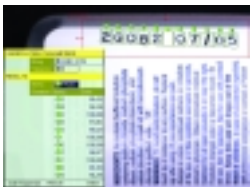
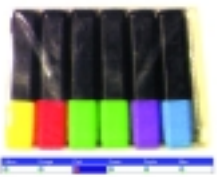


CHANGES IN PART APPEARANCE



LIGHTING VARIATIONS

VISION TOOL OVERVIEW

TOOL CATEGORY	DESCRIPTION	THE COGNEX ADVANTAGE
PART LOCATION TOOLS 	Accurately locates parts and part features within the camera's field of view	- Handles wide variations in part orientation, size, and appearance - Loosens fixturing requirements and need to control lighting conditions
INDUSTRIAL CODE READING TOOLS 	Reads 1D and 2D bar codes on a wide range of part surfaces	- Handles low-contrast, poorly formed codes resulting from process degradation and marking techniques such as dot pen and laser etch - Reads up to 50 codes per second - Supports wide range of commonly used code formats
INSPECTION TOOLS 	Verifies the correct assembly of components and finds flaws in part appearance	- Provides robust, repeatable inspection results despite changes in part orientation - Image processing capabilities optimize inspection performance - Allows users to easily classify defects by defect type
MEASUREMENT TOOLS 	Measures distances between image features, locates straight and curved edges, sorts edges into pairs, and computes edge statistics	Enables high-accuracy gauging of critical part dimensions despite changes in part orientation and ambient lighting
OCV/OCR TOOLS 	Verifies and reads alphanumeric character strings	- Handles low-contrast strings, as well as strings with confusing or unevenly-spaced characters - Verifies/reads up to 600 strings per minute
COLOR VISION TOOLS* 	Verifies and sorts a wide range of part types based on color	- Provides robust, reliable color detection of a wide range of part types - Converts color images to grey-scale for additional types of inspections

*Available on the In-Sight 1000C vision sensor

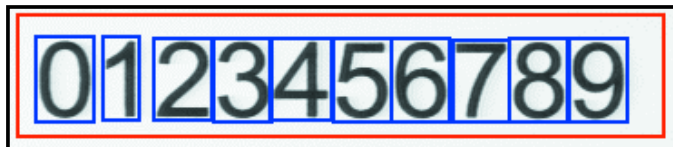
OPTICAL CHARACTER VERIFICATION AND READING

In-Sight OCV and OCR tools deliver accurate, reliable character verification and reading performance in a compact, low-cost package. Adaptable to a wide range of conditions, the In-Sight OCV and OCR tools utilize advanced recognition algorithms to reliably verify and read printed codes containing unevenly spaced characters, confusing characters (such as “B” and “8”), and touching characters. Additionally, the tools tolerate changes in label orientation, as well as changes in code appearance caused by low-contrast printing, poor lighting conditions, or print degradation. And, these tools can verify up to 600 labels per minute, making it well suited for today’s high-speed packaging lines.

FONT TRAINING, FAST AND SIMPLE

In-Sight OCV and OCR tools allow users to quickly teach the system multiple characters by simply drawing a box around the examples and clicking the train button. Characters are automatically segmented from each other, and can be edited to clean up printing voids and extraneous marks. A statistical font training capability is also provided, which allows training the system on multiple instances of a character, each with different visual characteristics. This enables In-Sight to tolerate a range of normal variations in print quality.

Once fonts have been trained, they are automatically stored in the vision sensor’s memory. This enables on-the-fly character string changes in OCV applications without operator intervention.



With font-based training, characters are automatically segmented from each other.



APPLICATION EXAMPLES

OCV

- Verifying date and lot codes on pharmaceutical packages
- Verifying laser-engraved markings on metal and plastic medical devices

OCR

- Reading alphanumeric characters on automotive parts
- Inspecting codes on financial and insurance documents for legibility

CODE-READING AND IDENTIFICATION

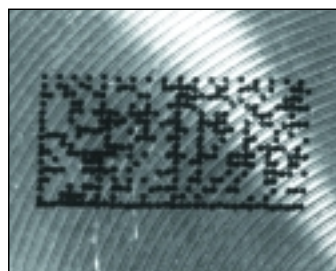
In-Sight code-reading tools, available for all In-Sight vision sensors, utilize advanced recognition algorithms to provide reliable reading of 1D and 2D codes. These powerful tools read codes that have been poorly formed, degraded, or which vary in position or orientation from part to part. The tools can also verify code quality to established standards, indicating how well the marking process is working.

Depending upon the application, these code-reading tools can read up to 50 codes per second, making In-Sight vision sensors the perfect choice for high-speed code reading applications.

In-Sight ID tools provide outstanding performance with the most popular marking methods...stamped, inkjet, dot peen, etched, and hot stamped...on surfaces such as glass, metal, ceramic, and plastic.

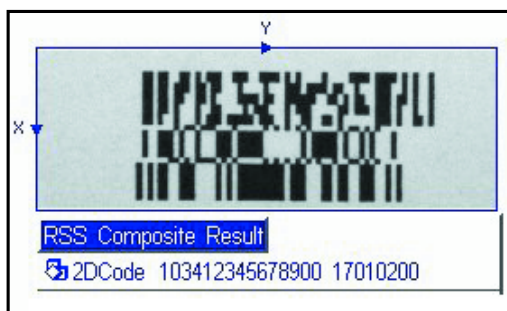


Applications include identification of codes (even if damaged or degraded) on items such as bottles.



Virtually every code applied by popular marking methods, such as the 2D inkjet on brushed metal code shown at left, can be read.

CODES SUPPORTED BY IN-SIGHT VISION SENSORS		
2D	1D	
• Data Matrix™ ECC200 • QR Code • PDF417 • Composite Symbology (CS)	• Code 3 of 9 • Code 128 • Interleaved 2 of 5 • Reduced Space Symbology (RSS)	• UPC/EAN • PostNet • Planet Code • Pharma Code • UPU-57



In-Sight provides accurate reading and verification of RSS and CS codes, enabling machine-readable encoding of pharmaceutical product information. This capability allows Cognex to implement National Drug Code requirements for identification and traceability.

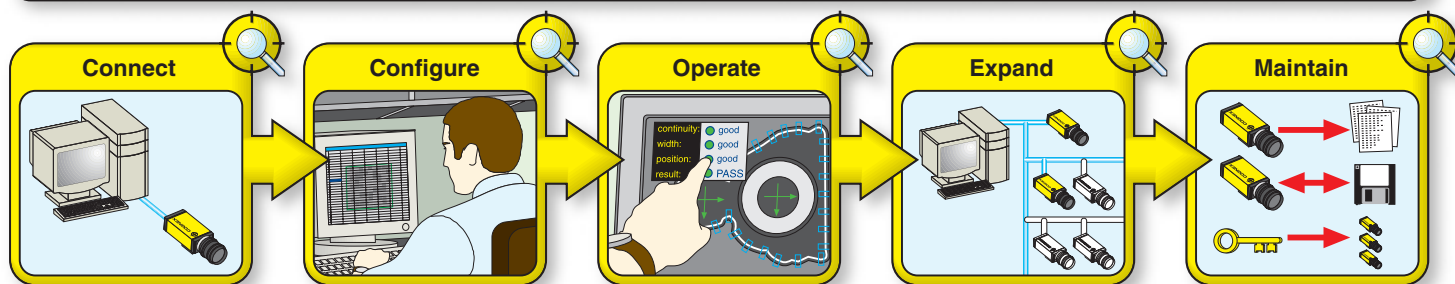
IN-SIGHT 1010 ID CODE READER

The compact, standalone In-Sight 1010 reads 1D and 2D codes, and communicates the information to local or company-wide locations. This innovative ID code reader provides users with powerful code reading performance, integrated CCD camera and processor, and a suite of communication options.



Powerful In-Sight code reading and identification tools include PostNet and Planet Code formats. Automated mail sorting applications achieve new levels of efficiency from the high-speed reading of these codes by In-Sight vision sensors.

AN INTEGRATED USER ENVIRONMENT FOR IN-SIGHT VISION SENSORS



In-Sight vision sensors have played a key role in reducing the cost of ownership of machine vision installations, due in part to the simplicity they bring to development and integration. In-Sight Explorer enhances the power of Cognex In-Sight vision sensors by combining efficient vision application development with powerful tools with which to administer a vision sensor network.

In-Sight Explorer is designed for the entire line of network-enabled In-Sight vision sensors. Incorporating the familiar Microsoft Windows® interface, In-Sight Explorer greatly enhances the In-Sight spreadsheet development tool. Additionally, integrated utilities simplify system setup, monitoring, and management. This easy-to-use environment translates into lower cost of ownership and faster deployment of vision applications onto the factory floor.

In-Sight Explorer achieves this by simplifying the five steps of the vision development life cycle:

- **Connect** Step-by-step wizards facilitate the connection of a single vision sensor to a PC, or the connection of multiple vision sensors to a factory floor network. No networking knowledge is required.
- **Configure** In-Sight Explorer enhances the powerful In-Sight spreadsheet with standard Windows functionality such as shortcuts, a new tool palette, image zooming and panning, and integrated context-sensitive help.
- **Operate** Flexible and customizable user interfaces can be created and independently password-protected for multiple sensors. These interfaces can be simultaneously viewed within a *single* In-Sight Explorer application, greatly enhancing the ease of monitoring a typical production line where multiple vision sensors are employed.
- **Expand** File utilities that allow backup and duplication enable the rapid addition of vision sensors across new production lines linked by an Ethernet network.
- **Maintain** Management utilities provide administration tools for maintaining networked vision sensors. These utilities include report generation, file management, and firmware updating.

ADVANTAGES

- Microsoft Windows look and feel provides a familiar user environment
- Wizards and intuitive operations enable simple setups
- Reporting feature facilitates management communications
- Simplified sensor management lowers total cost of ownership
- Environment is consistent across all In-Sight products
- Provides full compatibility with existing In-Sight jobs

BRINGING SIMPLICITY AND EFFICIENCY TO IN-SIGHT USERS

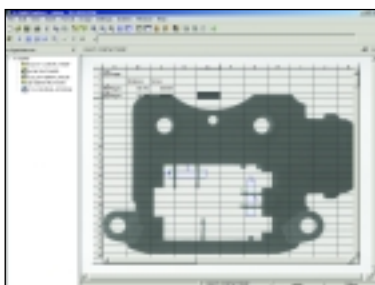
Here are a few examples of how In-Sight Explorer simplifies the development, integration, and administration of vision applications, reducing cost of ownership

Enhanced Development Environment



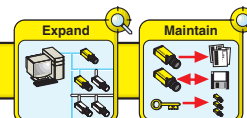
Point and Click graphical environment is designed for mouse and keyboard use as well as touch screen PCs.

Vision Tool Palette provides the ability to drag and drop vision tools from the palette directly to the spreadsheet.



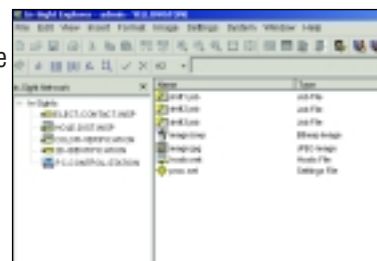
Task Bar allows the user to quickly access the most common features without navigating through menus or function keys.

File Manager



Backup and Restore allows the user to backup and restore systems to and from a PC.

Clone System facilitates the duplication of an entire system's settings and job files onto multiple systems.



Multi System Update enables the updating of firmware across a network of In-Sight systems.

View Manager



View Multiple Systems

allows the simultaneous viewing of one, two, four or more systems in a single screen, with tool graphics.

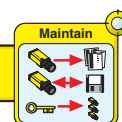


View Entire In-Sight Network

allows viewing of all In-Sight systems on the network, and includes an icon that indicates user access to a given system.

Pan, Zoom, Scale allows the user to pan, scale, or zoom into an In-Sight display.

Report Manager

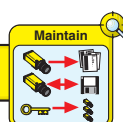


Job Reports produces current job information, including tools utilized and all I/O configurations in .xml format.

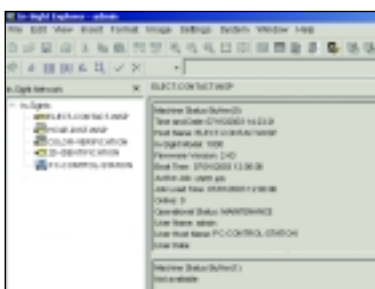
Network Reports provides the system's network settings and IP configurations in .xml format.



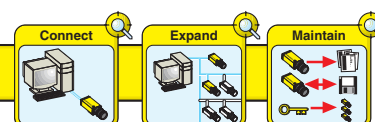
Machine Status Manager



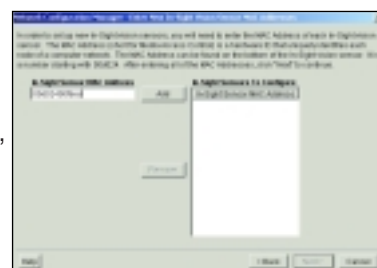
Provides a means to view machine status and user-selected information (including uptime, active job, online and offline information) for any In-Sight system.



Network Manager



Provides a step-by-step wizard interface to connect an In-Sight unit directly to a PC, add more units to the network, and set up or modify In-Sight vision sensors already connected to the network.

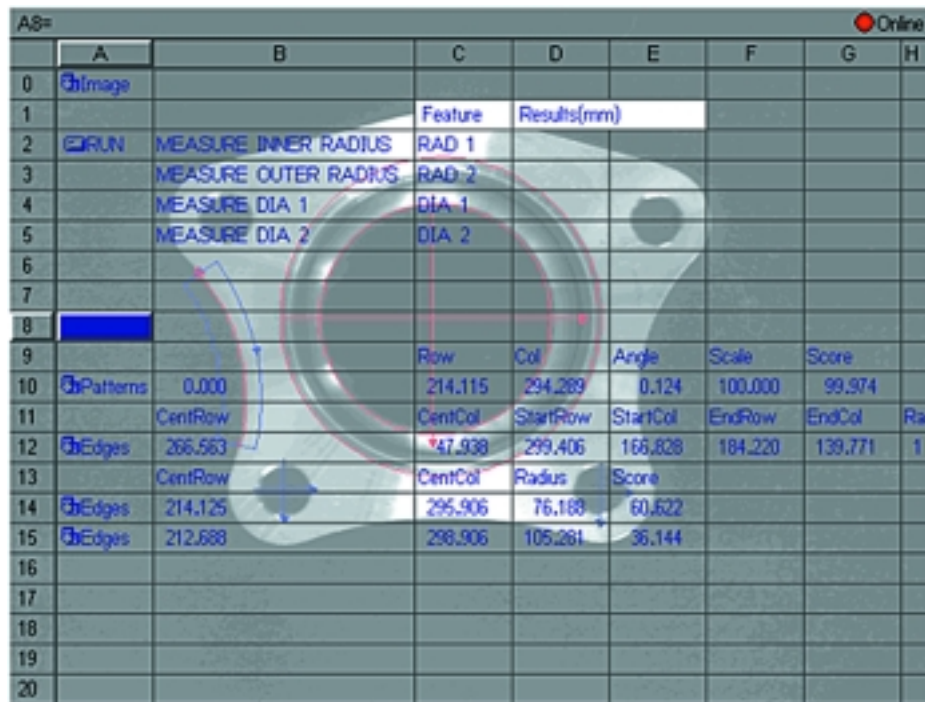


DEVELOPMENT INTERFACE

With the patent-pending In-Sight vision spreadsheet interface, vision applications can be set up in a fraction of the time it takes with a conventional vision system – all without any programming.

Combining the flexibility of a programming language with point-and-click simplicity, the vision spreadsheet enables the selection of tools and parameters from drop-down menus, and then automatically inserts tool results into cells. These can easily be linked together to perform the desired task. This makes “proof of concept” prototyping much faster, and enables applications to be modified on the fly during product changeovers. The interface also provides context-sensitive help, and menu text can be displayed in a variety of languages, including English, Japanese, French and German.

To make the vision application setup even easier, the vision spreadsheet is transparent, making an image of the part visible during setup. This allows you to see vision tools being applied to the image without having to switch between two separate screens.



AS=								Online
	A	B	C	D	E	F	G	H
0	Image							
1			Feature	Results(mm)				
2	MEASURE INNER RADIUS	RAD 1						
3	MEASURE OUTER RADIUS	RAD 2						
4	MEASURE DIA 1	DIA 1						
5	MEASURE DIA 2	DIA 2						
6								
7								
8								
9			Row	Col	Angle	Scale	Score	
10	Patterns	0.000	214.115	294.289	0.124	100.000	99.974	
11	CentRow		CentCol	StartRow	StartCol	EndRow	EndCol	Ra
12	Edges	266.563	47.938	299.406	166.828	184.220	139.771	1
13	CentRow		CentCol	Radius	Score			
14	Edges	214.125	295.906	76.168	60.622			
15	Edges	212.688	298.906	105.281	36.144			
16								
17								
18								
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20								

The In-Sight vision spreadsheet enables fast, easy setup of vision applications without any programming.

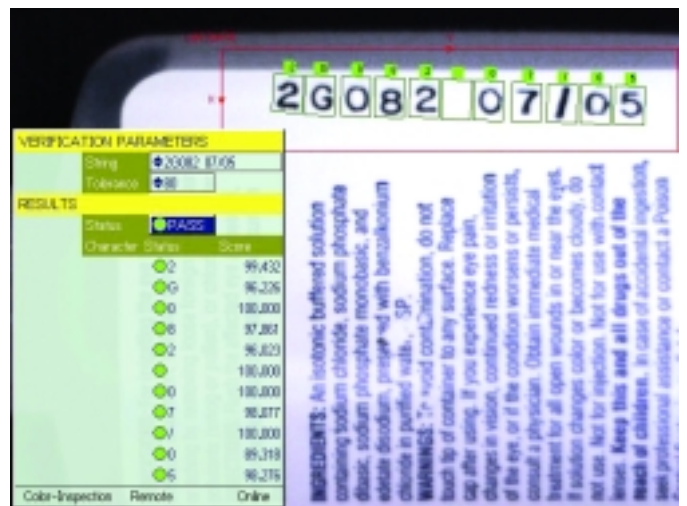
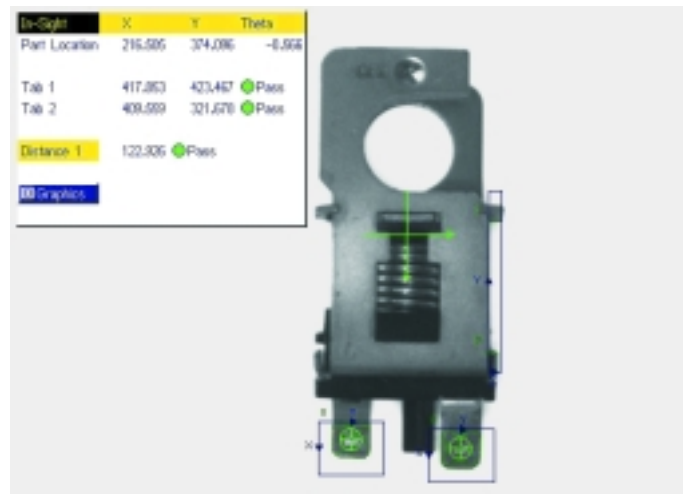
WHY A SPREADSHEET FOR VISION?

What benefits does a spreadsheet approach offer for machine vision? First, machine vision operations are based on data, and spreadsheets offer one of the most robust, efficient means of working with large data sets. Second, spreadsheets can include hundreds of specialized functions, options and operations. These range from advanced mathematics to annotated graphics. Therefore, they have a great deal of built-in capability. Finally, spreadsheets provide a familiar work environment. Most engineers have used spreadsheets for statistical process evaluations, or even expense reports. This familiarity helps minimize the learning curve for inexperienced users and eliminates the need to learn a programming language.

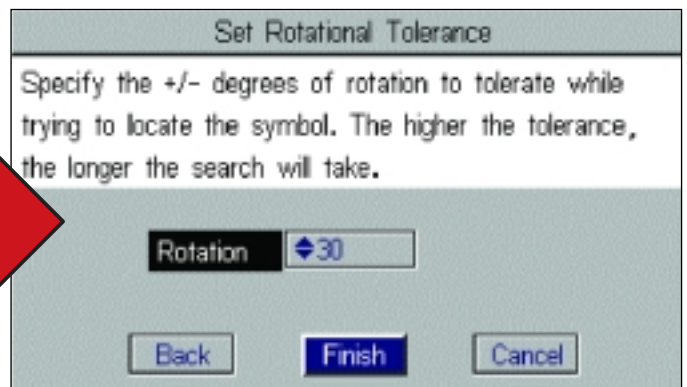
OPERATOR INTERFACE

The vision spreadsheet allows the configuration of customized operator interfaces, making it easy for line operators, technicians, and maintenance staff to use In-Sight vision sensors. It provides toggle buttons, checkboxes, pass/fail LEDs, and other items that can be easily pieced together into user-friendly operator interface screens designed for the application at hand.

In-Sight sensors also enable the configuration of wizards that can lead operators through a setup procedure, without having to access the entire application. This is accomplished by creating simple dialogue boxes for each step in the process, and then chaining them together in a defined order.



In-Sight makes it easy to build user-friendly operator interface screens.



Wizards can be created to simplify the process of modifying applications.

NETWORKED VISION MADE EASY

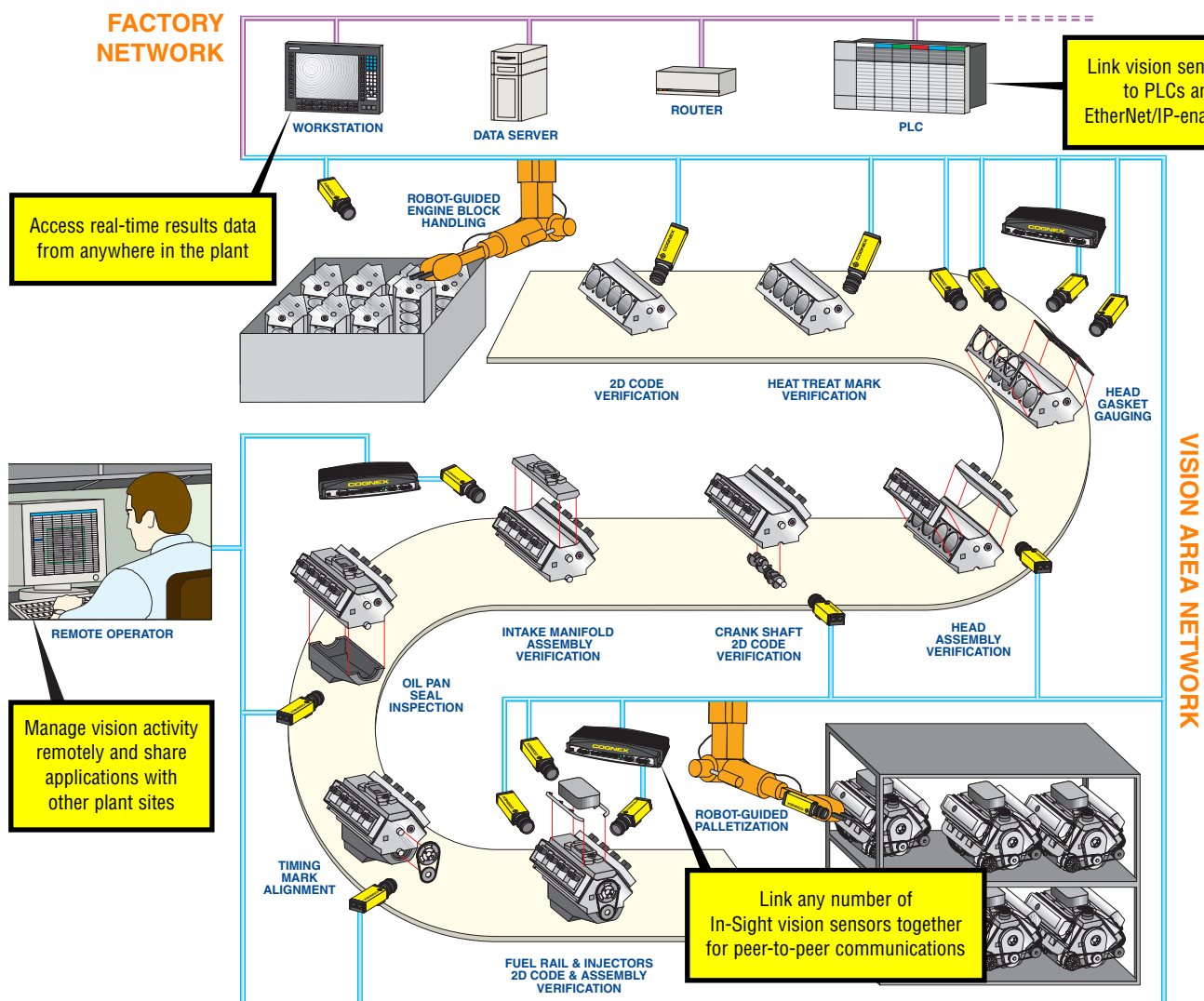
Because In-Sight vision sensors are so affordable, they can be used at multiple points in the manufacturing process. By using vision at key process points, defects can be caught early, and equipment problems can be identified more quickly.

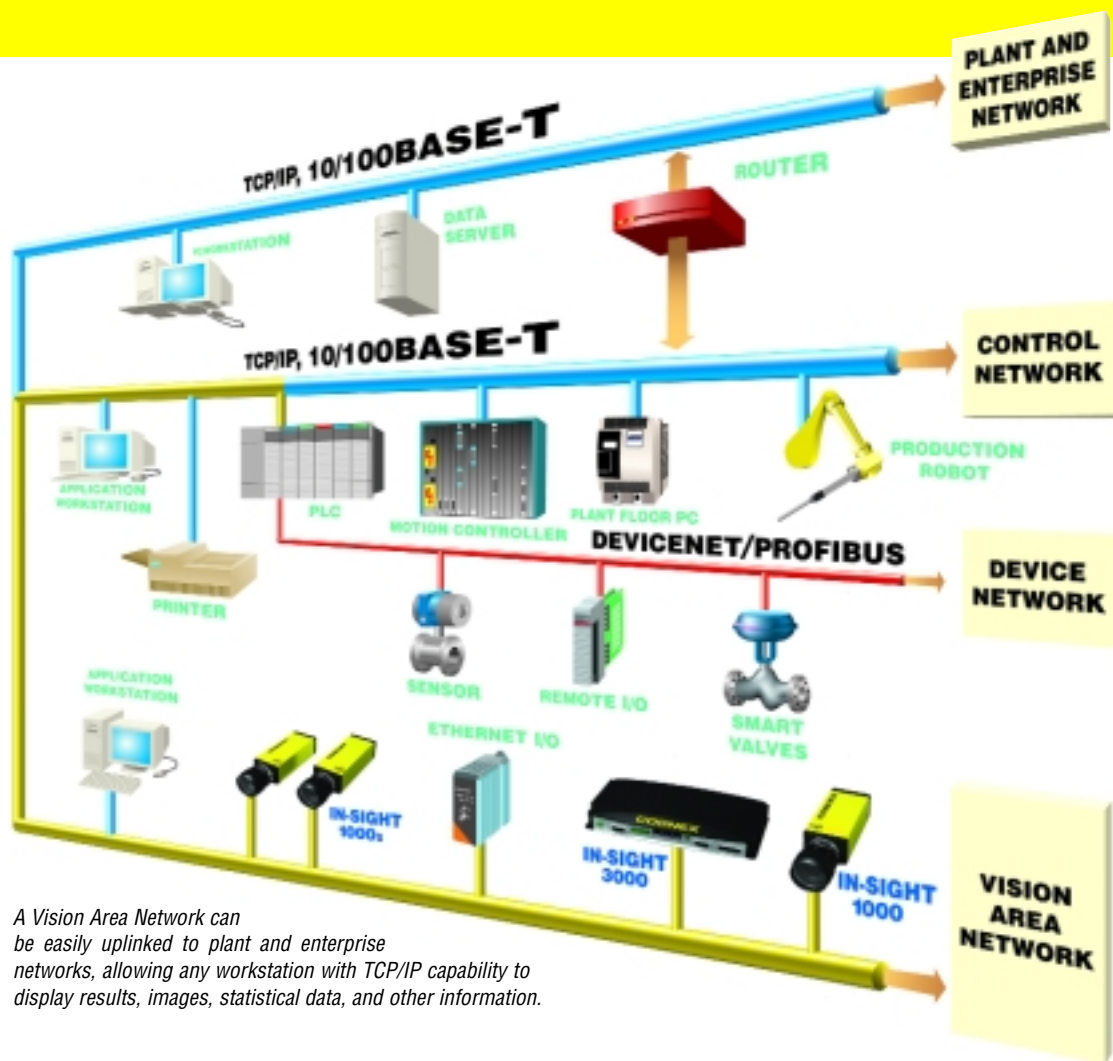
With built-in Ethernet communications, multiple In-Sight vision sensors can be linked across the factory in a variety of ways: for example, two or more In-Sight sensors can be grouped to create a Vision Area Network™ (VAN). This enables data to be exchanged between sensors and managed by a host. The VAN can be uplinked to plant and enterprise networks. This allows any workstation with TCP/IP capability to display vision results, images, statistical data, and other information.

Additionally, with EtherNet/IP support, In-Sight vision sensors can be easily linked to PLCs and other devices over a single Ethernet cable, eliminating the need for complex wiring schemes and costly network gateways.

Networkable In-Sight vision sensors support a variety of standard network and field bus protocols, including:

- TCP/IP, FTP, Telnet, SMTP (standard)
- EtherNet/IP, ModBus/TCP (fieldbus)





A Vision Area Network can be easily uplinked to plant and enterprise networks, allowing any workstation with TCP/IP capability to display results, images, statistical data, and other information.

MULTI-CAMERAS ➔ MULTI-SENSORS

In the past, users of machine vision systems would often be forced to multiplex vision cameras from a single processor in order to distribute vision at multiple points on the production line. While this minimized the hardware costs associated with each inspection point, vision processing had to be divided among multiple cameras, resulting in poor scalability and reduced vision performance at each point.

Additionally, there was a great deal of software complexity – and integration costs – involved in managing and maintaining multiplexed cameras. Special programming was typically required to synchronize camera triggers

and outputs, and a problem at one station often meant the entire system had to be taken offline.

With In-Sight, the combination of low-cost vision processing and high-speed networking provides infinitely scalable, distributed vision without sacrificing performance. One processor per camera results in maximum vision performance at every point, as well as maximum uptime. And, since In-Sight sensors can easily be linked together and managed as a system, the overall costs and complexity of implementing distributed vision are dramatically reduced.

ROBOT COMMUNICATIONS WITH IN-SIGHT

Whether the application involves locating parts for pick-and-place or guiding a robot to assemble components,



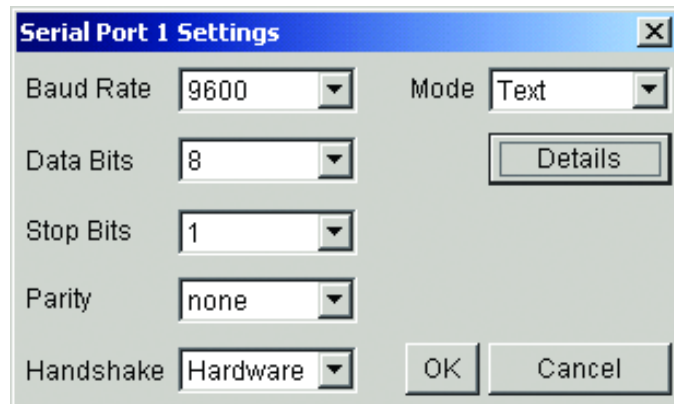
machine vision results need to be passed to robot controllers with a high degree of reliability. This requires tight, seamless integration between the vision sensor and robot.

In-Sight vision sensors make the process of communicating with robots – and performing vision-to-robot calibration – fast and simple.

For setting up the communication link, In-Sight sensors can easily be connected to robots via serial or Ethernet communications. In-Sight sensors also offer robot-specific communication protocols that enable the specification of robot type and communication parameters using simple, menu-driven dialogue boxes.

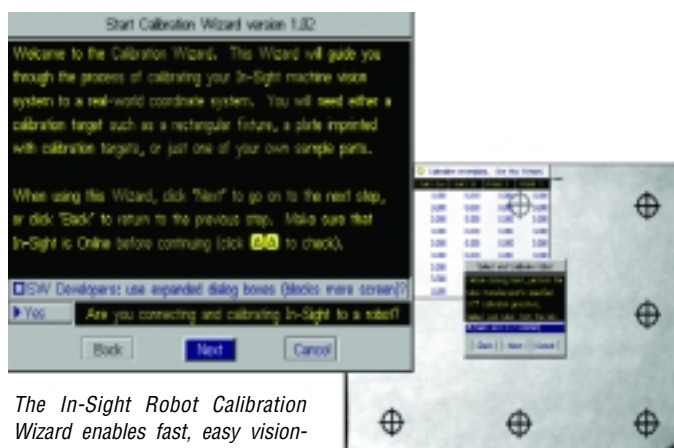


Vision-to-robot calibration, which can be an otherwise complicated, multi-step process, is a snap with the In-Sight Robot Calibration Wizard. The Wizard, which can be



Communications between In-Sight vision sensors and robots can be easily set up using serial communications or one of In-Sight's robot-specific drivers.

downloaded from the In-Sight Online Support website, guides users step-by-step through the calibration process with a series of easy-to-follow, point-and-click menus.



The In-Sight Robot Calibration Wizard enables fast, easy vision-to-robot calibration.

ACCESSORIES

With conventional vision systems, combining the right components to form a tightly integrated solution can be a great challenge. One must carefully handpick components from many vendors and hope they end up working together, or rely upon expert assistance.

To simplify and speed up the system integration process, Cognex offers a wide range of optional accessories designed specifically for use with In-Sight vision sensors.

LIGHTING

Acquiring high-quality images is an essential component of any successful machine vision application. And, while there are many types of lights and illumination techniques avail-



able to improve image quality, it is sometimes difficult to determine which will work best for your application.

In-Sight vision sensors provide an array of high-performance light modules from which to choose. Each light module provides superior illumination performance across a broad range of applications and widely-varying ambient lighting conditions. And their compact size allows them to be mounted almost anywhere on the production line.



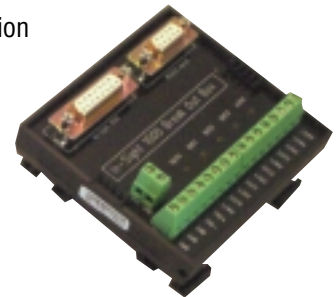
To learn more about different lighting techniques and application examples, please see page 34.

COMMUNICATIONS

In many applications, integrating vision with other devices on the factory floor can be more time-consuming than solving the vision task itself.

Cognex offers a wide range of communications peripherals for easy, quick connectivity between In-Sight vision sensors and PLCs, robots, other factory automation devices, and networks.

In-Sight Breakout Modules allow easy connection of In-Sight sensors to power, acquisition triggers, outputs, and serial devices.



In-Sight Expansion Modules extend the number of I/O channels on In-Sight systems.



DeviceNet® Interface Module provides fast, easy connectivity to DeviceNet for all In-Sight vision sensors.

MONITORS

Cognex offers a high-performance 10.4-inch display for use with In-Sight 2000 and 3000 vision sensors. This LCD display offers high-quality resolution with anti-glare impact shielding, and is



ruggedized for factory floor environments. The mounting bezel is sealed to NEMA 4/IP55 specifications and provides a dust- and liquid-tight seal when mounted in a suitable enclosure.

Ultra-thin and ruggedized, these flat-panel displays are ideal for the factory floor.

ETHERNET WORKSTATION

A 12.1-inch, NEMA 4/IP55-rated Ethernet workstation is available for In-Sight 1000, 3000, and 4000 series vision sensors. This option provides users with



The Ethernet workstation features a built-in 100 BaseT connection, a touch-screen interface, and is pre-loaded with Windows 2000 and In-Sight Explorer software.

an easy-to-mount panel PC, fully pre-installed with Microsoft Windows™ 2000 and In-Sight Explorer software. It also features a built-in 100 BaseT Ethernet connection, and a touch-screen interface. In addition to offering superior image resolution, the Ethernet workstation can act as a server for networked In-Sight sensors, enabling centralized job storage and archival of failed images.

LENSES

Cognex offers a full range of high-quality, compact camera lenses designed specifically for machine vision applications. The lenses feature lock-down screws to prevent de-focus and F-stop change caused by vibration or other movement. The lenses also provide threading for add-on filters, and are available in a variety of focal lengths, from 6mm – 75mm.



A wide range of accessory lenses assures the perfect lens for any machine vision application.

CAMERA ENCLOSURES

To protect In-Sight cameras from harsh factory floor conditions, Cognex offers industrial camera enclosure options. These enclosures offer complete protection from dust and moisture, and splashing or hose-directed water.



The compact remote-head camera of the In-Sight 4100 vision sensor is protected by its optional NEMA 6/IP67-rated industrial enclosure.



A rugged enclosure, NEMA 4/IP55-rated, is available to protect In-Sight vision sensors from harsh environments.

IN-SIGHT SUPPORT AND EDUCATION PROGRAMS

Because there is a wide range of experience and skill levels among machine vision users, Cognex offers a variety of In-Sight Support and Education Programs to make using In-Sight sensors simple and intuitive. Online courses, computer-based tutorials, online technical support, and on-site support get you up and running with In-Sight vision sensors quickly and easily ... providing information when you need it, where you need it.

DOCUMENTATION

- **Printed Documentation** – In your Starter Accessory Kit you will find a *Getting Started* manual.
- **HTML-based In-Sight Guide and Reference** – Comprehensive, searchable help file.



EDUCATION

- **Classroom Courses** – These industry-leading courses are offered regularly at our headquarters in Natick, Massachusetts and regionally throughout North America. And, the new Application Workshop gets you up and running quickly.
- **Online Courses** – Live and recorded, instructor-led courses are offered over the Internet. Access expert instruction from your office or factory location.



- **Computer-Based Tutorials (CBTs)** – In-Sight CBTs guide you step-by-step through the process of using In-Sight sensors, from getting started to configuring your vision application using *Sample Job Templates*.

- **Lighting & Optics Instructional Video** – Helps you to improve the resolution and reliability of your vision inspection application by covering a variety of optics and lighting techniques. Available on our website and on CD.



SUPPORT

- **Download Area** – Variety of downloadable files including firmware updates, documentation and support materials, *Sample Job Templates*, and a *Hardware Troubleshooting Guide*.
- **Case Submission** – Simply submit your technical questions for quick resolution by our team of technical support professionals. You also have online access to past cases submitted to Cognex Tech Support.
- **Knowledge Database** – A searchable database of *Frequently Asked Questions*.
- **Telephone Support** – Direct telephone support is provided by experienced vision engineers dedicated to assisting our customers.
- **Fast-Track (optional)** – Personalized on-site assistance designed to accelerate the setup and deployment of In-Sight sensors. Ideal for those working in exceptionally tight timeframes.



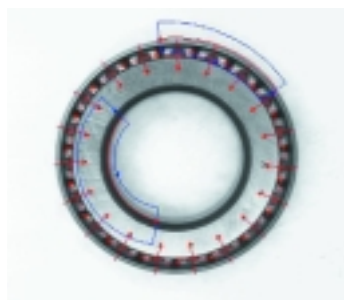
ADVANTAGES

- In-Sight courses right from your desktop
- Learn at your own pace
- Immediate, 24-hour access to a wide range of support services

APPLICATIONS

The possible applications for machine vision in modern manufacturing are virtually endless. In every industry, quality goals are tightening, and the demand for increased production throughput and productivity are increasing. If a visual feature can be seen using a camera, there is the opportunity to use a machine vision system to inspect it, gauge it, verify it or guide it. This section presents some examples below of how manufacturers are improving quality and production efficiency with Cognex vision.

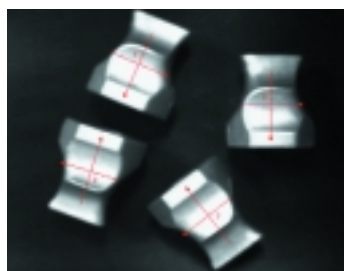
AUTOMOTIVE



VERIFYING ASSEMBLY OF BEARING COMPONENTS

Problem – A supplier of automotive bearing assemblies needed to inspect the components just after final assembly to ensure that all ball bearings were present. While the components had been inspected using a statistical offline method, the supplier's end customer was asking the company to provide 100% inline inspection. At the same time, there was increasing pressure from the end customer for cost reduction of the components. As a result, the supplier was hesitant to incur the added expense of a general-purpose vision system.

Solution – In-Sight checks each bearing component after final assembly. With 100% inspection, the supplier can meet their end customer's zero-defect quality mandate, while justifying the expense of vision despite cost-reduction pressures.



LOCATING SUSPENSION COIL LIFTERS FOR ROBOT HANDLING

Problem – An auto part manufacturer needed an accurate, reliable method of locating suspension coil lifters for robotic pick-and-place into a machining center. The parts are fed from a hopper onto a conveyor where they move freely down the line at random orientations. Because the parts are unfinished, surfaces either appear bright or dull depending on the angle at which light is hitting them. Several smart camera products were evaluated, though none could tolerate the wide changes in part angle and appearance.

Solution – With In-Sight's robust *PatFind* part location tool, the position of each lifter can be determined despite the angle at which it is presented or the inconsistency of the surface appearance. Once In-Sight determines the location of each part, it can communicate the positional coordinates to the robot controller, enabling the robot arm to accurately grip each part and load it into the machining center.



MEASURING DIMENSIONS ON SPARK PLUGS

Problem – A spark plug manufacturer needed to measure various dimensions on spark plugs to ensure that each plug met its customer's pre-set tolerance. The measurements had to be extremely reliable so the customer could insert the plugs into engines as cars were being built. While this called for advanced vision capability, no one at the plant site had experience programming a vision system. Thus, the company needed a user-friendly vision product capable of high-accuracy measurements.

Solution – In-Sight can determine the dimension of each plug accurately and reliably by measuring the gap between the ground and center electrodes, as well as the distance from the ceramic casing to the end of the tip. Also, In-Sight's vision spreadsheet can be easily and quickly configured without knowledge of a programming language.

RELATED APPLICATIONS

- Measuring dimensions on air bag sensors
- Reading ID codes on engine pistons
- Verifying the correct assembly of auto fuse blocks
- Measuring light intensity on dashboard panel lights
- Locating engine parts for robot pick-and-place

FOOD AND BEVERAGE



MEASURING LABEL POSITION ON SODA BOTTLES

Problem – A manufacturer of plastic bottles needed to add high-accuracy machine vision to its line to ensure the straightness of labels on soda bottles. If even a single bottle did not meet the high aesthetic quality demands of the manufacturer's customer, entire shipments would be sent back. Since new beverages were constantly being introduced, it was also important that plant engineers be able to easily and quickly apply the vision system to new bottle sizes, shapes and label treatments.

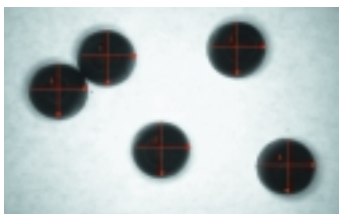
Solution – In-Sight checks for the straightness of each label by determining how closely the label ends match up at the seam. Results can then be compared to a set tolerance, and bottles with labels skewed beyond tolerance will be diverted to a separate bin for re-labeling. When a new product is introduced to the line, plant engineers can quickly re-teach In-Sight on the new bottle configuration by simply placing the part in front of the camera, capturing an image, and saving the image into the processor's memory.



VERIFYING THE ASSEMBLY OF SNACK-PACKS

Problem – A food manufacturer needed to automate the process of checking snack-packs for proper assembly. Due to mechanical problems with the cheese-filler machine, the packs were occasionally being shipped to retailers with an insufficient amount of cheese. While the inspections had been performed manually on a random sample basis, 100% inspection became necessary, as one of the retailers was threatening to discontinue sale of the product line.

Solution – In-Sight looks at every snack-pack coming down the line to ensure that all contents are present. It can also detect if the seal between the foil backing and plastic has been broken, helping avoid the risk of product contamination. Upon finding defects, In-Sight can also alert line operators to machine problems so the line can be shut down before additional defective packages are produced.



LOCATING CHOCOLATES FOR ROBOT PICKING

Problem – A maker of premium chocolates needed a more cost-effective and reliable way of guiding a robot for picking and placing individual chocolates into wrappers. While a general-purpose vision system was being used, it was expensive to maintain and often had difficulty locating chocolates that were overlapped by others on the line. The system was also sensitive to chocolate smudges on the conveyor surface, occasionally confusing the marks for chocolates.

Solution – With In-Sight, the chocolates are reliably located on the conveyor – at a fraction of the cost of the previous vision system. The In-Sight *PatFind* part location tool is able to locate chocolates as they move down the line at random orientation, and its unique ability to tolerate overlapping and confusing backgrounds can lead to higher packaging yields.

RELATED APPLICATIONS

- Measuring fill lines on juice bottles
- Verifying the roundness of cookies
- Checking for the presence of safety seals on packages
- Verifying the correct assembly of frozen pizza boxes

ELECTRONICS



VERIFYING THE ASSEMBLY OF CIRCUIT BREAKER SWITCHES

Problem – A manufacturer of industrial electronic components needed to verify the correct assembly of circuit breaker switches. In particular, it had to verify the presence and proper placement of a coil spring, which is fastened onto two posts by a machine. A vision system was inspecting the switches at the end of the line once they had been fully assembled; however, defects caught at this stage meant the entire component would need to be scrapped or disassembled and rebuilt. The manufacturer realized it could benefit from installing vision – if it was affordable enough – further upstream where the springs are inserted.

Solution – At a low cost, In-Sight provides powerful vision right at the spring insertion station. It is able to first check for the presence of the spring, and then, by measuring its angular position, verify whether or not the machine has inserted it properly. By catching defects earlier in the process, line operators can diagnose and correct machine problems before more problems occur.



MEASURING THE POSITION OF CONNECTOR PINS

Problem – An assembly machine builder needed to improve the flexibility of its next-generation assembly machine for the connector market. In particular, the new machines needed to be equipped with a vision solution that not only had tools accurate enough to measure the position of each pin on a connector, but one that could be easily and quickly trained on various types of pin arrangements.

Solution – In-Sight checks for bent leads, which can cause electrical shorts, and missing leads, thereby preventing a product from malfunctioning. Additionally, users can quickly retrain In-Sight on different pin arrangements by simply placing the part in front of the camera, capturing an image, and saving the image into the processor's memory.



VERIFYING THE ASSEMBLY OF HEARING AID BATTERY-PACKS

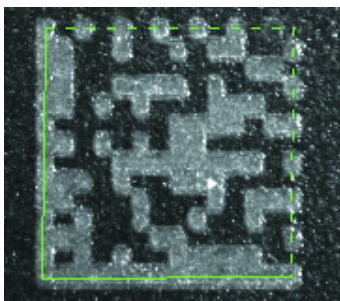
Problem – A battery manufacturer needed a more reliable way to verify that hearing aid battery-packs did not contain any missing or extra batteries. Occasional shipments of incomplete packs were causing customer complaints, while the presence of an extra battery during assembly would lead to jamming of the foiler machine as foil backing was applied. While a smart camera was being used to check the parts, its inability to handle variations in part contrast and reflections from the plastic resulted in a high number of falsely rejected battery packs.

Solution – In-Sight can ensure the correct number of batteries in each pack, using the *PatFind* part location tool to tolerate the wide contrast variations. This can help reduce customer complaints and minimize the amount of production downtime associated with machine jams.

RELATED APPLICATIONS

- Measuring dimensions on cell phone and pager enclosures
- Verifying crimps between cables and connectors
- Locating disk drive head gimble assemblies for robot pick-and-place

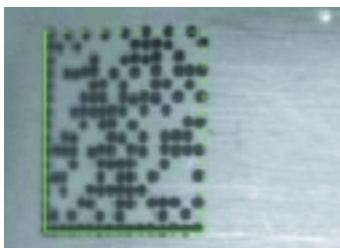
PART IDENTIFICATION



READING 2D DATA MATRIX CODES ON TORQUE CONVERTERS

Problem – An auto part supplier needed to automatically read ball-peen marked 2D Data Matrix codes on torque converters. The codes, which contain information about the date the part was produced and the part identification number, were difficult to read due to a number of challenging conditions. Part color varied from light gray to dark gray, and braze and crayon would often be marked on the part surface near the code. A smart camera had previously been used for the job, but its inability to handle the part-to-part variations resulted in several no-read instances.

Solution – Using highly robust code location and decoding algorithms, In-Sight vision sensors read 2D codes despite surface degradations or confusing backgrounds. Additionally, it is able to monitor code quality, providing process feedback to operators about peen marker performance so pins can be replaced if necessary.



CONTACT LENS PARTS TRACKING

Problem – A medical product manufacturer needed to track disposable contact lenses through the manufacturing process for part traceability. Before any manufacturing operations are performed on the lenses, the 2D code, which indicates the identity of each lens, had to be read and the resulting data stored on disk for archival purposes. An inkjet printer was used to mark each part, which often resulted in poorly formed codes that were difficult to read. However, the company did not want to absorb the cost of upgrading its marking equipment. The other challenge for machine vision was to read the codes reliably despite the curved nature of the parts.

Solution – In-Sight reads the codes reliably despite part curvature and poor print quality. Once decoded, data about the identity of each lens is transferred from the In-Sight serial port into the serial port of a host PC, where a spreadsheet performs statistical analysis of the data. In addition to providing reliable part identification, In-Sight has the ability to handle poor code quality which has enabled the company to maintain its investment in the facility's inkjet printers.



READING 1D AND 2D CODES ON PHARMACEUTICAL PACKAGES

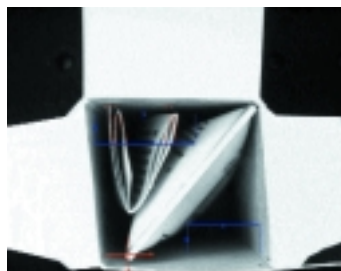
Problem – To meet regulatory compliance, a manufacturer of pharmaceutical products began adding 2D Data Matrix codes to packages already marked with linear 1D bar codes to provide more in-depth information on each package, including part number, date, and lot code. As a result, they required a vision system that could read linear bar codes and 2D matrix codes on labels while keeping up with extremely high line speeds.

Solution – Equipped with both 2D and 1D bar code reading tools, In-Sight locates and decodes both codes within a single field of view on each package while meeting the company's demanding throughput requirements. Additionally, it is able to check the labels for label position and skew using In-Sight's edge detection tools. The solution enables the company to adhere to regulations and improve product quality and traceability.

RELATED APPLICATIONS

- Reading 1D and 2D codes on electronic and automotive components
- Reading laser-etched 2D codes on glass materials
- Matching the bar code on medical test kit boxes with Data Matrix code-marked contents

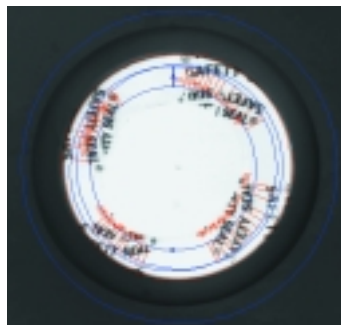
PHARMACEUTICAL



LOCATING INSTRUCTION PAMPHLETS IN MEDICINE BOXES

Problem – A pharmaceutical company producing topical ointment needed to ensure that an instruction pamphlet had been inserted into each box. Since the pamphlets are inserted automatically, machine problems occasionally resulted in only partial insertion of a pamphlet. This would cause the pamphlet to fall out of the box as it moved down the line. Line operators were checking the boxes on a random sample basis, however boxes with missing pamphlets were occasionally being shipped and causing consumer complaints. Thus, 100% automated inspection was required.

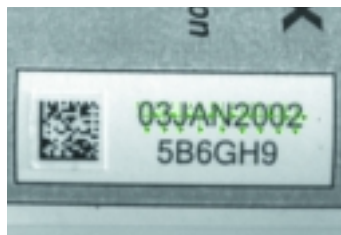
Solution – In-Sight checks open boxes for the presence of a pamphlet, and can issue a “FAIL” signal to activate a reject mechanism to remove the defective box from the line. This signal can also alert operators that a problem has occurred, enabling them to instantly correct the problem before other defective boxes are produced.



VERIFYING PRESENCE OF TAMPER-EVIDENT SEALS ON COUGH SYRUP BOTTLES

Problem – In order to protect consumers and address liability concerns, a pharmaceutical manufacturer needed to verify the presence of tamper-evident seals on cough syrup bottles with 100% automated inspection. As the bottles travel through the banding station, machine problems occasionally prevent seals from being applied. The company evaluated several smart sensor products, none of which could keep pace with the line speed of 300 bottles per minute.

Solution – With its high-performance processor, In-Sight provides 100% presence verification of the tamper-evident seals at the required throughput rates. In doing so, it is able to better ensure product safety and prevent future liability problems.



VERIFYING DATE AND LOT CODES ON ASPIRIN BOTTLES

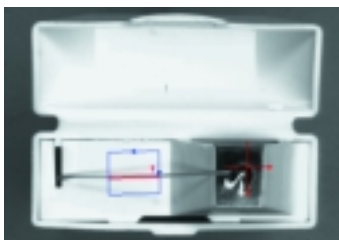
Problem – A pharmaceutical manufacturer needed to verify that the expiration date and lot codes on aspirin bottles were printed clearly and accurately. Problems such as misaligned printer heads and variations in ink viscosity were causing misprints on the labels, preventing the bottles from complying with FDA requirements.

Solution – In-Sight provides highly accurate and reliable character verification on the bottles. Using its robust optical character verification tools, the sensor can verify that characters have been clearly printed on the packages, while distinguishing between confusing character pairs such as “G” and “6.” A graphical font training utility enables users to quickly and easily train fonts by simply drawing a box around the characters to be verified and hitting a train button.

RELATED APPLICATIONS

- Verifying the presence of capsules in blister packs
- Measuring the position of labels on cough syrup bottles
- Verifying the correct number of medicine bottles in cartons
- Reading 2D codes on pharmaceutical packages
- Verifying the correct assembly of nasal inhalers

CONSUMER



VERIFYING THE ASSEMBLY OF DENTAL FLOSS PACKAGES

Problem – As part of a new quality control initiative, a manufacturer of dental care products needed to ensure that each dental floss package leaving the facility was assembled correctly. In particular, they needed to verify the presence of both the string and metallic cutter, and ensure the string was anchored to the cutter. While a vision system had been used to monitor the assembly process, it would often have trouble locating the cutter due to light reflecting off the metallic surface. As a result, defective packages were being shipped and causing customer complaints.

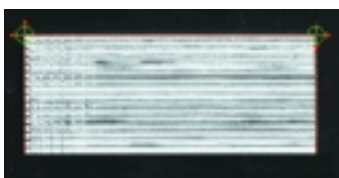
Solution – In-Sight checks each floss package for proper assembly. The *PatFind* tool can locate the cutter despite surface reflections, and then search a second region for the string. Based on the horizontal position of the string, the vision sensor can determine whether or not the string is anchored properly. This can help reduce the number of falsely accepted products and minimize customer complaints.



MEASURING DIMENSIONS ON DINNER FORKS

Problem – To achieve an uncompromising standard of quality, a manufacturer of fine cutlery needed to accurately measure tines on dinner forks. The goal was to ensure that all the tines were the same length, since they could become elongated or shortened slightly during the manufacturing process. Based on the speed and quantity of forks coming down the line, the manufacturer could not rely on manual inspection and therefore decided to add machine vision to the line.

Solution – In-Sight inspects the forks with a high degree of accuracy and reliability, ensuring they are all dimensionally correct. In addition to keeping pace with the high production line speeds, In-Sight is able to perform the inspections despite the highly reflective surfaces of the flatware. Forks that pass inspection can then be routed to an engraving station, and defective utensils can be channeled off to a reject bin.



MEASURING DIMENSIONS ON NAILS

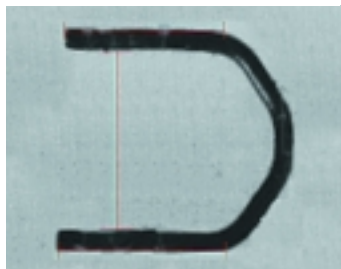
Problem – A manufacturer of galvanized nails designed for nail-guns needed to perform 100% inspection on nails at a rate of 1200 nails per minute. Occasionally, the nail-forming machine would experience mechanical problems, resulting in nails that were too long or too short. If machine problems weren't discovered immediately, thousands of defective nails would be produced in just minutes and would have to be scrapped.

Solution – In-Sight monitors nail production from the exit track of the nail-forming machine to catch defects as soon they occur. With its high-speed processor, In-Sight can inspect groups of 16 nails at 75 inspections per minute, meeting the company's throughput requirements. Upon detecting defective nails, In-Sight can alert line operators to stop the machine to clear up the problem before more nails are produced.

RELATED APPLICATIONS

- Verifying the presence of "O" rings in aerosol spray can valve assemblies
- Guiding the robotic assembly of disposable cameras
- Measuring dimensions on eyeliner pencils
- Checking label placement on deodorant sticks

MEDICAL



MEASURING DIMENSIONS ON SURGICAL STAPLES

Problem – In order to avoid potentially disastrous jamming of suture staplers during surgery, a manufacturer of surgical staples needed a way to precisely measure the overall width of auto suture staples, as well as determine the length of each staple leg. While a laser-based inspection system was in place, it could only perform one measurement at a time, making the process very time consuming. The company decided to evaluate several smart cameras for the job. However, over-sensitivity to lighting variations and “hot-spots” frequently resulted in falsely rejected staples.

Solution – In-Sight measures the entire profile of each staple accurately and reliably – despite the effects of inconsistent lighting. Part features can be measured within a few thousandths of an inch, ensuring that each staple is dimensionally correct and reducing the number of false rejects.



VERIFYING THE PRESENCE OF SYRINGES IN PACKAGES

Problem – To ensure package integrity, a medical device manufacturer was using a PC-based vision system to verify the presence of syringes in packages. It was also used to ensure that no portion of a syringe was jutting out of its package. While the system kept pace with the high-speed inspection rate of 300 parts per minute, it often had trouble recognizing syringes through the plastic blisters due to wrinkles and reflections. In order to verify package integrity, an operator would need to stop the line and look at the parts manually. These constant interruptions were having a negative impact on production throughput.

Solution – In-Sight reliably inspects each syringe package without interruption. Using its robust *PatFind* tool for part location, In-Sight is able to easily distinguish the presence of a syringe from its visually-confusing plastic background. It can also measure the relative position of the syringe to the blister to ensure that no portion of the syringe is jutting out of the seal, thereby eliminating the risk of product contamination.



GUIDING THE ROBOTIC HANDLING OF DIGITAL THERMOMETERS

Problem – A maker of electronic medical products needed to guide a robot to retrieve digital thermometers and place them into packages. While a smart camera was being used to guide the robot, inconsistent factory lighting and shadows caused by the robot arm moving over the part often prevented the device from accurately finding the part. In some cases, the robot would fail to pick up a thermometer. In others, inaccurate vision results would cause the robot’s end effector to collide with a thermometer, damaging the device.

Solution – In-Sight finds each thermometer as it moves down the conveyor belt despite appearance changes caused by shadows and lighting variations. Once the positional coordinates of the part are communicated to a robot controller, the robot can then grip the part at a specified point and place it into a package.

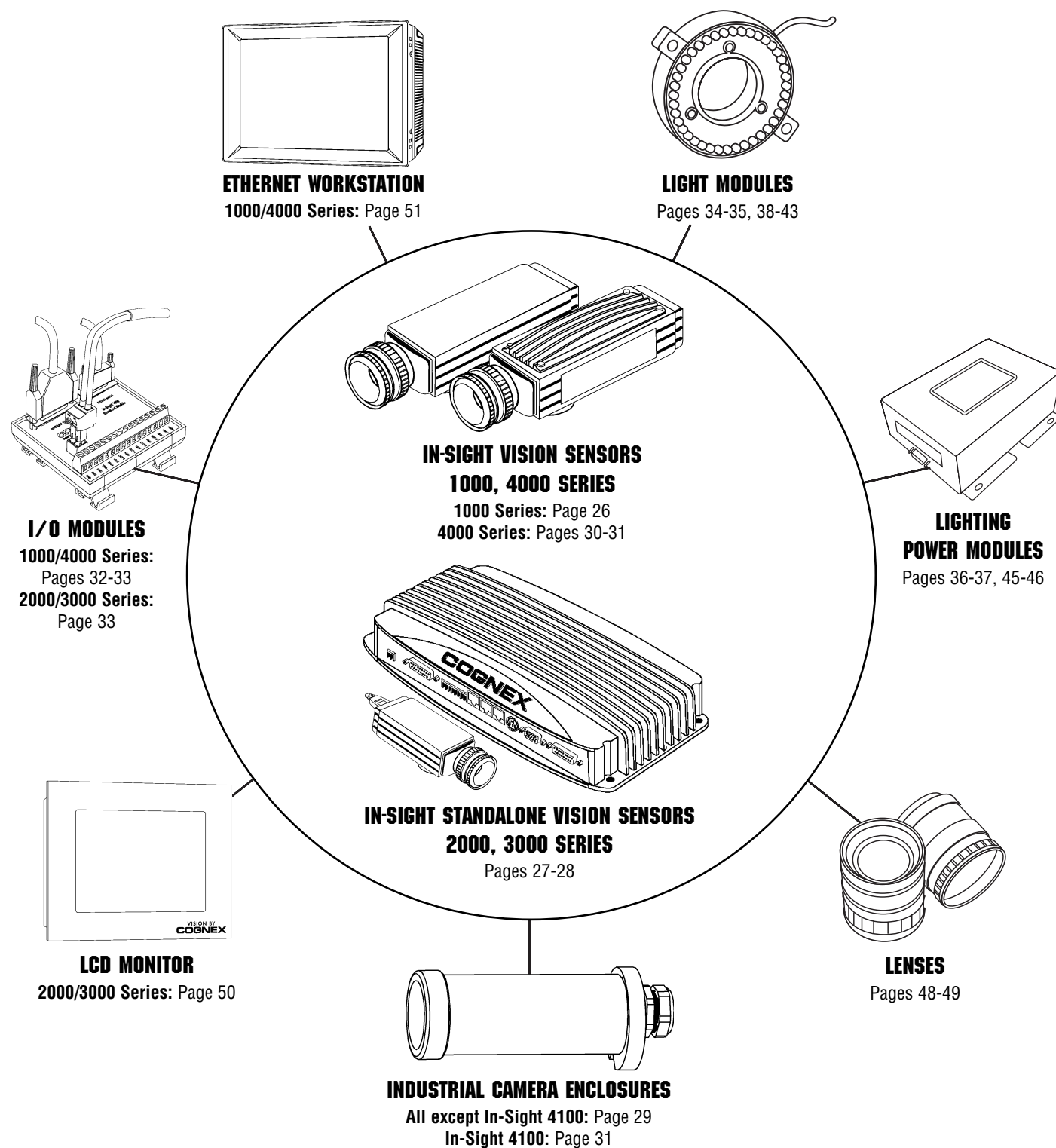
RELATED APPLICATIONS

- Measuring dimensions on heart catheters
- Verifying the correct assembly of cholesterol home screening kits
- Measuring syringe needles for proper length
- Verifying the correct assembly of diabetes test monitors

IN-SIGHT SPECIFICATIONS

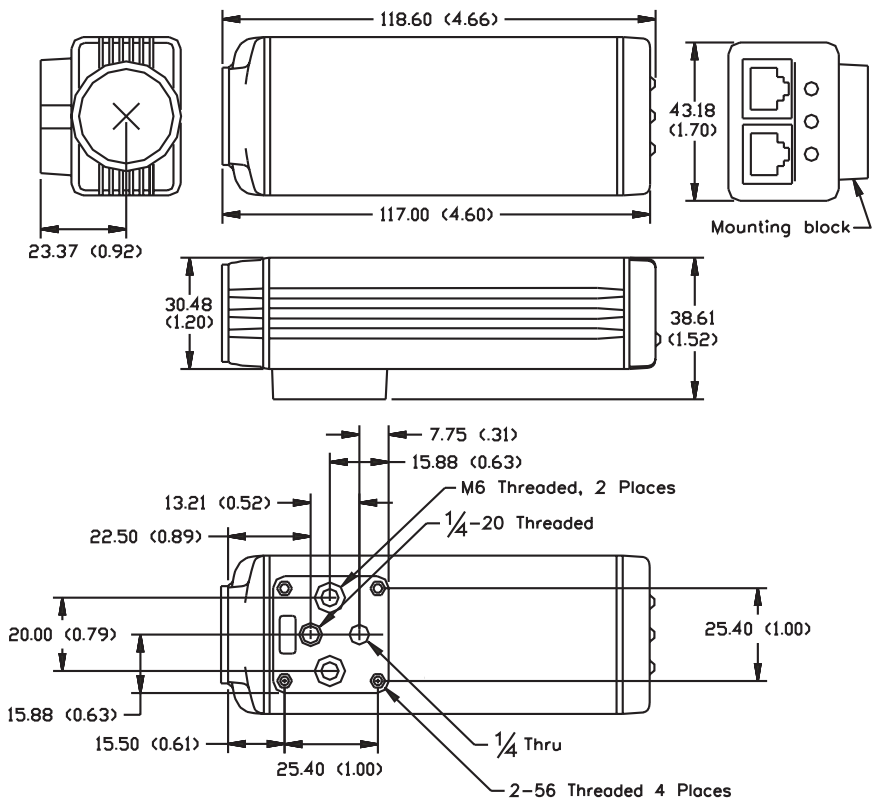
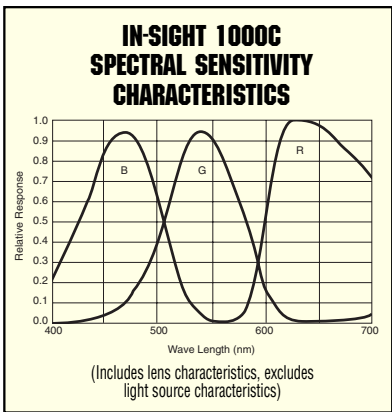
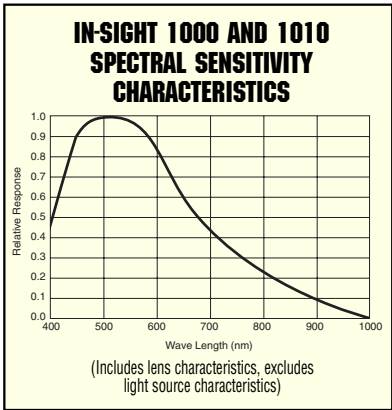
This section provides a convenient reference of specifications for In-Sight vision sensors and accessories. An In-Sight model comparison chart can be found on pages 52 and 53.

Your Cognex sales engineer can provide additional information on these products.



IN-SIGHT 1000, 1000C, AND 1010

Note: All measurements are provided in millimeters (first number) and inches (number in parenthesis).

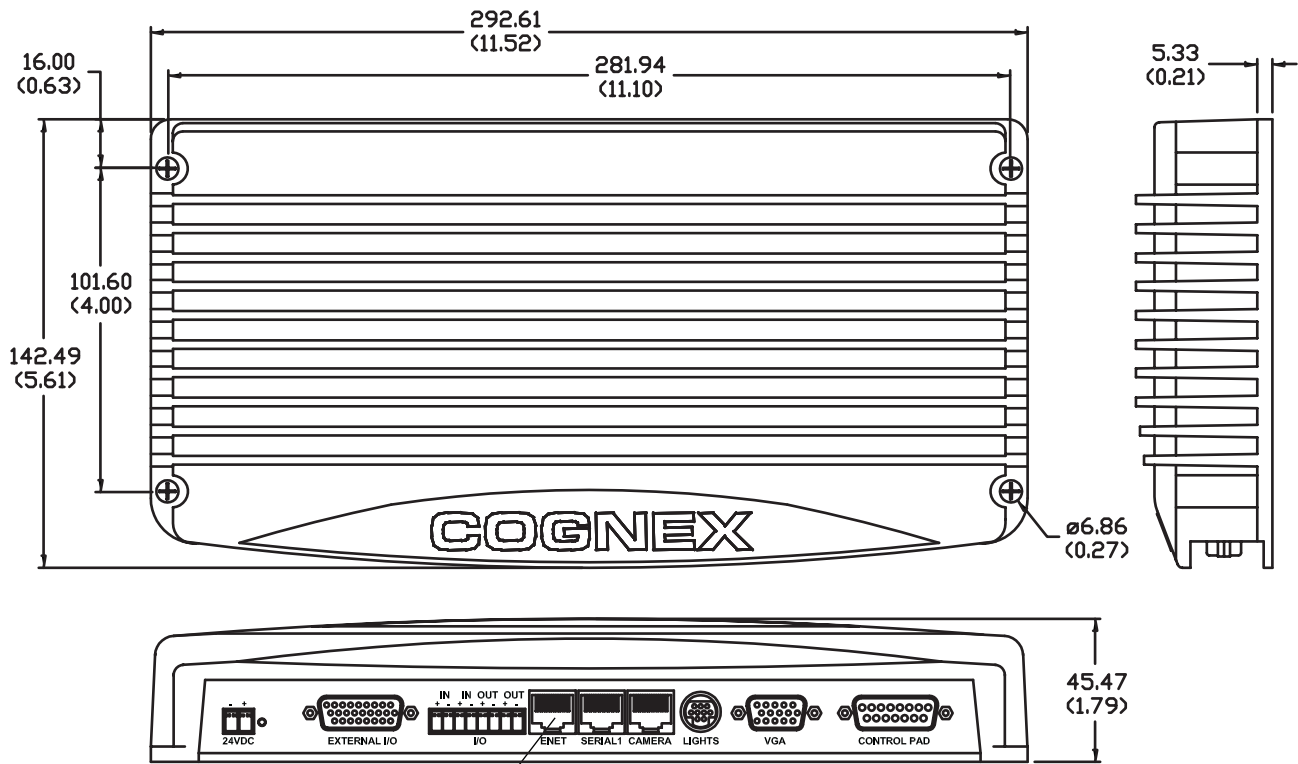


Memory	
Job and program	4MB non-volatile flash memory; unlimited job storage via networked storage device
Image acquisition and processing	16MB SDRAM
Acquisition	
	Rapid reset, progressive scan, full-frame integration
Frame rates	Up to 30 frames per second
Image resolution	640 x 480 with 256 gray levels (8 bits per pixel) 1000C: 640 x 480 RGB mosaic (24 bits per pixel, 16 million colors)
Sensor	1/3-inch CCD (5.84 x 4.94mm)
Electronic shutter speed	32µs - 33ms
Gain	
	Controlled by software
I/O	
Inputs	1 opto-isolated discrete input (acquisition trigger)
	On: 20-28V (24V normal); Off: 0-3V; Threshold: 12V
	Draws approximately 1mA at 24V
Outputs	2 NPN (pull-down) lines, which pull down an external load to 0V when enabled
	200mA maximum sink current
	Maximum 200µA leakage current when off; external load resistance less than 10K
	2 configurable LEDs (green and red)

I/O (cont.)	
Optional I/O modules	The CIO-1350-00 Breakout module provides convenient access to connections and can be mounted on a DIN rail.
	The CIO-1450-00 Expansion module provides convenient access to connections, eight additional inputs and outputs, RS-232 port, and can be mounted on a DIN rail.
	Additional I/O points via supported Ethernet I/O modules (optional).
Communications	
Serial	One port using RS-232C protocol with TX/RX support. For applications requiring RTS/CTS, order the CIO-1450-00 Expansion Module
Ethernet	10/100Mbps/sec, TCP/IP protocol; supports DHCP (factory default) and static IP address
Mechanical	
Weight	7.5 oz. (210g)
Power	
Power consumption	24VDC +/-10%; 200mA
Environmental	
Operating temperature	10°C to 45°C (50°F to 113°F)
Operating humidity	10 to 90%, non-condensing
Storage temperature	-10°C to 65°C (14°F to 149°F)
Storage humidity	10 to 90%, non-condensing
Certifications	
Approvals	CE, CUL

IN-SIGHT 2000 & 3000 PROCESSOR

Note: All measurements are provided in millimeters (first number) and inches (number in parenthesis).



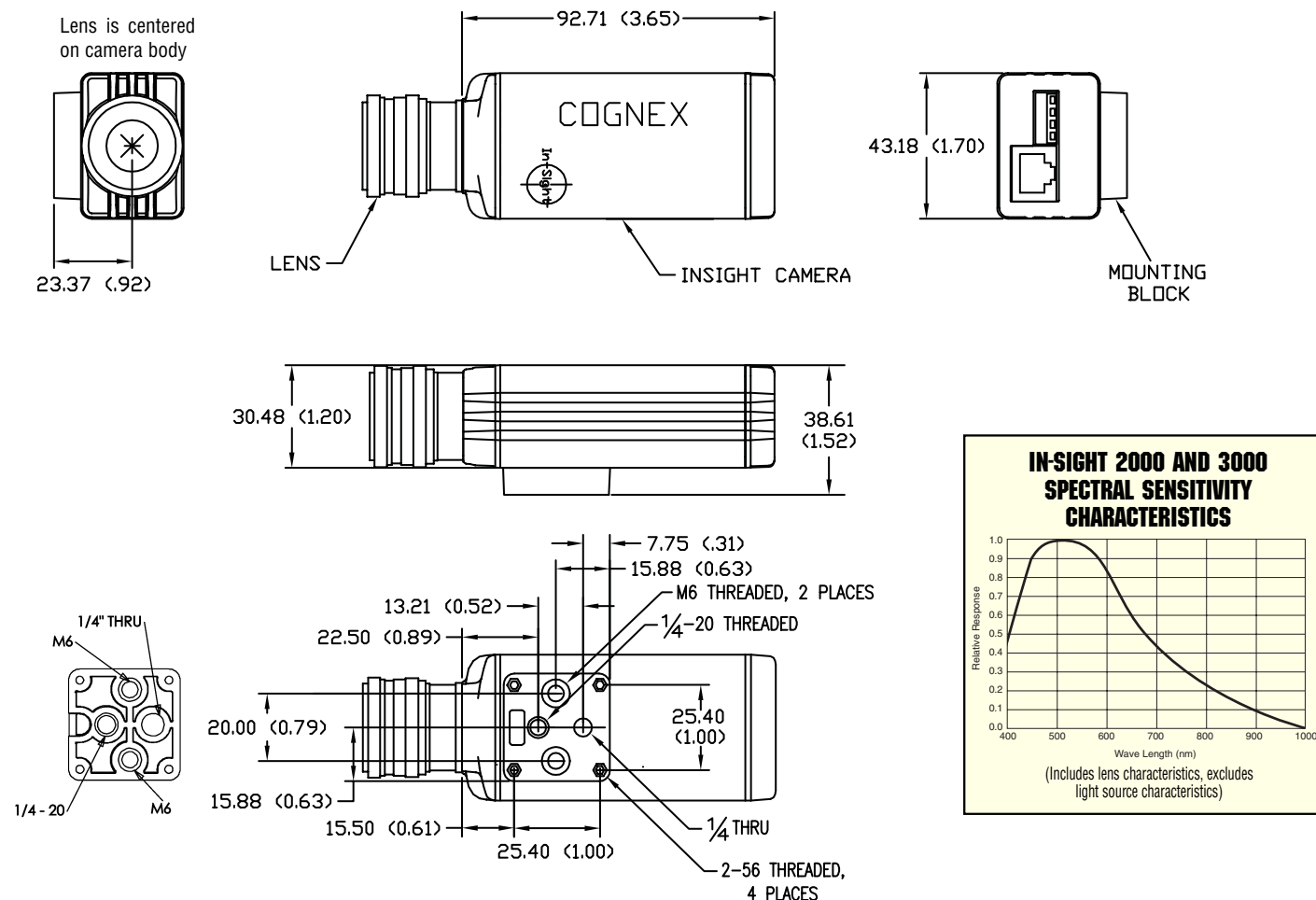
Serial port on In-Sight 2000

Memory		
Job and program storage	4MB non-volatile flash memory, for up to 20 jobs (In-Sight 2000); 4MB non-volatile flash memory for unlimited job storage via networked storage device	
Image acquisition and processing	16MB SDRAM	
VGA display	1MB	
Input		
Controls	10-button control pad with 10 ft. (3m) cable	
Keyboard and mouse	<i>In-Sight 2000</i>	<i>In-Sight 3000</i>
	Entry and navigation from a PC using In-Sight PC Server software	Entry and navigation from a PC using In-Sight PC Host software
Display		
VGA output	640 x 480 through a standard 15-pin D-sub connector: color graphics overlay	
I/O		
Built-in	2 discrete inputs and 2 discrete outputs. 10-24VDC optically isolated	
External	8 discrete inputs and 8 discrete outputs (requires the optional I/O Expansion Module)	
Light Control		
Dynamic control	For variable-intensity lights, each with one or two independent light channels (requires an optional Cognex Light Module)	

Communications		
Serial	<i>In-Sight 2000</i>	<i>In-Sight 3000</i>
	Two serial ports using RS-232C protocol. RJ-45 to DB-9 adapter supplied	One serial port using RS-232C protocol. RJ-45 to DB-9 adapter supplied
Ethernet	N/A	Supports Ethernet 10/100 BaseT communications. Ethernet I/O also supported
Mechanical		
Enclosure	Cast-aluminum; no moving parts, fans or disk drives	
Mounting	Four flanged 1/4" holes for horizontal or vertical mounting to a flat surface	
Weight	33.8 oz. (966 grams)	37.1 oz. (1060 grams)
Panel/DIN rail mounting	Optional mounting accessory available	
Power		
Power consumption	24VDC ±10%, 1 Amp (includes the camera, two Cognex Spot Light Modules, and one I/O Expansion Module)	
Field wiring size	26 to 16 AWG	
Connections	Screw terminals on a detachable terminal plug	
Environmental		
Operating temperature	10°C to 50°C (50°F to 122°F)	
Operating humidity	10 to 90%, non-condensing	
Storage temperature	-10°C to 65°C (14°F to 149°F)	
Storage humidity	10 to 90%, non-condensing	
Certifications		
Approvals	CE, CUL	

IN-SIGHT 2000 & 3000 CAMERA

Note: All measurements are provided in millimeters (first number) and inches (number in parenthesis).

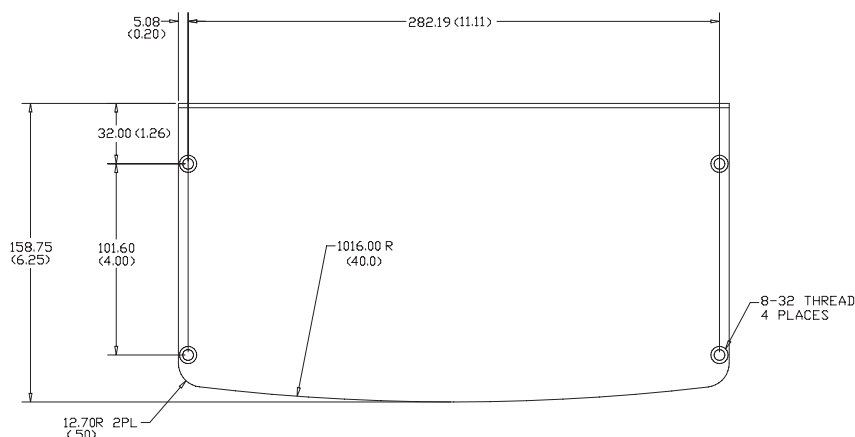


Acquisition	
	Rapid reset, progressive scan, full-frame and partial-frame integration
Frame rates	30 frames per second, digital image transmission
Image resolution	640 x 480 image size, with 256 gray levels (8 bits per pixel)
Sensor	1/3-inch CCD (5.84 x 4.94mm, 6mm diagonal)
	307,200 pixels (640 x 480 image)
	Square pixels, 7.4 micrometers x 7.4 micrometers
Electronic shutter speed	64µs - 1000ms
Lens	
	Accepts standard C-mount lens; choice of lenses available
I/O	
Trigger input	15 mA
Strobe output	10 mA pulse, duration two horizontal scan lines (128 µSec) 0-24VDC optically isolated. 15 mA max (sink or source)
	Connected through a detachable 4-pin terminal plug
Field wiring size	26 to 12 AWG
Trigger-to-strobe latency	74 µSec max

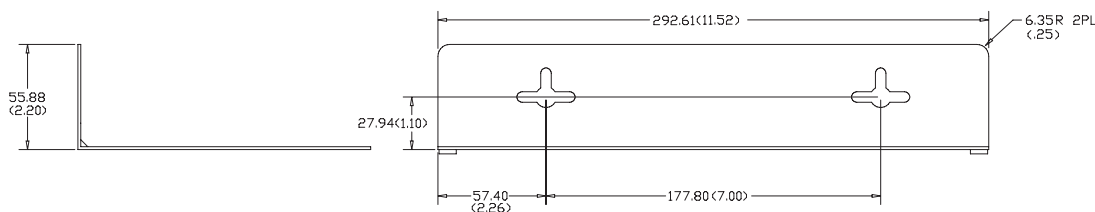
Gain and Offset	
	Software controllable
Mechanical	
Enclosure	Aluminum housing
Mounting	Non-conductive plastic mounting block, with one 1/4 - 20 and two M6 threaded attachment points
Weight	5.6 oz. (160 grams)
Cable	RJ-45 to RJ-45, shielded CAT-5. 15, 30, and 50 foot lengths available
Power	
Power consumption	12VDC, supplied from the In-Sight processor
Environmental	
Operating temperature	10°C to 45°C (50°F to 113°F)
Operating humidity	10 to 90%, non-condensing
Storage temperature	-10°C to 65°C (14°F to 149°F)
Storage humidity	10 to 90% non-condensing

PROCESSOR MOUNTING BRACKETS (OPTIONAL FOR IN-SIGHT 2000 AND 3000 VISION SENSORS)

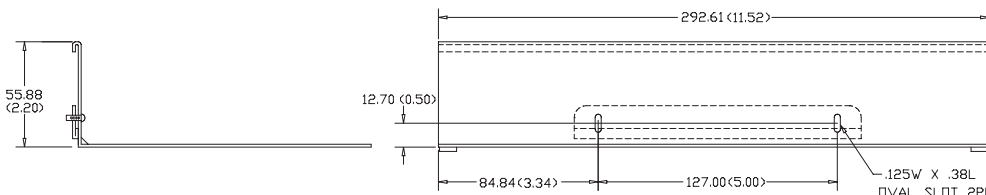
Note: All measurements are provided in millimeters (first number) and inches (number in parenthesis).



WALL MOUNT 370-0253

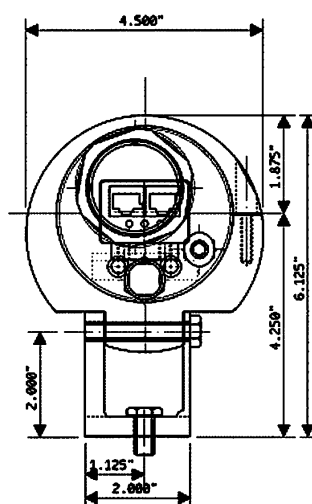
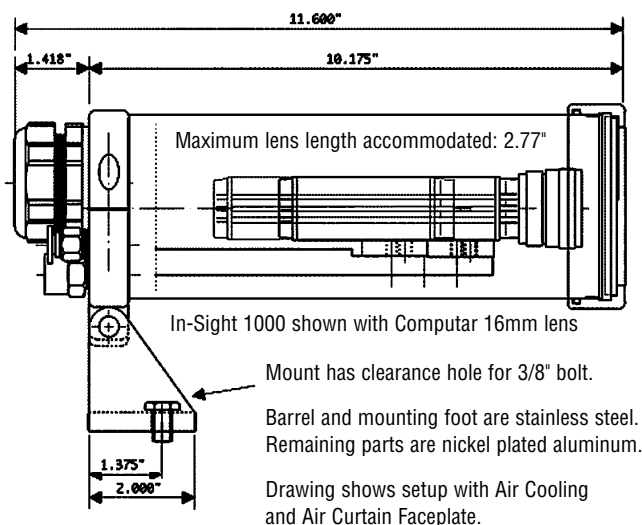


DIN RAIL MOUNT 370-0252



INDUSTRIAL CAMERA ENCLOSURE (OPTIONAL FOR IN-SIGHT 1000, 1000C, 1010, 2000, 3000, 4000, 4001) IS-INDENCL-00

Please Note: All measurements are provided in inches.



Weight • 6.2 Lb. (with 9" barrel)

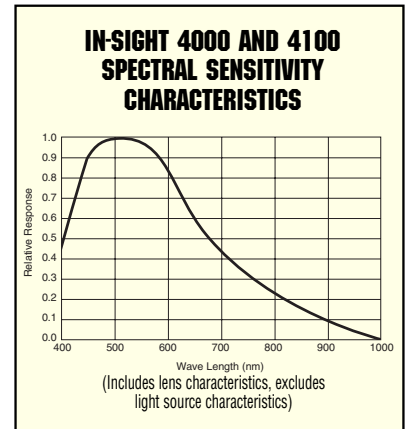
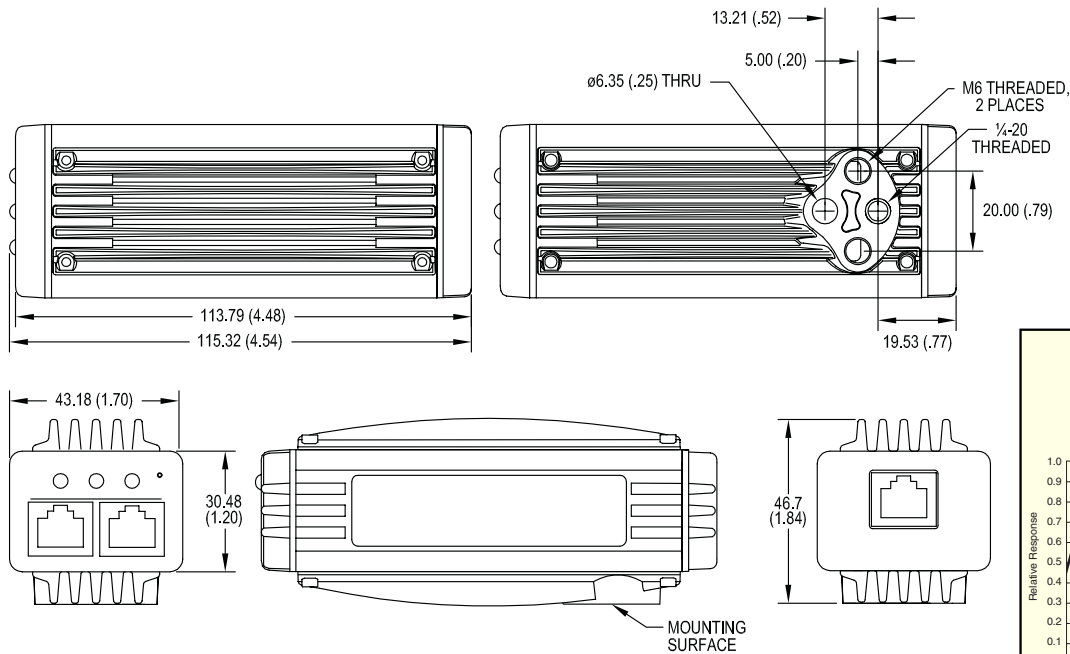
NOTE:

- Air Curtain Faceplate option reduces protection level to IP55 when air is on, IP54 when air is off
- Enclosure has 304 stainless steel barrel & mounting foot
- Remaining pieces are nickel plated 6061 aluminum
- Backplate has (2) 1/4" NPT holes for optional air cooling, and a PG36 split insert cable gland
- All fasteners are stainless steel
- Fasteners to mount the In-Sight 1000 and In-Sight 2000/3000 camera are included

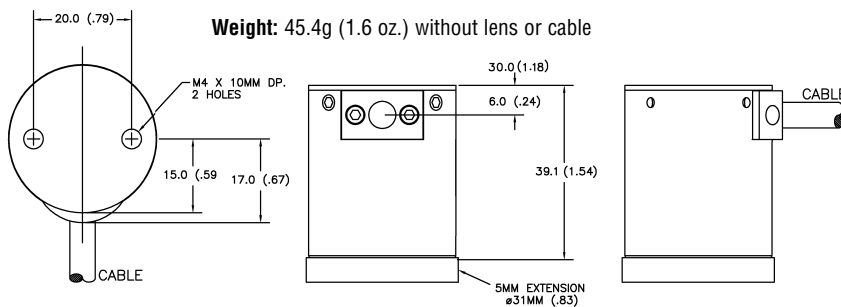
Cable gland allows passage of both standard In-Sight cables simultaneously, without removal of connectors.

IN-SIGHT 4100

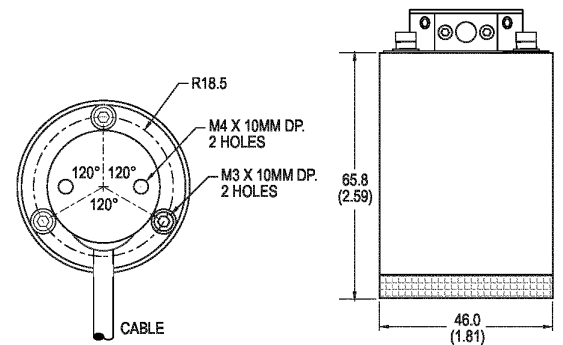
Note: All measurements are provided in millimeters (first number) and inches (number in parenthesis).



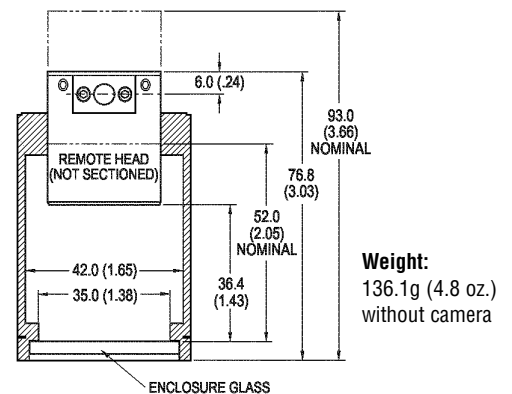
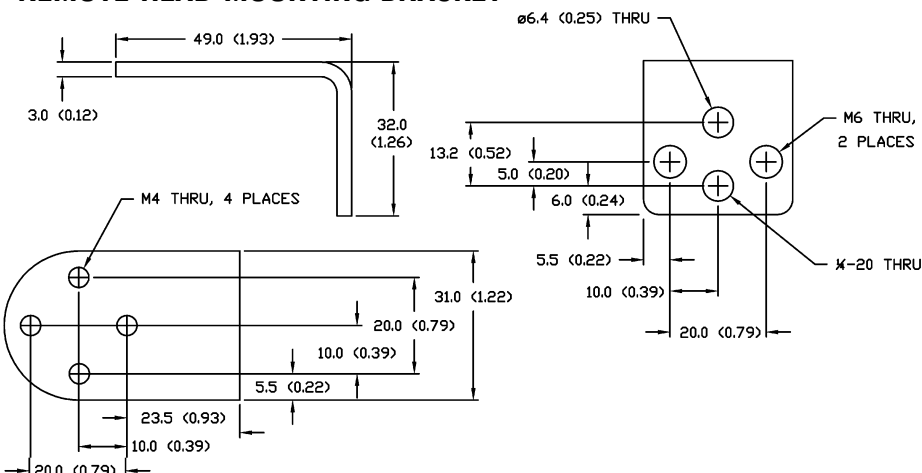
REMOTE HEAD CAMERA AND MOUNTING BRACKET



OPTIONAL INDUSTRIAL CAMERA ENCLOSURE



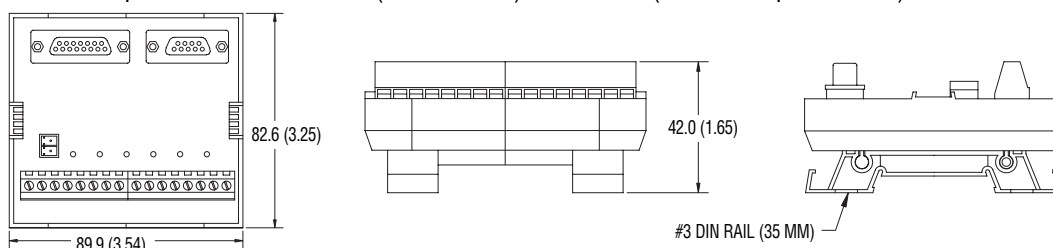
REMOTE HEAD MOUNTING BRACKET



Weight:
136.1g (4.8 oz.)
without camera

IN-SIGHT BREAKOUT MODULE (FOR USE WITH IN-SIGHT 1000, 1000C, 4000, 4001, AND 4100 VISION SENSORS) CIO-1350-00

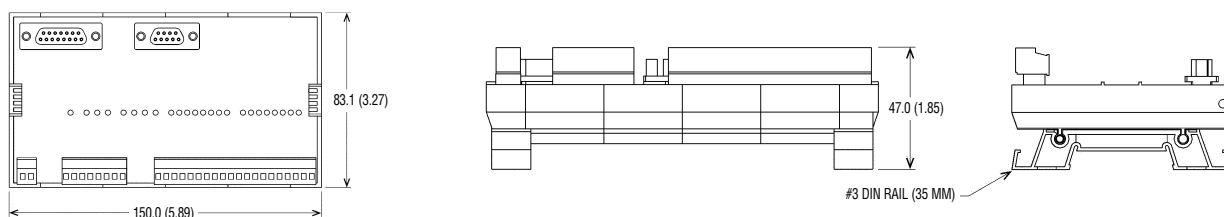
Note: All measurements are provided in millimeters (first number) and inches (number in parenthesis).



I/O	
Acquisition trigger	1 independent discrete input, optically isolated
Outputs	2 discrete outputs
Input delay	
Trigger input	ON: 30 μ Sec @ 3.5 mA; 8 μ Sec @ 15 mA OFF: 45 μ Sec @ 3.5 mA; 80 μ Sec @ 15 mA
Output delay	ON: 6 μ Sec OFF: 130 μ Sec @ 5 μ A; 95 μ Sec @ 10 mA; 85 μ Sec @ 15 mA
Trigger input resistance	~ 1000 Ohms
Trigger input state current	ON: 3.5 to 15 mA OFF: 500 μ A
Maximum output current	200 mA (sink)
ON state voltage drop	0.8VDC @ 10 mA; 2.6VDC @ 15 mA
OFF state leakage current	100 μ A; maximum @ 15VDC

Mechanical	
Terminal block torque	7 in-lb (0.8 N-M) Maximum
Cable	4.6 m (15 ft.) supplied, 12.3m (40 ft.) optional
Power	
Operating voltage (field side)	5VDC to 24VDC
Power consumption	24VDC +/-10%, 50mA plus camera load
Status LEDs	1 each for power, acquisition trigger, and outputs
Field wiring size	26 to 12 AWG
Environmental	
Operating temperature	0 to 50°C (32 to 122°F)
Operating humidity	5 to 95% non-condensing
Storage temperature	-20 to 85°C (-4 to 185°F)
Storage humidity	5 to 95% non-condensing

IN-SIGHT EXPANSION MODULE (FOR USE WITH IN-SIGHT 1000, 1000C, 4000, 4001, AND 4100 VISION SENSORS) CIO-1450-00



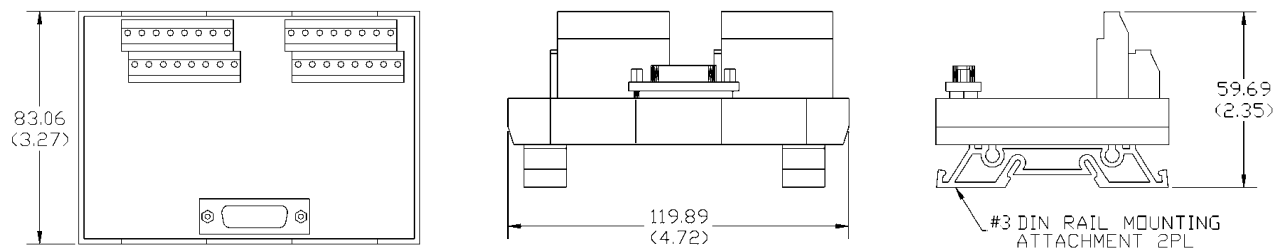
I/O	
Acquisition trigger	1 independent discrete input, optically isolated
General purpose inputs	8 discrete inputs
General purpose outputs	10 discrete (2 high-speed, 8 general purpose)
Serial	1 RS-232C port (1200 to 115,200 baud rates), Rx/D, Tx/D, and Flow control (RTS/CTS)
Input delay	
Trigger input	250 μ Sec
8 general-purpose inputs	600 μ Sec maximum delay
Output delay	
2 high-speed outputs	ON: 6 μ Sec OFF: 130 μ Sec @ 5 μ A; 95 μ Sec @ 10mA, 85 μ Sec @ 15mA
8 general-purpose outputs	Pulse mode 375 μ Sec max Set/Reset mode 550 μ Sec max
Trigger input resistance	~2K Ohms
Input state current	
Trigger	ON: 10 to 14.4mA OFF: <300 μ A
General purpose inputs	1.3mA
Maximum output current	
High-speed outputs	200mA (Sink)
General purpose outputs	150mA (Sink)

I/O (cont.)	
ON state voltage drop	Depends on output load configuration
OFF state leakage current	
General purpose inputs	<50 μ A
High-speed outputs	200 μ A
General purpose outputs	200 μ A
Mechanical	
Terminal block torque	0.3 N-m (2.7 in-lb) Maximum
Cable	4.6 m (15 ft.) supplied, 12.3m (40 ft.) optional 200 μ A
Power	
Operating voltage (field side)	5VDC to 24VDC
Power consumption	24VDC $\pm$ 10%, 1.25 Amps, 30W supply*
Status LEDs	1 each for power, acquisition trigger, inputs, and outputs 2 each for camera and remote RS232
Field wiring size	26 to 16 AWG
Environmental	
Operating temperature	0 to 50°C (32 to 122°F)
Operating humidity	10 to 90%, non-condensing
Storage temperature	-10 to 65°C (14 to 149°F)
Storage humidity	10 to 90%, non-condensing

* Maximum draw when I/O Expansion Module supplies power to an In-Sight 4100 sensor, and when all inputs, outputs, and LED indicators are in use. Draw will be less than 30W under typical usage.

I/O BREAKOUT MODULE (OPTIONAL FOR IN-SIGHT 2000 AND 3000 VISION SENSORS) CIO-2350-00

Note: All measurements are provided in millimeters (first number) and inches (number in parenthesis).

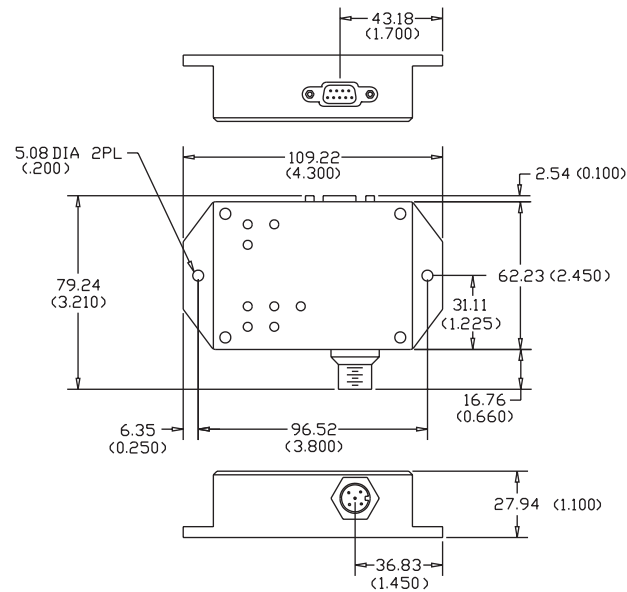


I/O	
Inputs	8 independent discrete inputs, optically isolated
Outputs	8 independent discrete outputs, optically isolated
Input delay	ON: 30 μ s @ 3.5 mA; 8 μ s @ 15 mA OFF: 45 μ s @ 3.5 mA; 80 μ s @ 15 mA
Output delay	ON: 6 μ s OFF: 130 μ s @ 5 mA; 95 μ s @ 10 mA; 85 μ s @ 15 mA
Input resistance	1K Ohms
Input state current	ON: 3.5 to 15 mA OFF: 500 μ A
ON state voltage drop	0.8VDC @ 10 mA, 2.6VDC @ 15 mA
OFF state leakage current	100 μ A; maximum @ 15VDC
Mechanical	
Terminal block torque	7 in-lb (0.8 N-M) Maximum
Cable	7' (2.13m), supplied

Power	
Operating voltage (field side)	5-24VDC
Power consumption	5VDC, supplied from the Vision Processor
Maximum output current	15 mA (sink or source)
Status LEDs	1 each for inputs, and outputs
Field wiring size	26 to 12 AWG
Environmental	
Operating temperature	0°C to 50°C (32°F to 122°F)
Operating humidity	5 to 95% non-condensing
Storage temperature	-20°C to 85°C (-4°F to 185°F)
Storage humidity	5 to 95% non-condensing

DEVICENET INTERFACE MODULE (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS*) CIO-2550-00

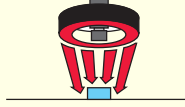
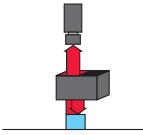
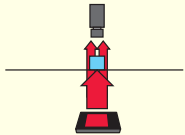
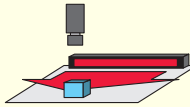
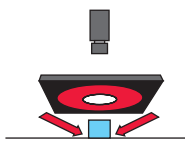
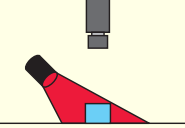
Note: All measurements are provided in millimeters (first number) and inches (number in parenthesis).



Data	
Data size	8/7 bits (software config.)
Parity	Even/odd/none
Stop bits	1 (fixed)
Data rate (serial)	300, 1220, 2400, 4800, 9600, 19.2 kbs (software selected)
(DeviceNet)	125, 250, 500 kbs
Flow control	None. RTS/CTS, X-On/X-Off
Power	
Isolation	500v
ESD protection	+/-10kv
Overload protection	+/-30kv
Short circuit	Indefinite
Output levels	+/-7.9v (typical)
Environmental	
Operating temperature	0°C to 70°C (32°F to 158°F)

* For In-Sight 1000, I/O configuration with RTS/CTS is required.

COGNEX LIGHT MODULES (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS)

Light Type Category*	Operation	Attributes of Light Type	Application	Category*	Drawing No.**
Ring Lights		- Provides soft, even illumination from all directions. - Emphasizes surface features on non-reflective parts. - De-emphasizes contrast between part and background.	- Measuring small molded plastic parts. - Measuring parts that cannot be illuminated with back lighting.	A	L1
				B	L2
					L3
					L4
					L5
					L6
					L7
				C	L8
Low Angle Ring Lights		- Provides soft, low angle illumination from all directions. - Emphasizes edges along with scratches on glossy surfaces of parts.	Used in above applications, where working distance is limited.	B	L9
					L10
					L11
				C	L38
Diffuse Lights		- Provides high-intensity, on-axis illumination. - Emphasizes flat regions of part surface. - De-emphasizes deviations in part surface.	- Verifying presence of liners inside bottle-caps. - Measuring interior features with varying depths.	A	L12
				B	L13
					L14
					L15
Back Lights		- Provides maximum contrast between part outline and background. - Emphasizes outline of part and part features. - De-emphasizes interior features.	- Measuring external part edges. - Verifying hole patterns in stamped metal parts.	A	L17
				B	L18
					L19
					L20
					L21
					L22
Dome Lights		- Provides extremely even, diffuse illumination. - Evenly illuminates mirrored surfaces. - De-emphasizes 3-dimensional part surface characteristics.	- Detecting printing on wrinkled foil. - Measuring connector pins.	A	L23
				B	L24
Linear Array Lights		- Provides even, concentrated illumination along a straight line. - Emphasizes part surface irregularities and "raised" features.	Measuring long, thin parts, and parts where edges need to be highlighted.	A	L25
				B	L26
					L27
					L28
					L29
Dark Field Lights		- Provides extremely low-angle illumination for imaging of part surface irregularities. - Emphasizes surface irregularities and "raised" features on parts.	Inspecting metal parts with dents, bumps, or other "raised" features.	A	L32
				B	L33
					L34
					L35
Spot Lights		- Provides diffuse beam of light for achieving maximum contrast in a certain direction. - Emphasizes a specific feature on a part.	- Verifying the presence of individual components in an assembly. - Inspecting parts with features that are angled in a certain direction.	A	L37
				B	L40

* Denotes compatible power supply and cable category

** Designates outline drawings on pages 38 to 44

Cognex Lighting Module Part Numbers & Description		Power Requirements			
		Non-Strobed Applications		Strobed Applications	
		IS1xxx/4xxx	IS2000/3000	IS1xxx/4xxx	IS2000/3000
CLM-4260-00 ¹	100mm outer diameter ring	CLA-400-00 or CLA-CS100-00	CLA-2000-01	CLA-4000-00	CLA-1000-00
CLM-LDR32-00	32mm outer diameter ring	CLA-PD3012-00 or CLA-PB2430-00 and CLA-CBx-00		CLA-PD3012-00, CLA-CBx-00 and CLA-STU3000-00	
CLM-LDR50B-00	50mm outer diameter ring				
CLM-LDR70AN-00	70mm outer diameter ring				
CLM-LDR90B-00	90mm outer diameter ring				
CLK-LDR70ASW-00	70mm outer diameter ring (White)	CLA-PD3024-00 and CLA-FCBx-00		CLA-PD3024-00, CLA-FCBx-00 and CLA-STU3000-00	
CLK-LDR90BSW-00	90mm outer diameter ring (White)	CLA-PD3024-00 and CLA-FCBx-00		CLA-PD3024-00, CLA-FCBx-00 and CLA-STU3000-00	
CLK-3010-00	Fluorescent Ring Light	120VAC, 50/60Hz14W			
CLK-3010-01	Fluorescent Ring Light	220VAC, 50/60Hz14W			
CLM-LDR74LA-00	74mm outer diameter ring	CLA-PD3012-00 or CLA-PB2430-00 and CLA-CBx-00		CLA-PD3012-00, CLA-CBx-00 and CLA-STU3000-00	
CLM-LDR132LA-00	132mm outer diameter ring				
CLM-LDR170LA-00	170mm outer diameter ring				
CLM-FPQ75BL-00	75mm x 75mm square light (Blue)	CLA-PD3024-00 and CLA-FCBx-00		CLA-PD3024-00, CLA-FCBx-00 and CLA-STU3000-00	
CLK-003630-00	630mm outer diameter ring	220VAC, 50/60Hz14W			
CLM-2449-00 ²	52mm illumination window	CLA-400-00 or CLA-CS100-00	CLA-2000-01	CLA-4000-00	CLA-1000-00
CLM-LFVCP18-00	18mm illumination window	CLA-PD3012-00 or CLA-PB2430-00 and CLA-CBx-00		CLA-PD3012-00, CLA-CBx-00 and CLA-STU3000-00	
CLM-LFV50A-00	50mm illumination window				
CLM-LFVCP70A-00	70mm illumination window				
CLK-LFV50ASW-00	50mm illumination window (White)	CLA-PD3024-00 and CLA-FCBx-00		CLA-PD3024-00, CLA-FCBx-00 and CLA-STU3000-00	
CLM-1960-00	100mm x 100mm back light	CLA-400-00 or CLA-CS100-00	CLA-2000-01	CLA-4000-00	CLA-1000-00
CLM-LDLTP27x27-00	27mm x 27mm back light	CLA-PD3012-00 or CLA-PB2430-00 and CLA-CBx-00		CLA-PD3012-00, CLA-CBx-00 and CLA-STU3000-00	
CLM-LDLTP51x51-00	51mm x 51mm back light				
CLM-LDLTP100100-00	100mm x 100mm back light				
CLM-LDLTP211200-00	211mm x 200mm back light	CLA-PD5024-00 or CLA-PB2430-00 and CLA-CBx-00		CLA-PD5024-00, CLA-CBx-00 and CLA-STU3000-00	
CLK-LFL100SW-00	100mm x 100mm back light (White)	CLA-PD3024-00 and CLA-FCBx-00		CLA-PD3024-00, CLA-FCBx-00 and CLA-STU3000-00	
CLK-LFL100IR95-00	100x80 IR back light	CLA-PD3012-00 or CLA-PB2430-00 and CLA-CBx-00		CLA-PD3012-00, CLA-CBx-00 and CLA-STU3000-00	
CLM-7248-00 ³	Covers areas up to 80mm	CLA-400-00 or CLA-CS100-00	CLA-2000-01	CLA-4000-00	CLA-1000-00
CLM-LDM90A-00	Covers areas up to 90mm	CLA-PD3012-00 or CLA-PB2430-00 and CLA-CBx-00		CLA-PD3012-00, CLA-CBx-00 and CLA-STU3000-00	
CLM-1248-00	233mm x 20mm line illumination	CLA-400-00 or CLA-CS100-00	CLA-2000-01	CLA-4000-00	CLA-1000-00
CLM-LDL42x15-00	42mm x 15mm line illumination	CLA-PD3012-00 or CLA-PB2430-00 and CLA-CBx-00		CLA-PD3012-00, CLA-CBx-00 and CLA-STU3000-00	
CLM-LDL74x27N-00	74mm x 27mm line illumination				
CLM-LDL130x15-00	130mm x 15mm line illumination				
CLK-LDL42x15SW-00	42mm x 15mm line illumination (White)	CLA-PD3024-00 and CLA-FCBx-00		CLA-PD3024-00, CLA-FCBx-00 and CLA-STU3000-00	
CLK-LDL130x15SW-00	130mm x 15mm line illumination (White)	CLA-PD3024-00 and CLA-FCBx-00		CLA-PD3024-00, CLA-FCBx-00 and CLA-STU3000-00	
CLM-1660-00 ⁴	101mm inner ring diameter	CLA-400-00 or CLA-CS100-00	CLA-2000-01	CLA-4000-00	CLA-1000-00
CLM-LDR75LA1-00	46mm inner ring diameter	CLA-PD3012-00 or CLA-PB2430-00 and CLA-CBx-00		CLA-PD3012-00, CLA-CBx-00 and CLA-STU3000-00	
CLM-LDR96LA1-00	60mm inner ring diameter				
CLM-LDR146LA1-00	110mm inner ring diameter				
CLM-LDR206LA1-00	170mm inner ring diameter				
CLM-2420-00	Covers up to 50mm at a distance of 100mm	CLA-400-00 or CLA-CS100-00	CLA-2000-01	CLA-4000-00	CLA-1000-00
CLM-1236880100L-00	Covers up to 50mm at a distance of 100mm (Infrared spot light)				
CLM-LSP41RD-00	Covers up to 5mm at a distance of 100mm	CLA-PD3012-00 or CLA-PB2430-00 and CLA-CBx-00		CLA-PD3012-00, CLA-CBx-00 and CLA-STU3000-00	

¹ Includes bracket B1 on page 47² Includes bracket B2 on page 47³ Includes bracket B3 on page 47⁴ Includes bracket B4 on page 47

LIGHT MODULE POWER SOURCES AND ADAPTERS

POWER SUPPLIES					
	Category*	Drawing No.**	Model	Power Requirements	Voltage/Power Output
	A	P1	CLA-400-00	AC90~264VAC	24V/30w
	B	P2	CLA-PD3012-00	AC90~264VAC	12V/28w
		P2	CLA-PD3024-00	AC90~264VAC	24V/28w
		P3	CLA-PD5024-00	AC90~264VAC	24V/50w

POWER SUPPLY AND STROBE ADAPTER COMBINATION					
	Category*	Drawing No.**	Model	Trigger Input	
	A	P5	CLA-4000-00	TTL level positive & negative edge trigger	
		P6	CLA-6000-00	TTL level positive & negative edge trigger	
	B	P10	CLA-PTU3012-00	Photocoupler input (5mA)	

STROBE ADAPTERS					
	Category*	Drawing No.**	Model	Trigger Input	
	A	P4	CLA-1000-00	Supplied by an In-Sight 2000 or 3000 camera via 13' 2" cable	
	B	P7	CLA-STU3000-00	Photocoupler input (4mA)	

POWER ADAPTERS					
	Category*	Drawing No.**	Model	Trigger Input	
	A	P8	CLA-CS100-00	None (Doesn't support strobing)	
	B	P9	CLA-PB2430-00	None (Doesn't support strobing)	

LIGHT MODULE CABLES AND ADAPTERS

CABLE & CABLE ADAPTERS					
Category*		Model		Description	
A		CLA-2000-01		Patch cable connecting any category "A" light to an In-Sight 2000 or 3000	
		185-0036		Extension cable that adds additional length to any category "A" light	
		185-0035		Extension cable that adds additional length to any category "A" light	
		185-0037		Dual "Spot" Light adapter cable, provides power to 2 spot lights	
B		CLA-CB2-00		Extension cable that adds additional length to any 12V category "B" light	
		CLA-CB5-00		Extension cable that adds additional length to any 12V category "B" light	
		CLA-CBW-00		Dual light adapter. Enables two category "B" 12V lights to be connected to a single power supply. Total power of the 2 lights must not exceed power supplies limit.	

Digital Light Control	External Light Control	No. of Lights Supported
none	none	2 Lights (supports any 2 category "A" lights)
256 levels	External light control bit, light pulse, int/ext switching	2 Lights (combined power draw of the 2 lights must not exceed power output of unit).

Output	Power Requirements	Pulse Width
Provides power & strobe output for a single category "A" light	24VDC @ 1.25A max. w/ overload protection	.01 to 64 msec
Provides power & strobe output for 2 category "A" lights	24VDC @ 1.25A max. w/ overload protection	.01 to 64 msec
12V, 80mA Max per circuit, 2 circuits, 28 Watts Max	VAC 100-240	.01 to 99 msec

Output	Power Requirements	Pulse Width
Provides power & strobe output for a single category "A" light (can strobe 2 spot lights)	Supplied by an In-Sight 2000 or 3000 via 6' 4" cable	.01 to 1.9 msec
High-speed CMOS output; drive on/off control input of power unit	Supplied by digital power supplies	.01 to 99.99 msec

Output	Power Requirements
14.4W	24VDC input
12V & 24V outputs, 50W	24VDC input

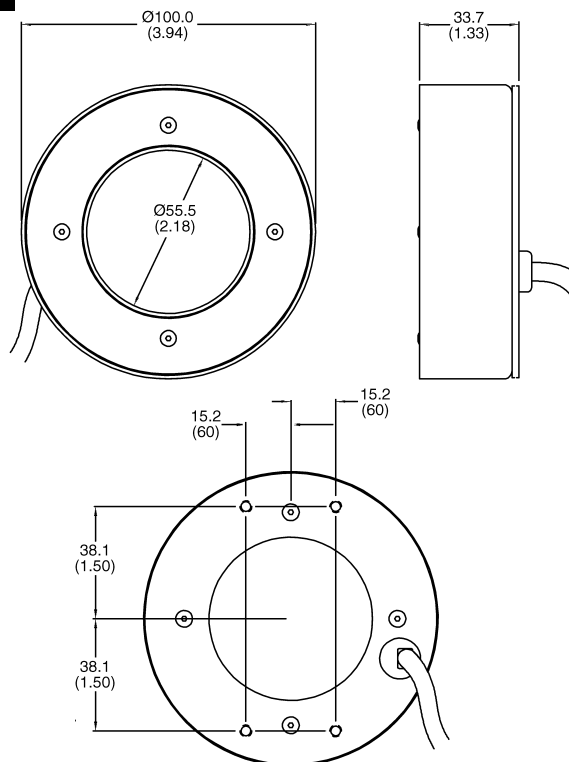
Length	No. of Lights Supported
3 feet	1
10 feet	1
30 feet	1
30 feet	2 (spot lights)
6.5 feet	1
15 feet	1
14 inches	2

COGNEX LIGHT MODULES (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS) “L” numbers refer to chart on page 34.

Note: Measurements are provided in millimeters. Numbers in parenthesis are in inches.

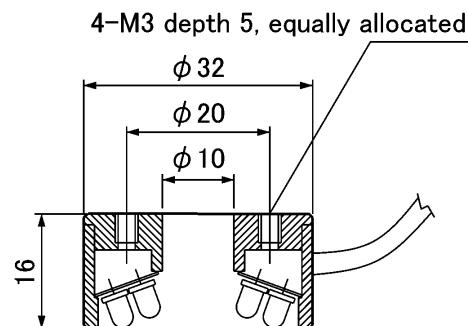
L1

CLM-4260-00



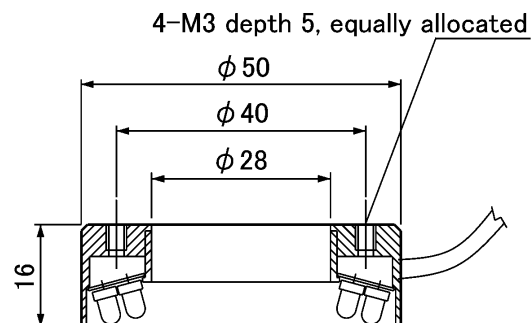
L2

CLM-LDR32-00



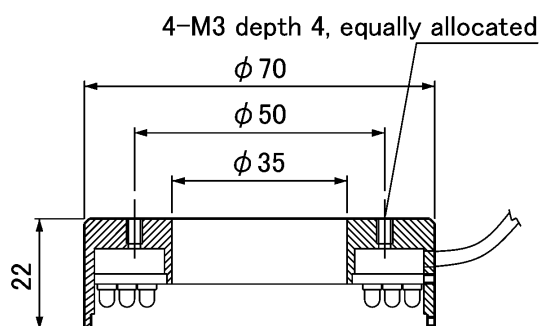
L3

CLM-LDR50B-00



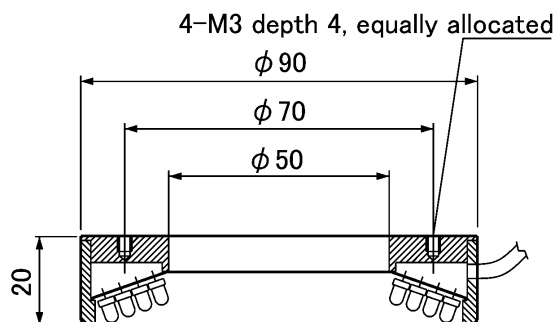
L4

CLM-LDR70AN-00



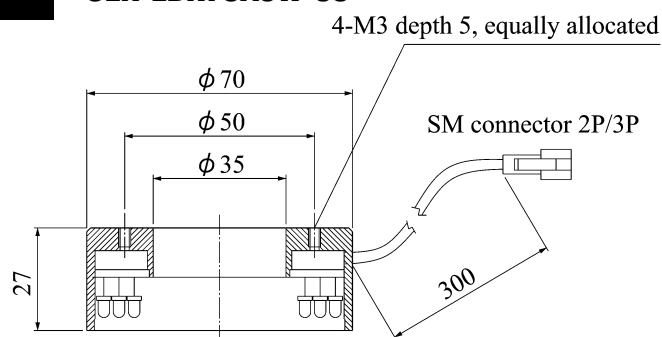
L5

CLM-LDR90B-00



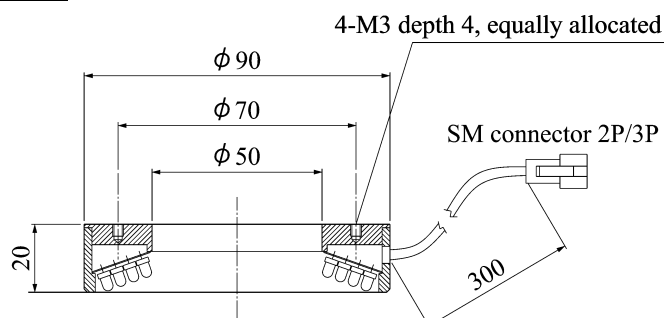
L6

CLK-LDR70ASW-00



L7

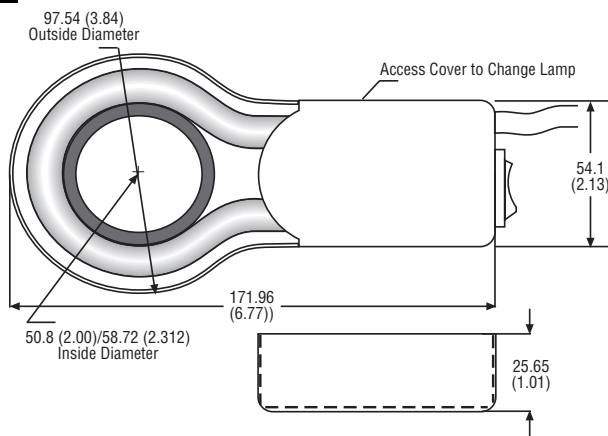
CLK-LDR90BSW-00



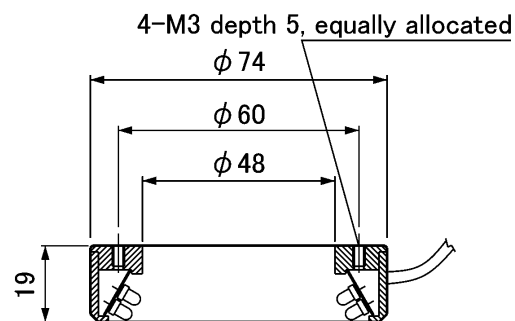
COGNEX LIGHT MODULES (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS) “L” numbers refer to chart on page 34.

Note: Measurements are provided in millimeters. Numbers in parenthesis are in inches.

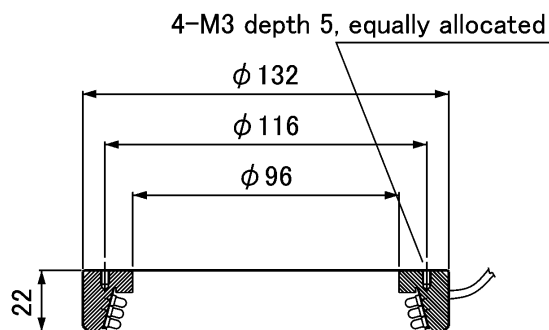
L8 CLK3010-00 / CLK-3010-01



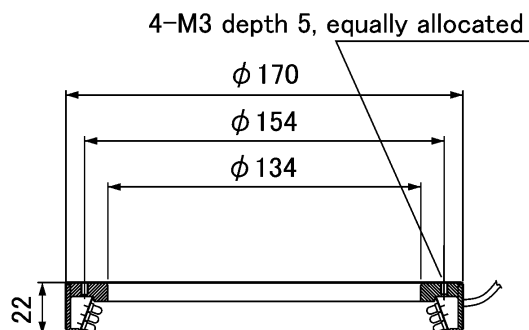
L9 CLM-LDR74LA-00



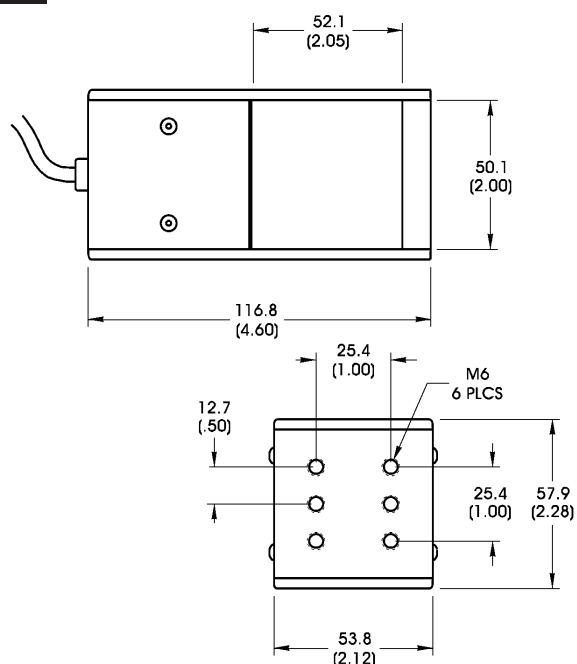
L10 CLM-LDR132LA-00



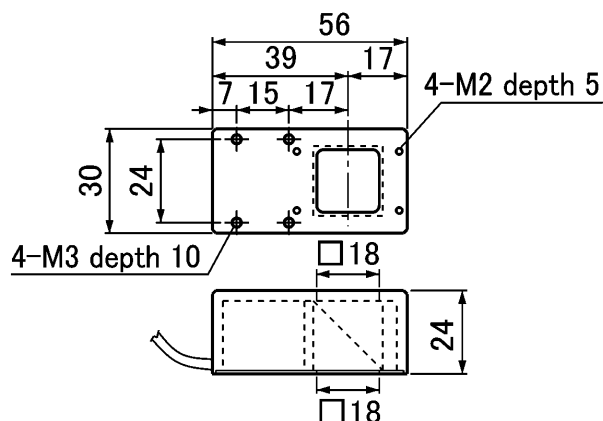
L11 CLM-LDR170LA-00



L12 CLM-2449-00



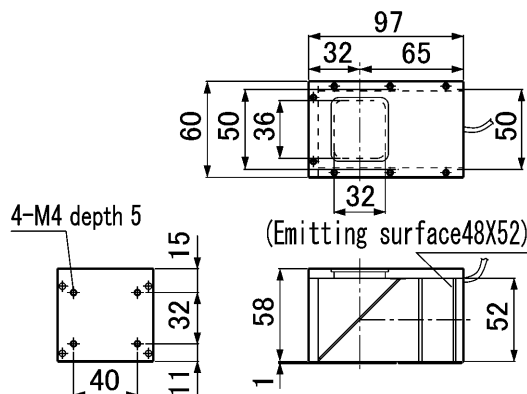
L13 CLM-LFVCP18-00



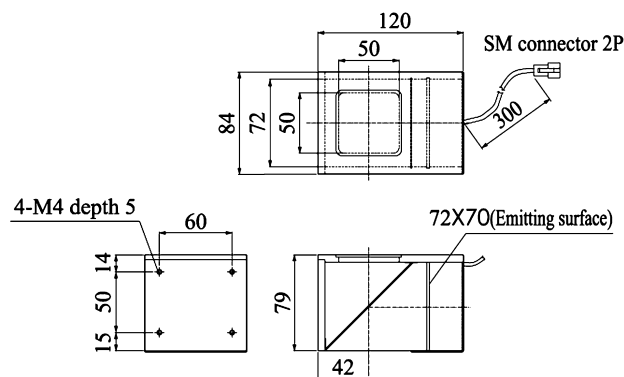
COGNEX LIGHT MODULES (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS) “L” numbers refer to chart on page 34.

Note: Measurements are provided in millimeters. Numbers in parenthesis are in inches.

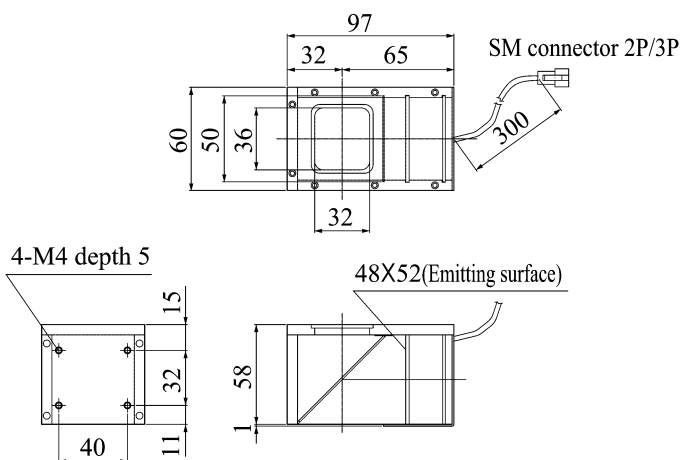
L14 CLM-LFV50A-00



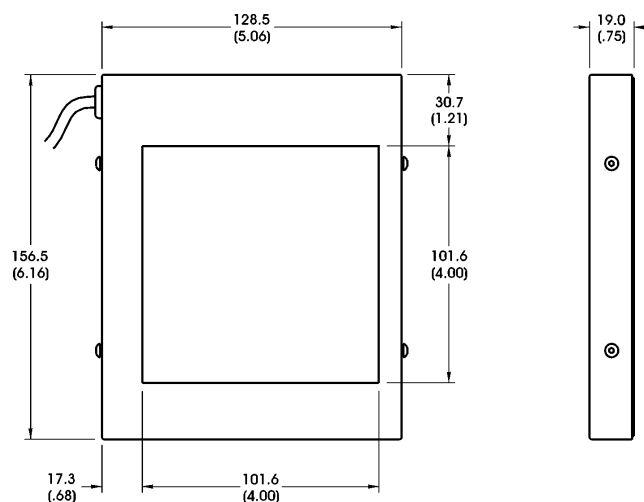
L15 CLM-LFVCP70A-00



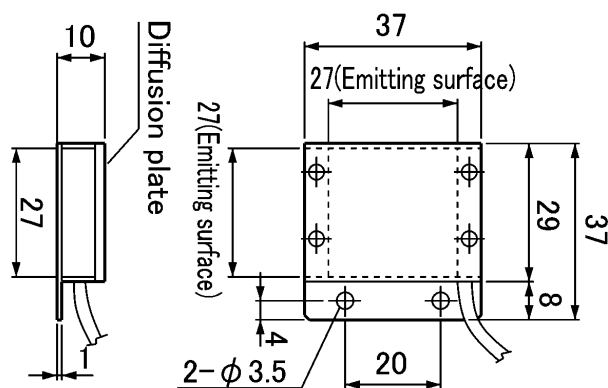
L16 CLK-LFV50ASW-00



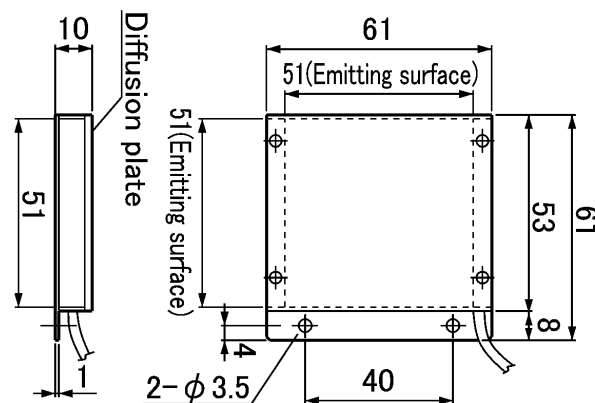
L17 CLM-1960-00



L18 CLM-LDLTP27X27-00



L19 CLM-LDLTP51X51-00



COGNEX LIGHT MODULES (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS) “L” numbers refer to chart on page 34.

Note: Measurements are provided in millimeters. Numbers in parenthesis are in inches.

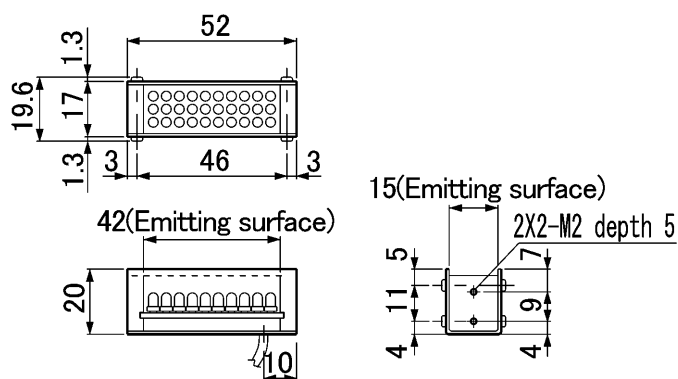
L20 CLM-LDLTP100100-00	L21 CLM-LDLTP211200-00
L22 CLK-LFL100SW-00	L23 CLM-7248-00
L24 CLM-LDM90A-00	L25 CLM-1248-00

COGNEX LIGHT MODULES (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS) “L” numbers refer to chart on page 34.

Note: Measurements are provided in millimeters. Numbers in parenthesis are in inches.

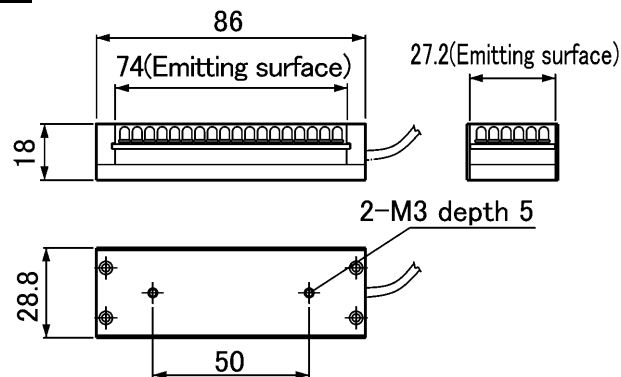
L26

CLM-LDL42X15-00



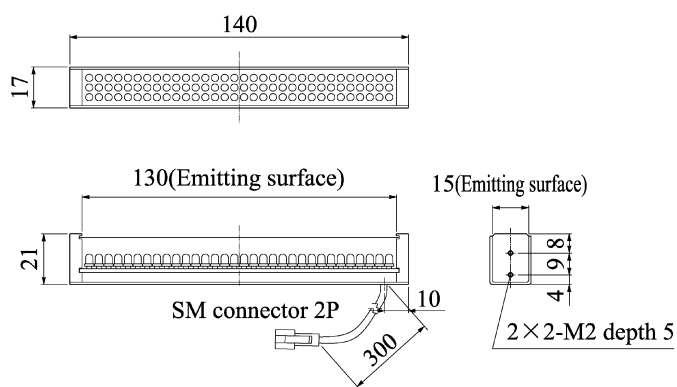
L27

CLM-LDL74X27N-00



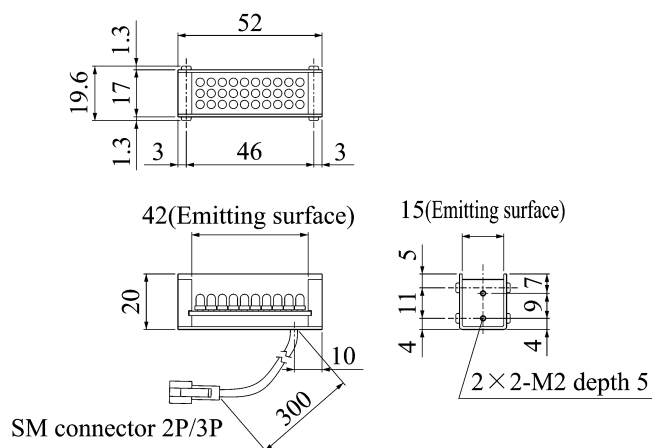
L28

CLM-LDL130X15-00



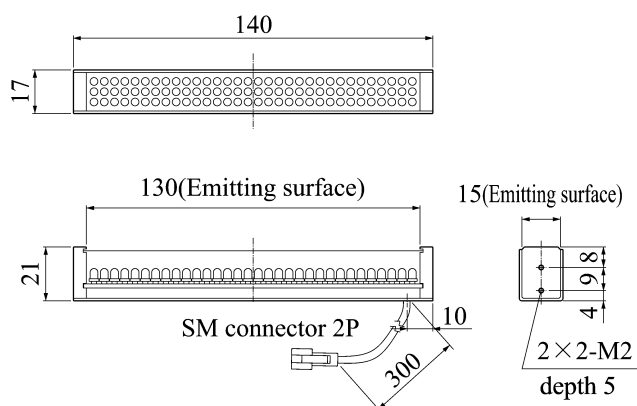
L29

CLK-LDL42X15SW-00



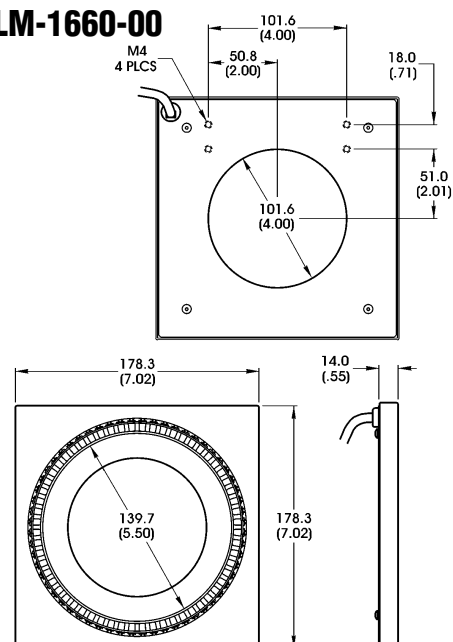
L30

CLK-LDL130X15SW-00



L31

CLM-1660-00

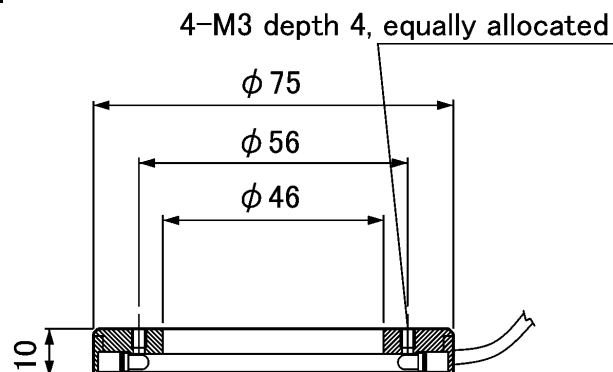


COGNEX LIGHT MODULES (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS) “L” numbers refer to chart on page 34.

Note: Measurements are provided in millimeters. Numbers in parenthesis are in inches.

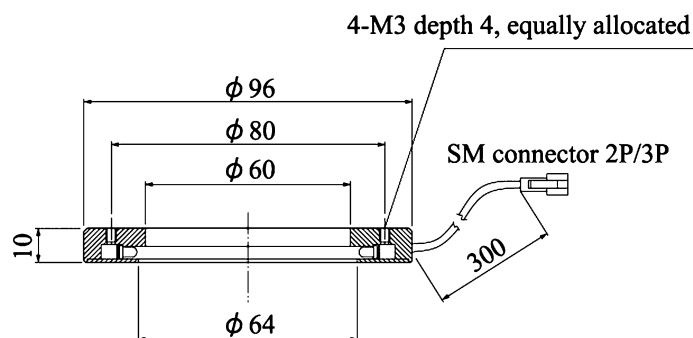
L32

CLM-LDR75LA1-00



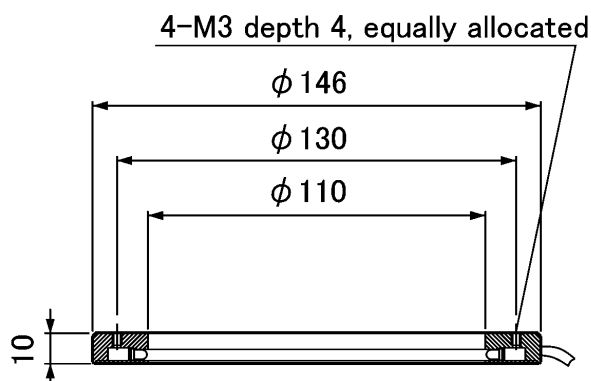
L33

CLM-LDR96LA1-00



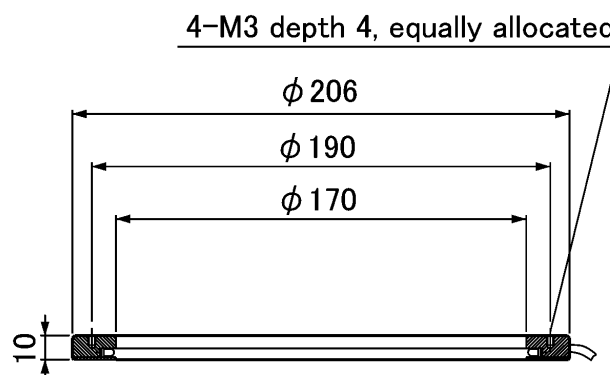
L34

CLM-LDR146LA1-00



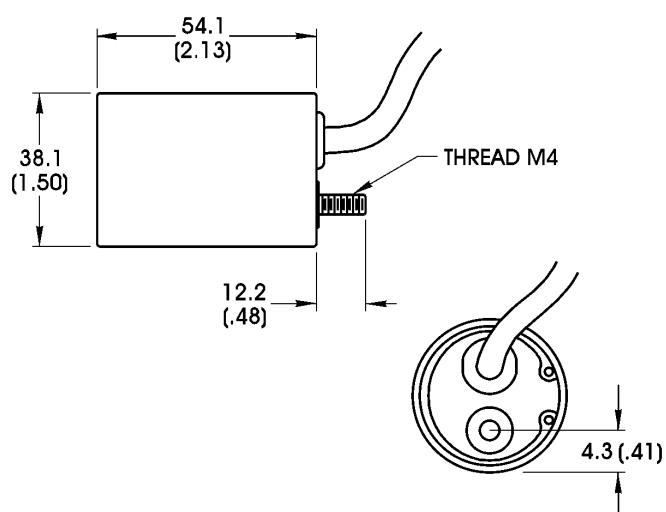
L35

CLM-LDR206LA1-00



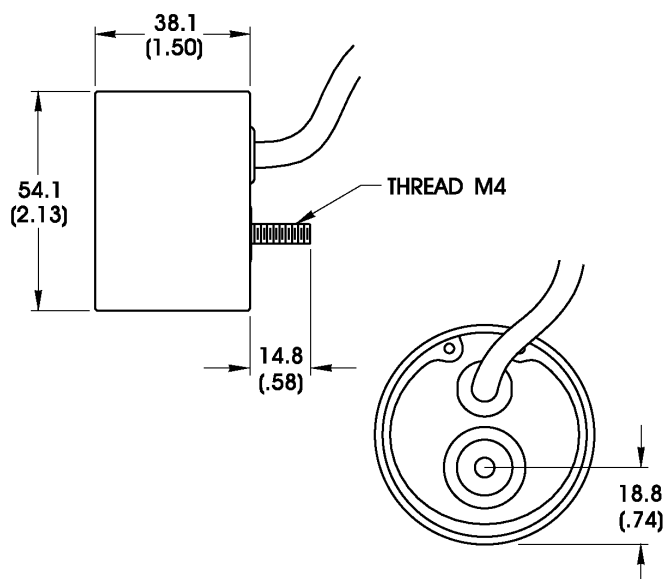
L36

CLM-2420-00



L37

CLM-1236880100L-00



SPECIFICATIONS

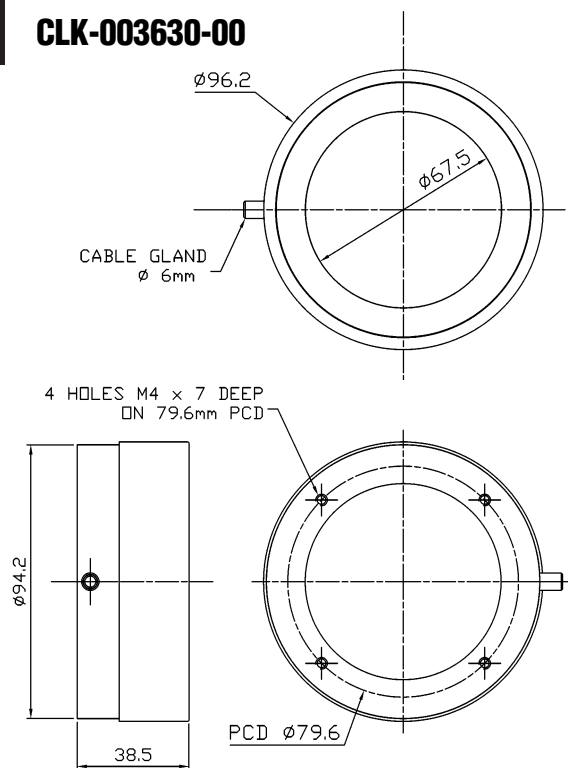
LIGHTING

COGNEX LIGHT MODULES (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS) “L” numbers refer to chart on page 34.

Note: Measurements are provided in millimeters. Numbers in parenthesis are in inches.

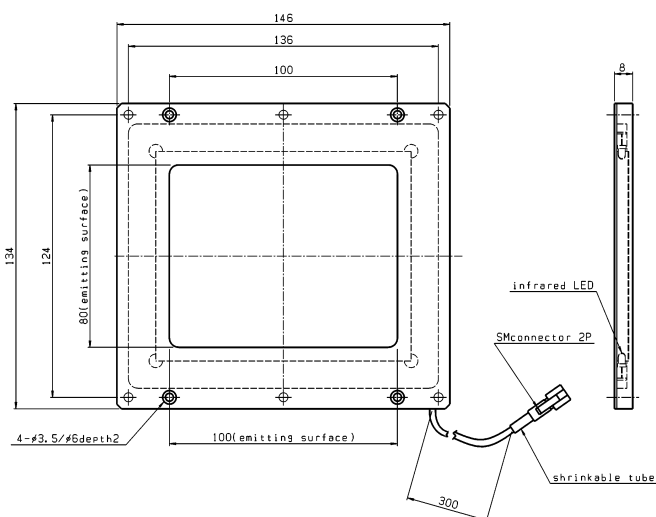
L38

CLK-003630-00



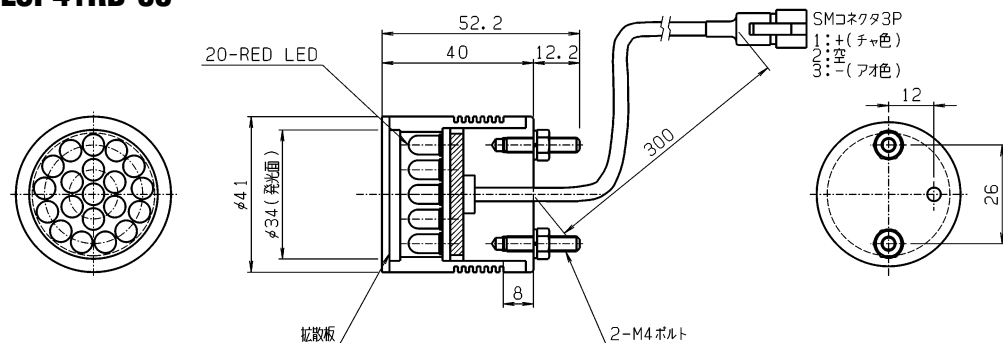
L39

CLK-LFL-100IR95-00



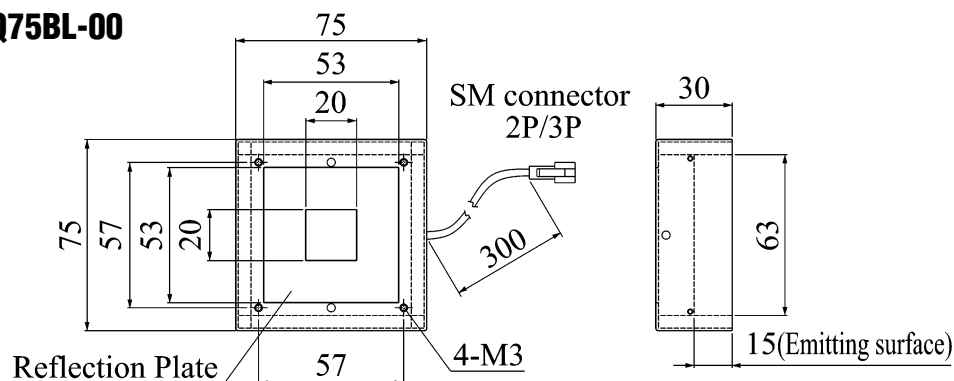
L40

CLM-LSP41RD-00



L41

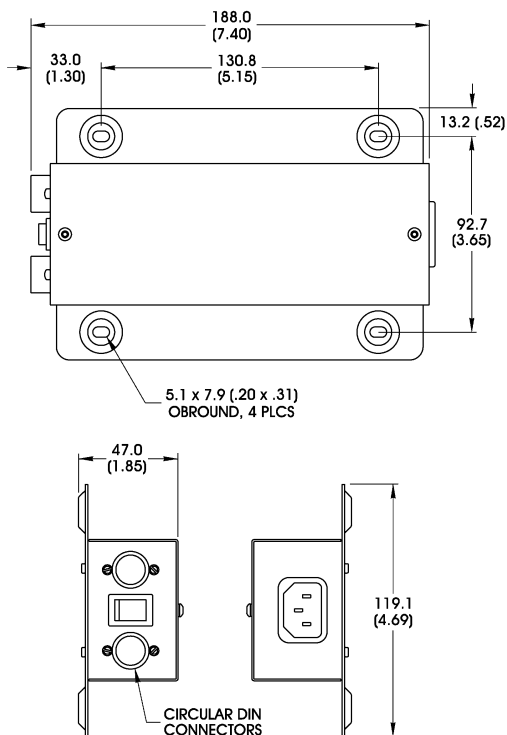
CLM-FPQ75BL-00



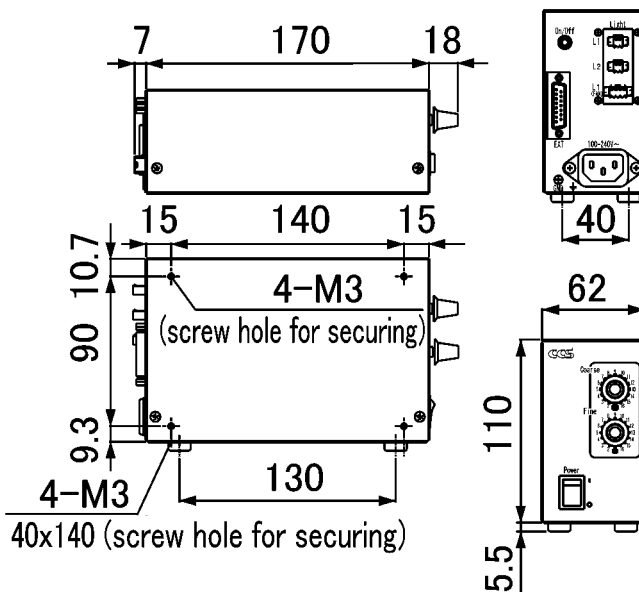
COGNEX POWER MODULES (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS) “P” numbers refer to chart on page 36.

Note: Measurements are provided in millimeters. Numbers in parenthesis are in inches.

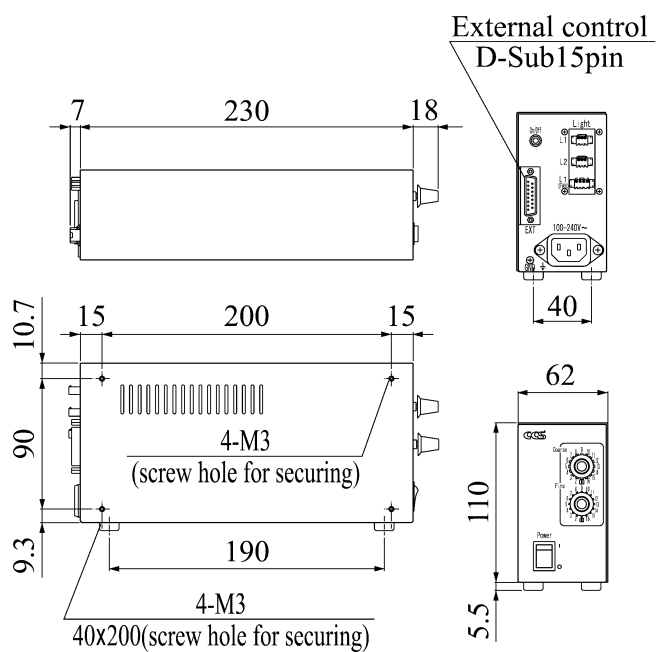
P1 CLA-400-00



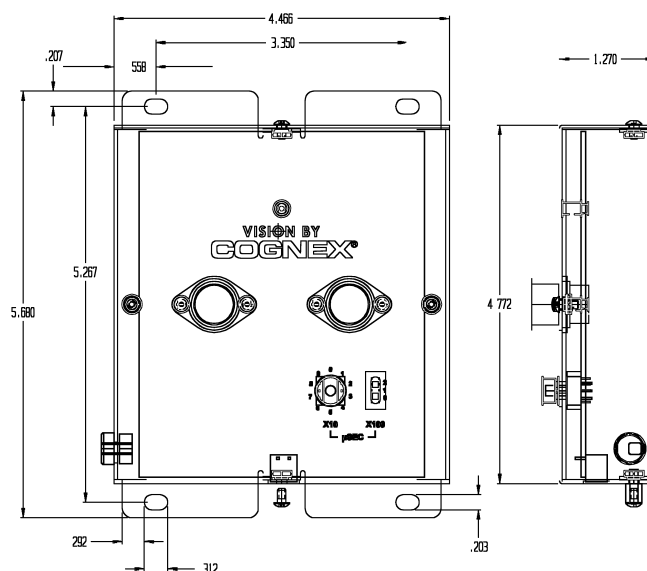
P2 CLA-PD3012-00 / CLA-PD3024-00



P3 CLA-PD5024-00



P4 CLA-1000-00



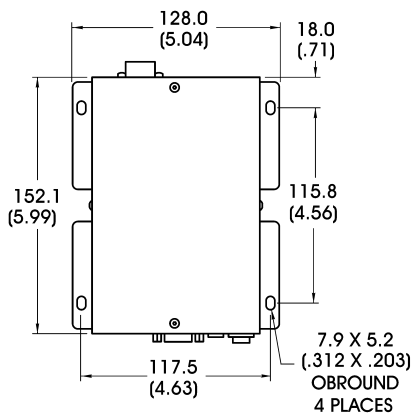
SPECIFICATIONS

LIGHTING

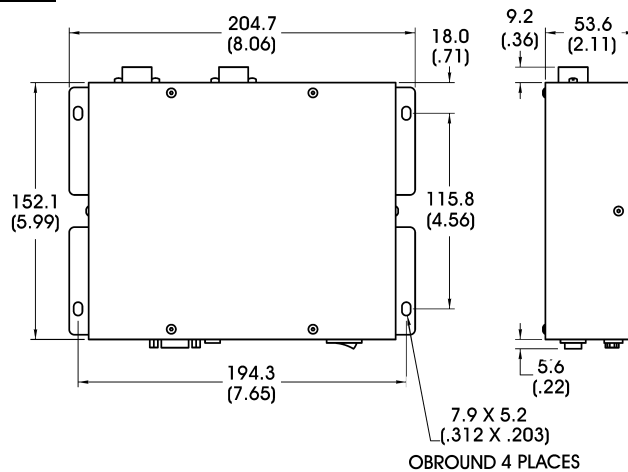
COGNEX POWER MODULES (OPTIONAL FOR ALL IN-SIGHT VISION SENSORS) “P” numbers refer to chart on page 36.

Note: Measurements are provided in millimeters. Numbers in parenthesis are in inches.

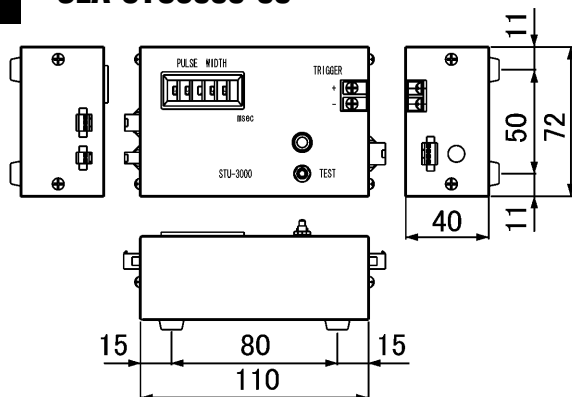
P5 CLA-4000-00



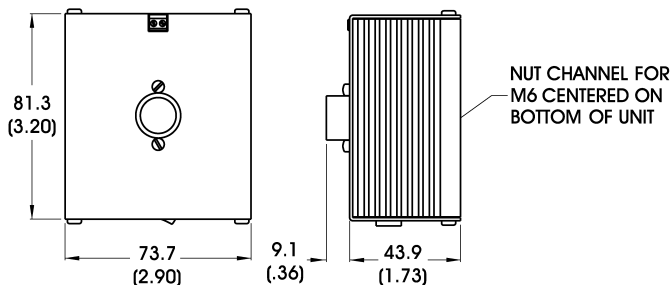
P6 CLA-6000-00



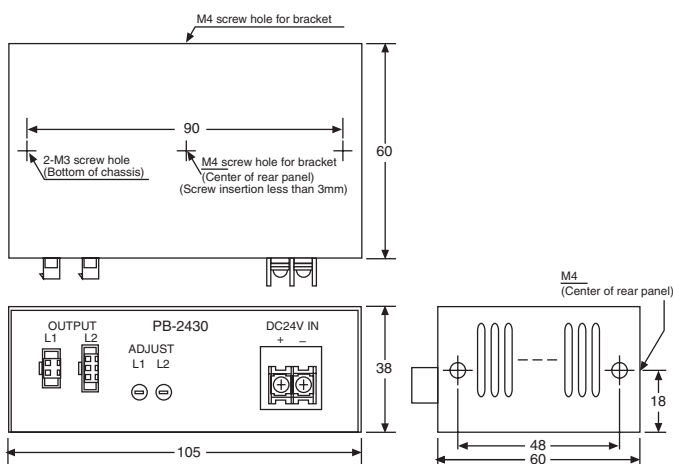
P7 CLA-STU3000-00



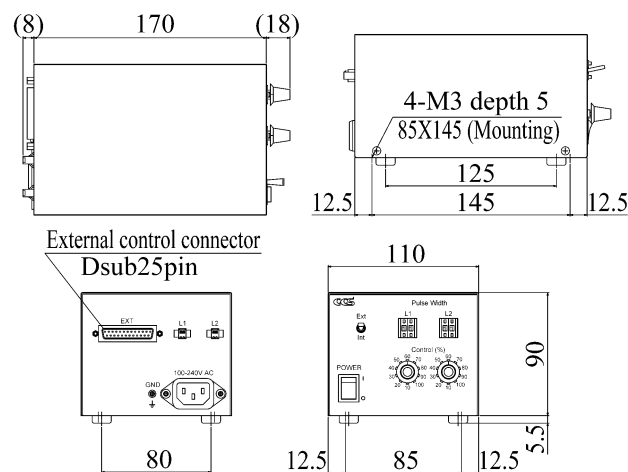
P8 CLA-CS100-00



P9 CLA-PB2430-00



P10 CLA-PTU3012-00



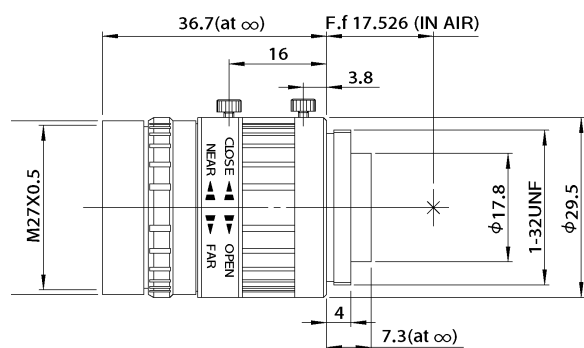
COGNEX LIGHT MODULE BRACKETS “B” numbers refer to chart on page 35.

Note: Measurements are provided in millimeters. Numbers in parenthesis are in inches.

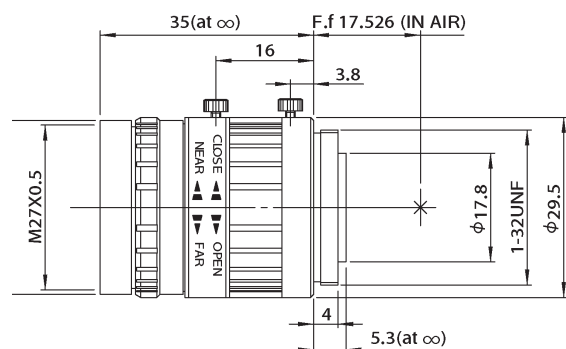
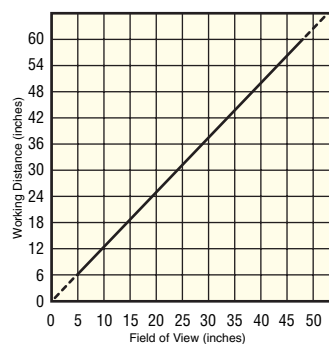
B1	RING LIGHT BRACKET (Included with CLM-4260-00)
B2	DIFFUSE LIGHT BRACKET (Included with CLM-2449-00)
B3	DOME LIGHT BRACKET (Included with CLM-7248-00)
B4	DARK FIELD LIGHT BRACKET (Included with CLM-1660-00)

LENSES

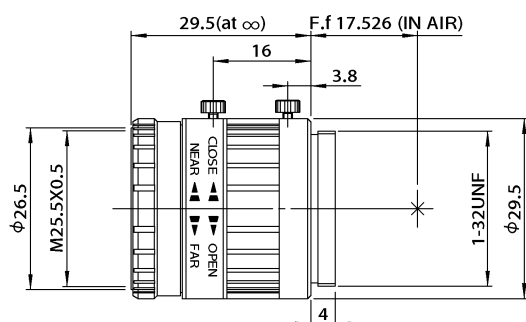
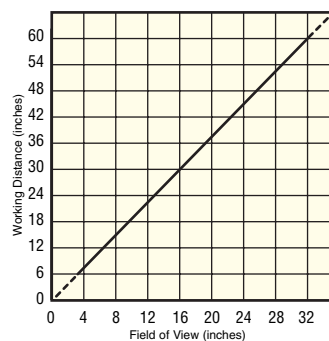
- Notes:**
- Measurements are provided in millimeters.
 - Solid lines in charts are measured values; dashed lines are extrapolated values.



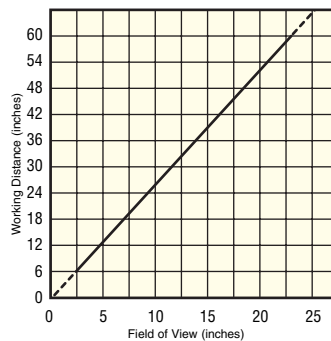
6MM LENS LNS-DF6HA1-00



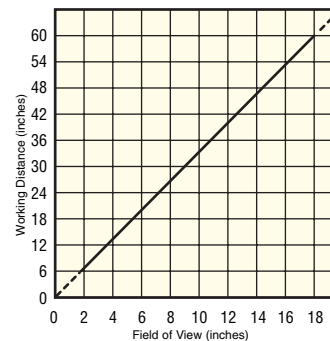
9MM LENS LNS-HF9HA1-00



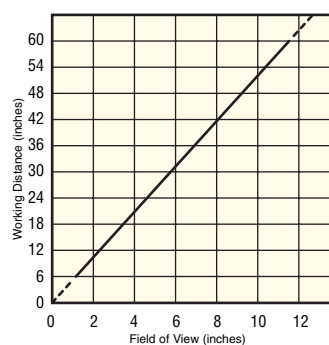
12.5MM LENS LNS-HF125HA1-00



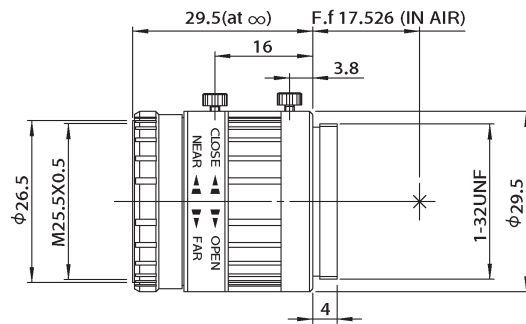
16MM LENS LNS-HF16HA1-00



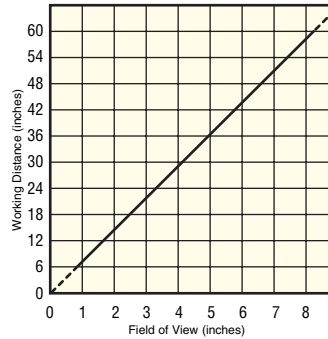
25MM LENS LNS-HF25HA1-00



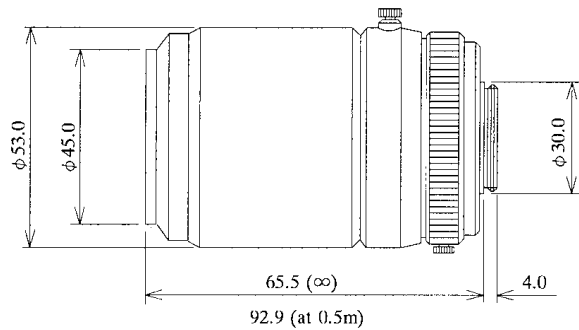
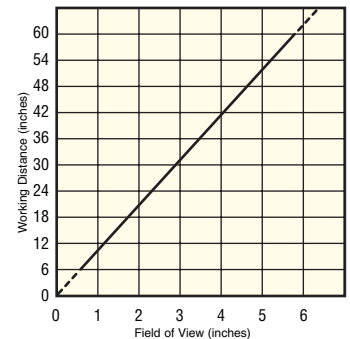
- Notes:** - Measurements are provided in millimeters.
 - Solid lines in charts are measured values; dashed lines are extrapolated values.



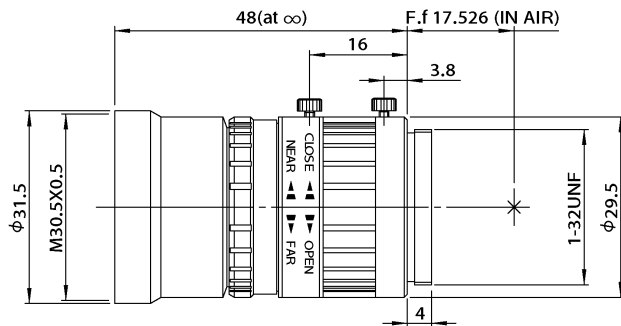
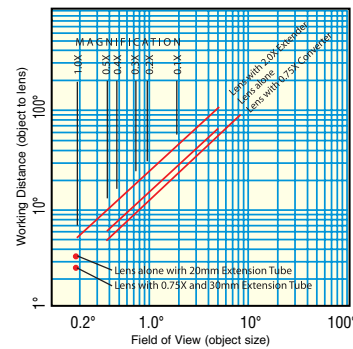
35MM LENS LNS-HF35HA1-00



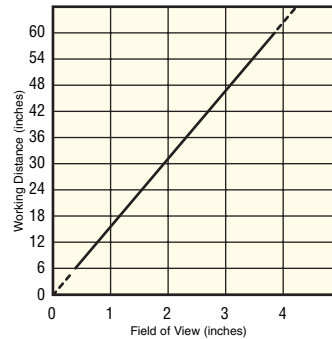
50MM LENS LNS-HF50HA1-00



55MM LENS Telecentric 114-0050



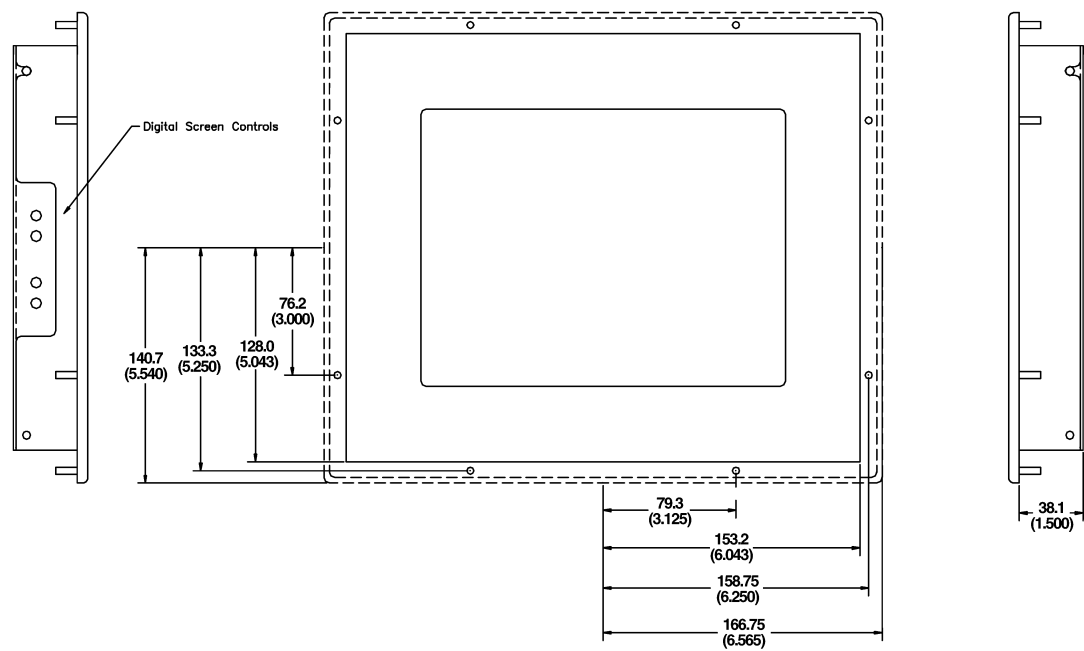
75MM LENS LNS-HF75HA1-00



Part Number	Size	Manufacturer	Lock-down screws	Sharp Cut Filter	Polarizer	Can be used with In-Sight 4100 camera enclosure
LNS-DF6HA1-00	6mm	Fujinon	Yes	LNS-R6427-00	LNS-FLTRPL27-00	Yes
LNS-HF9HA1-00	9mm	Fujinon	Yes	LNS-R6427-00	LNS-FLTRPL27-00	Yes
LNS-HF125HA1-00	12.5mm	Fujinon	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-HF16HA1-00	16mm	Fujinon	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-HF25HA1-00	25mm	Fujinon	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-HF35HA1-00	35mm	Fujinon	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-HF50HA1-00	50mm	Fujinon	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-HF75HA1-00	75mm	Fujinon	Yes	LNS-R6430-00	LNS-FLTRPL30-00	Yes
LNS-23FM08L-00	8mm	Tamron	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-23FM12L-00	12mm	Tamron	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-23FM16L-00	16mm	Tamron	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-23FM25L-00	25mm	Tamron	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-23FM35L-00	35mm	Tamron	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-23FM50L-00	50mm	Tamron	Yes	LNS-R6425-00	LNS-FLTRPL25-00	Yes
LNS-23FM75L-00	75mm	Tamron	Yes	LNS-R6425-00	LNS-FLTRPL25-00	No

FLAT PANEL MONITOR (OPTIONAL FOR IN-SIGHT 2000 AND 3000 VISION SENSORS) CIM-LCD-104

10.4" DIAGONAL/TFT ACTIVE MATRIX

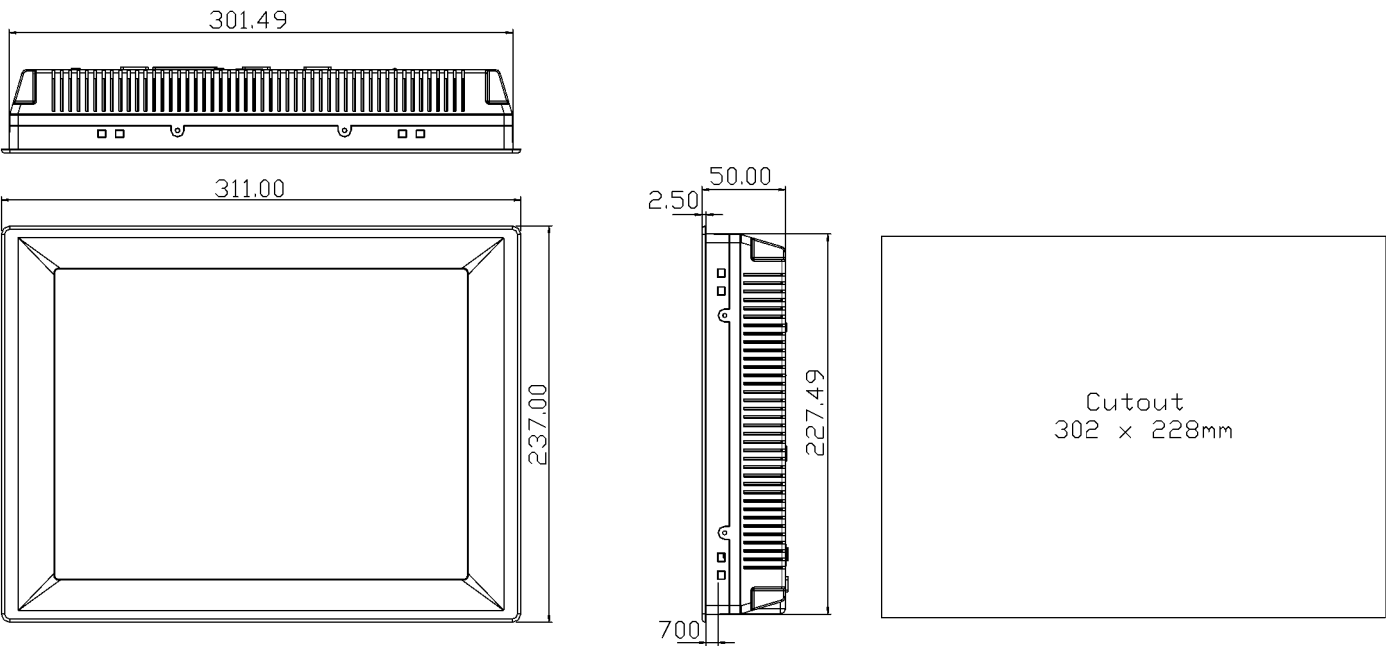


Liquid Crystal Display (LCD)	
Active area	211mm (8.31")(h) x 158.75mm (6.25")(v)
Pixel format	640(h) x 480(v)
Brightness	400 Nits Typical
Contrast ratio	300:1 Typical
Viewing angle	(Horizontal) 60° / 60° (Vertical) 45° / 55°
Back light life	50,000 Hours (Half Life)
Colors supported	256,000
Impact Window	
Thickness	.118 Nominal
Finish	Anti Glare
Finish external	UV Hard Coat
Material	Polycarbonate
Mechanical	
Bezel outside dimension	333.5mm (13.130")(h) x 281mm (11.080")(v)
Bezel material	6.35mm (.250") 6061 Aluminum
Bezel finish	Black Powder Coating

Mechanical (cont.)	
Front end construction	NEMA 4/12
Chassis depth	(Behind Cabinet Door) 28.54mm (1.125") (add 63.5mm (2.5") for cables unless bottom exit cables specified)
Chassis construction	18 Ga. Stainless Steel
Weight	3.18kg (7lbs)
Power	
Input voltage	24VDC nominal
Input wattage	25 Watts typical
Environmental	
Operating temperature	0°C to 50°C (32°F to 122°F)
Operating humidity	10 to 95%, non-condensing
Storage temperature	0°C to 60°C (32°F to 140°F)
Storage humidity	10 to 95%, non-condensing
Certifications	
Approvals	UL

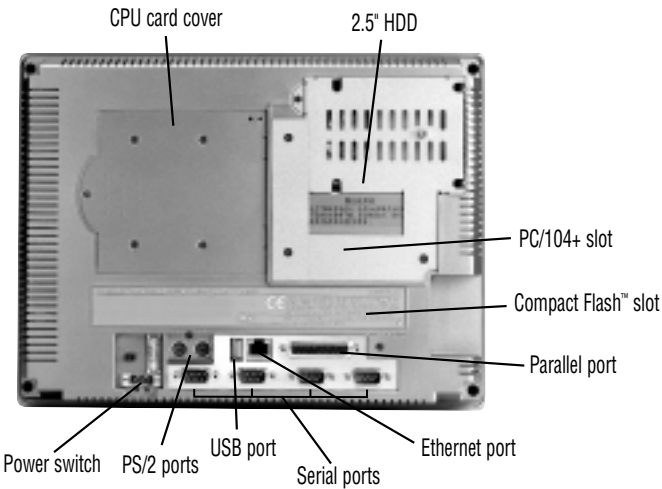
ETHERNET WORKSTATION (OPTIONAL FOR IN-SIGHT 1000, 1000C, 3000, AND 4000 VISION SENSORS) CIM-ENET-121

Please Note: All measurements are provided in millimeters.
Kit includes sealing gasket.



Touchscreen Display	
	12.1" SVGA TFT LCD
Type	4-wire, analog resistive
Resolution	continuous
Light transmission	above 75%
Life	100 million activation minimum
CPU and Core Logic	
	Transmeta® Crusoe™ 5400 (500 MHz)
BIOS	
	Award® 256KB
VGA	
	SMI® 710/712 VGA controller
DRAM	
	128 MB on board, among which 112 MB for users
Expansion	
	One 32-bit PC/104-Plus expansion slot
Watchdog Timer	
	1.6 seconds interval
Storage	
	Internal 2.5" HDD (20GB or higher); CompactFlash™ memory slot available.
I/O	
	4 serial ports (one configurable to RS-422/485) and RS-485 is auto flow controlled, 1 parallel port, 1 Ethernet port (10/100Base-T), 1 USB port, 2 PS/2 ports
Mechanical	
Construction	Al-Mg and plastic molding
Dimensions	311 x 237 x 50 mm (WxHxD) (12.24" x 9.33" x 1.97")
Weight	2.2kg (4.85 lbs)

Power	
	24VDC, 0.8 A maximum
Environmental	
Operating temperature	0°C to 50°C (32°F to 122°F)
Operating humidity	10% to 95% @ 40°C, non-condensing
Storage temperature	-20°C to 60°C (-4°F to 140°F)
Storage humidity	Up to 95%, non condensing
EMI	FCC Class A certified
	Front panel meets NEMA4 / IP65
Certifications	
Approvals	CE, UL



IN-SIGHT MODEL COMPARISON



PRODUCT ATTRIBUTE		1000	1010
Memory	Firmware & User	4MB	4MB
Camera	Resolution	640 x 480	640 x 480
	Acquisition Rate	30fps	30fps
	Partial Image Acquisition	No	No
	Max. Distance (camera to processor)	N/A	N/A
	NEMA/IP Ratings (camera)	NEMA 4/IP55 ⁴	NEMA 4/IP55 ⁴
	Max. Operating Temperature	45°C	45°C
	Max. Operating Temp w/in Enclosure	35°C	35°C
Display Options	VGA Port	No	No
	PC (via PC Host)	Yes	Yes
I/O Options	Trigger	Yes	Yes
	Strobe	Yes ¹	Yes ¹
	Integrated # of Outputs	2	2
	Integrated # of Inputs	1	1
	I/O Breakout Module (CIO-1350-00) Support	Yes	Yes
	I/O Expansion Module (CIO-1450-00) Support (adds 8i/8o)	Yes	Yes
	I/O Breakout Module (CIO-2350-00) Support (adds 8i/8o)	No	No
	Ethernet I/O Support (up to 512i/ 512o)	Yes	Yes
Communication Options	RS232 Port (w/ Rx/Tx & RTS/CTS)	1 ⁵	1 ⁵
	RS232 Port (w/ Rx/Tx)	1	1
	Ethernet Ports	1	1
Lighting Options	Direct Power	No	No
Application Development Options	Control Pad	No	No
	PC Host (In-Sight.exe)	Yes	Yes
Lens Mount	C Mount	Yes	Yes
	CS Mount	No	No
Vision Tool Support	PatFind	Yes	No
	Edge	Yes	No
	Blob	Yes	No
	Histogram	Yes	No
	Image Processing	Yes	Yes
	OCV/OCR	Yes	No
	1D Codes:		
	Code 3 of 9, Code 128, Interleaved 2 of 5,	Yes	Yes
	Reduced Space Symbology (RSS),	Yes	Yes
	UPC/EAN, PostNet, Planet Code, Pharma Code, UPU-57	Yes	Yes
	2D Codes: Data Matrix™ ECC200, QR Code, PDF-17,	Yes	Yes
	Composite Symbology (CS)	Yes	Yes
	Color Tools	No	No

Notes:

- 1) Strobe output can also be used as general output for non-strobing applications.
- 2) Requires lens cover accessory.
- 3) Strobe outputs and Trigger inputs are located on the processor package (they are in the camera package on the IS2000/3000).

- 4) Requires optional camera enclosure for NEMA-rated protection.
- 5) When used with I/O Expansion module, PN# CIO-1450-00.
- 6) QR and Data Matrix only.

					
1000C	2000	3000	4000	4001	4100
4MB	4MB	4MB	8MB	8MB	8MB
640 x 480	640 x 480	640 x 480	640 x 480	1024 x 768	640 x 480
30fps	30fps	30fps	38fps	18fps	38fps
No	Yes	Yes	Yes	Yes	Yes
N/A	50 feet	50 feet	N/A	N/A	5 meters
NEMA 4/IP55 ⁴	NEMA 4/IP55 ⁴	NEMA 4/IP55 ⁴	NEMA 4/IP55 ⁴	NEMA 4/IP55 ⁴	NEMA 6/IP67 ²
45°C	45°C	45°C	35°C	35°C	50°C
35°C	45°C	45°C	TBD	TBD	50°C
No	Yes	Yes	No	No	No
Yes	No	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes ³
Yes ¹	Yes	Yes	Yes ¹	Yes ¹	Yes ^{1,3}
2	2	2	2	2	2
1	2	2	1	1	1
Yes	No	No	Yes	Yes	Yes
Yes	No	No	Yes	Yes	Yes
No	Yes	Yes	No	No	No
Yes	No	Yes	Yes	Yes	Yes
1 ⁵	2	1	1 ⁵	1 ⁵	1 ⁵
1	0	0	1	1	1
1	0	1	1	1	1
No	Yes	Yes	No	No	No
No	Yes	Yes	No	No	No
Yes	No	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
No	No	No	No	No	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	No	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	No	No	Yes	Yes	Yes
Yes	Yes ⁶	Yes ⁶	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	No	No	No	No	No



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