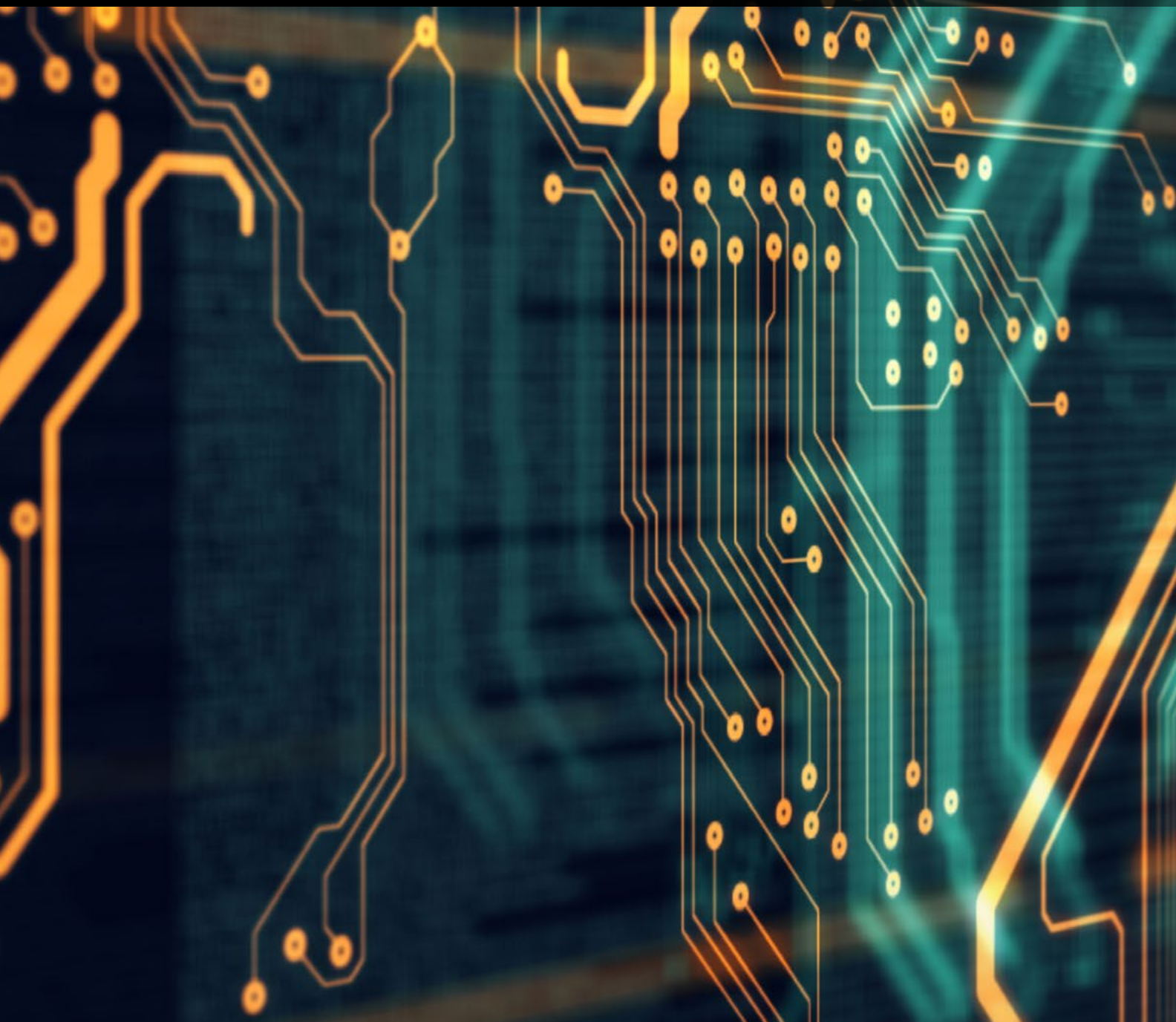
COGNEX

mailenom SYSTEMS

COGNEX PSI in Russia and the CIS

ELECTRONICS SOLUTIONS GUIDE

OEM Capital Equipment ▪ Finished Electonic Device Manufacturing ▪ Traceability and Process Control



THE GLOBAL LEADER

IN MACHINE VISION AND INDUSTRIAL BARCODE READING

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

With over 2.3 million systems installed in facilities around the world and over thirty nine years of experience, Cognex is focused on industrial machine vision and image-based barcode reading technology. Deployed by the world's top manufacturers, suppliers and machine builders, Cognex products ensure that manufactured items meet the stringent quality requirements of each industry.

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

$726 MILLION
2019 REVENUE

OVER 39
YEARS IN THE BUSINESS

500+
CHANNEL PARTNERS

GLOBAL OFFICES IN
20+ COUNTRIES

2,300,000+
SYSTEMS SHIPPED

MACHINE VISION AND BARCODE SOLUTIONS GUIDE FOR ELECTRONICS

GUIDE, INSPECT, ALIGN AND IDENTIFY WITH VISION

Electronics manufacturers and suppliers rely on Cognex's machine vision solutions to solve their most difficult production and packaging challenges while meeting stringent safety and quality requirements. Cognex sensors, vision systems, and image-based barcode readers satisfy the toughest applications for electronic materials, semiconductors, components, integrated circuit (IC) packaging, and finished electronic equipment. Driven by powerful vision technology and robust hardware, Cognex tools eliminate defects, verify assembly, and track and capture information during the production lifecycle to achieve maximum quality, high yields, and traceability.

OEM Capital Equipment 4

PCB Alignment 4

Surface Mount Device Robotic Guidance 4

Solder Paste Inspection 5

Post-Placement Automated Optical Inspection ... 5

Finished Electronic Device Manufacturers 6

Single-Pixel Display Defect Inspection 6

Barcode Reading 6

Product Enclosure Defect Inspection 7

Slider Head Optical Character Recognition 7

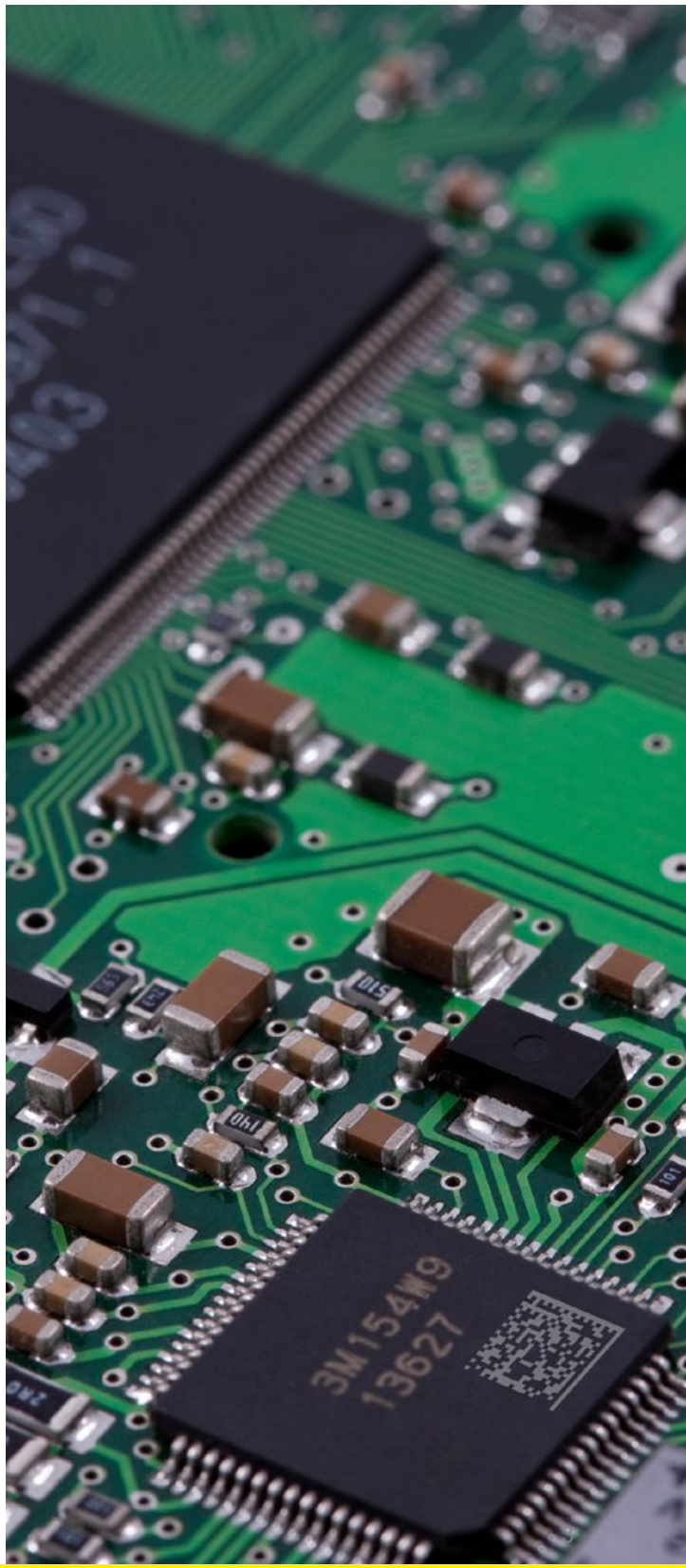
Hub and Platter Assembly Robotic Guidance 8

Head Gimbal Assembly Robotic Guidance 8

Traceability and Process Control 9

Supply Chain Traceability 9

Process Control 9



OEM CAPITAL EQUIPMENT

Cognex vision systems and barcode readers satisfy the widest range of guidance, inspection, alignment, measurement, and identification applications for capital equipment suppliers to semiconductor device and printed circuit board (PCB) manufacturers. Machine vision is a critical tool in PCB alignment; SMD picking, placement, and mounting verification; and solder validation.

PCB ALIGNMENT

Problem:

Printed Circuit Board (PCB) manufacturing involves detailed specifications and the precise inspection of tiny components. Fiducial marks located on opposite ends of a PCB ensure proper rotation and translation offsets, but they can be difficult to spot. Marks are typically 1 mm in diameter and lie flush with other components on the board, camouflaged by a confusing background and inadequate lighting conditions on the production floor.

Solution:

Without the speed and precision of vision-guided robotics, assembling modern PCBs would not be possible. Cognex advanced vision systems and patented algorithms offer integrated solutions for PCB alignment, including robotic arm guidance and lighting to locate fiducial marks and avoid placement errors. PatMax® pattern matching technology accurately locates parts against confusing backgrounds and under inadequate lighting conditions, even with rotation and scale variations. AlignPlus® vision-guided motion control also improves the accuracy of robotic pick-and-place applications. Cognex vision solutions improve the manufacturing quality of PCBs by detecting and tracking PCB assembly defects; verifying accurate placement; and detecting missing, reversed, or incorrect components.

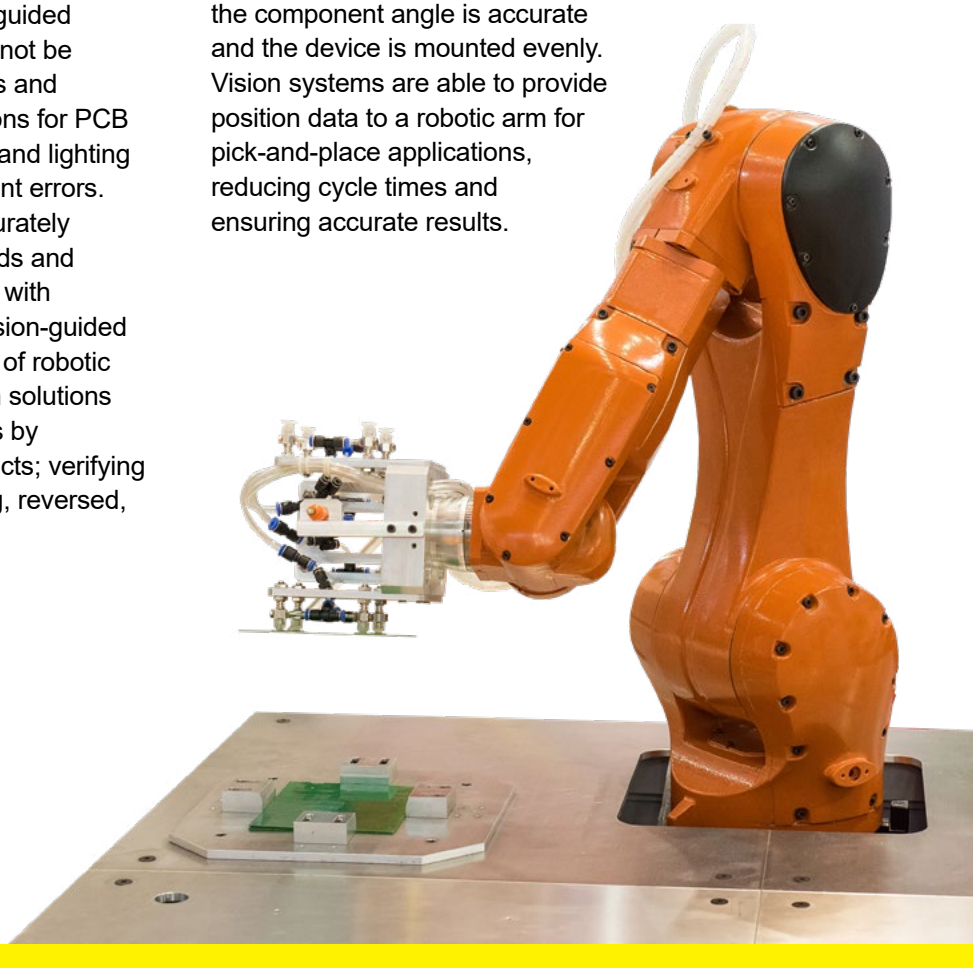
SURFACE MOUNT DEVICE ROBOTIC GUIDANCE

Problem:

The gull wing leads, soldering lands, and heat slug components of a surface mount device (SMD) package are commonly attached to a PCB by solder paste printing, which in excessive amounts can cause uneven placement. Even micron-level height variances will cause mechanical stress and limit thermal conduction and electrical insulation. This delicate process requires highly precise vision-guided robotics.

Solution:

Machine vision is critical to SMD picking, placement, and mounting verification. The In-Sight® VC200 multi smart camera vision system uses up to four cameras positioned at different angles to ensure accurate placement of the surface mount device package on the PCB. Measurements taken by the In-Sight Laser Profiler and the DS1000 3D laser displacement sensor complete an area profile to ensure the component angle is accurate and the device is mounted evenly. Vision systems are able to provide position data to a robotic arm for pick-and-place applications, reducing cycle times and ensuring accurate results.



SOLDER PASTE INSPECTION

Problem:

Solder paste is applied to PCB metal pads typically by stencil printing and occasionally by screen printing. With 50-70% of Surface Mount Technology (SMT) defects arising during the solder paste printing process, it is critical to inspect the solder paste after application on the PCB. Detection of screen printing defects prior to the insertion of components saves significant costs. Defects detected during the solder paste inspection stage cost ten times less to rework, on average, than those detected during the post-placement automated optical inspection stage. Defects found during the in-circuit test can cost up to fifty times more to rework.

Solution:

Solder paste volume is determined either by stencil thickness or by screen opening. The average volume applied is 0.001” and requires 3D machine vision for volume analysis to ensure the tolerance is met. Cognex VC5 vision controller connects directly to Cognex industrial GigE Vision cameras and DS1000 3D laser displacement sensors to ensure the solder paste does not exceed the tolerance. This configuration combines up to four area scan, line scan, or 3D displacement sensors to provide accurate 3D measurements.

POST-PLACEMENT AUTOMATED OPTICAL INSPECTION

Problem:

Post-placement Automated Optical Inspection (AOI) includes printed wiring board (PWB) inspection after assembly. The widespread use of SMT in PWB assembly has reduced component size and increased lead count and component density, greatly improving the performance capabilities of electronic devices but making manual assembly practically impossible and inspection at cost-effective production speeds challenging.

Solution:

As components continue to shrink in size, the chance of the wrong component being placed or reversed on a fast production line can only be determined through an automated inspection routine provided by machine vision technology. The small size of the PWB requires high resolution automated inspection post-assembly. As with the SMD device example, machine vision allows electronics manufacturers to inspect components like PWBs before additional value-add steps are taken, reducing rework and improving production yields. In-Sight vision systems now offer even higher resolution, greater speed and better color properties. Cognex CIC 29 megapixel cameras integrate with Cognex VisionPro® software and provide access to powerful vision tools like PatMax, IDMax®, and OCRMax™–an ideal system for OEMs trying to achieve the density and functionality featured in modern integrated circuits at a cost-effective rate.

FINISHED ELECTRONIC DEVICE MANUFACTURERS

Vision and barcode reading solutions inspect LCD displays for single pixel defects; verify the correct placement of keypads, gaskets, and other components; automatically read bar code labels for part tracking; and inspect product enclosures for scratches and other defects. Vision solutions perform slider head optical character recognition (OCR) to read laser-engraved codes, as well as guide hub and platter assembly, and also perform Head Gimbal Assembly (HGA) guidance to locate and measure the positions of the slider head and suspicion arm.

SINGLE-PIXEL DISPLAY DEFECT INSPECTION

Problem:

Pixel defects are very common on LED and OLED displays, but companies tolerate defective pixels differently. Pixel defects include ‘stuck sub-pixels’ (permanently on – showing R, G or B); ‘dark dot defects’ (permanently off – showing black); and ‘bright dot defects’ (permanently on – showing white). These types of defects are almost invisible to the naked eye, making it difficult for line operators to conduct manual inspections or for a basic system to perform accurate inspections.

Solution:

High performance color, line scan, and monochrome vision systems offer a range of options to achieve quality and process control in manufacturing operations. To improve the identification of pixel defects, a high resolution color inspection vision system is required. The Cognex In-Sight 5705C vision system combines a 5MP camera with true 24-bit color processing to identify single pixel defects in a single solution. The In-Sight 5705C vision system provides the necessary capacity to keep up with production rates, catching single-pixel defects while shortening cycle times to simplify even the most challenging color machine vision applications.

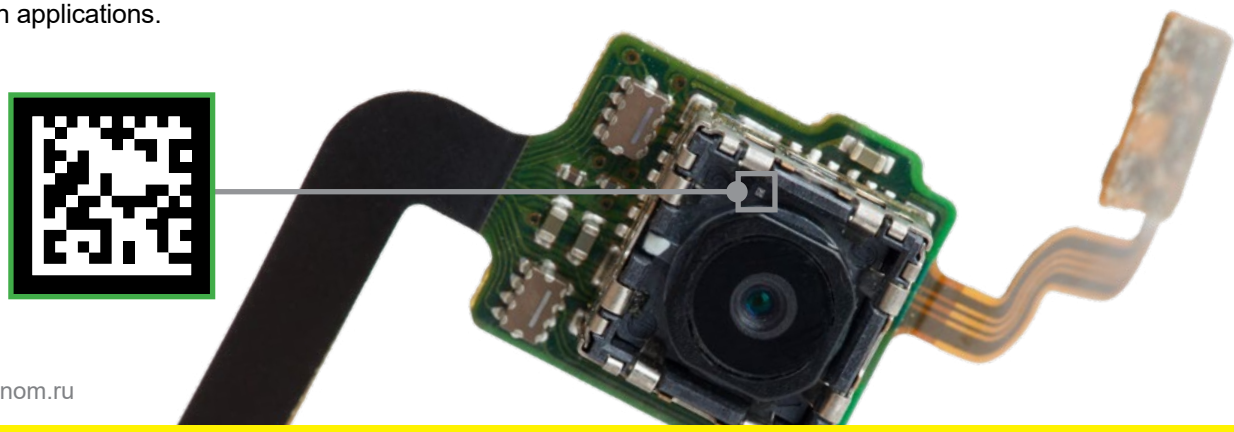
BARCODE READING

Problem:

Manufacturers apply label-based and direct part-mark (DPM) barcodes containing source, batch, and other vital information to electronic components in order to control traceability. As technology advances, hard drives are getting smaller, and more information must be encoded on small components. Some DPM codes are as small as 1 mm x 1 mm and cannot be read by traditional barcode reading technology. Additionally, as components travel along the assembly line, codes can become degraded by scratches or dirt, making them even harder to read. Incorrect parts may even be added and incorrect operations performed when multiple electronic parts intermix on assembly lines.

Solution:

Cognex DataMan® 262 ultra-high definition (UHD) fixed-mount barcode readers are able to read codes as small as 0.7 mil. 2DMax® with PowerGrid® technology reliably reads DPM codes even if they exhibit clocking pattern damage, finder pattern damage, or quiet zone violations. With the introduction of image-based barcode readers, manufacturers can easily track components and control traceability. Identification of the part at each critical station improves, avoiding operator error and dramatically reducing scrap and rework rates on the line.



PRODUCT ENCLOSURE DEFECT INSPECTION

Problem:

Defective enclosures allow dust and dirt into internal hardware, damaging product lifespan and customer satisfaction. Therefore, inspecting product enclosures is critical during the assembly process. Some scratches and defects are undetectable by the human eye, especially if there is little contrast between the part and the defect.

Solution:

High contrast 3D images help identify imperceptible defects like dust and dirt in a product enclosure. Cognex In-Sight 7000 vision system with SurfaceFX™ feature detection technology uses lighting and software to remove noise and clutter from the surface background in order to isolate defects. By capturing high contrast 3-D images, In-Sight vision tools can perform accurate feature inspections to identify defective enclosures and safeguard the assembly process.

SLIDER HEAD OPTICAL CHARACTER RECOGNITION

Problem:

Assembly markings are laser engraved directly onto components like slider heads, with characters as small as 1.1 mm x 1.4 mm and subject to degradation during the manufacturing process. On average, typical optical character recognition (OCR) technology only achieves 70% readability of engraved characters, which can result in mispairing.

Solution:

The In-Sight 7000 vision system reliably and accurately reads characters engraved on assemblies such as slider heads to ensure they are paired correctly and installed onto the right hard drives. OCRMax software, a font-trainable OCR and optical character verification (OCV) tool, achieves 99% accuracy of difficult-to-read characters while SurfaceFX features extraction technology to create high contrast images that enhance 3D features on a part. In-Sight 7000 prevents misreads and handles process variations to ensure that slider heads are correctly paired with the right hard drive.

HUB AND PLATTER ASSEMBLY ROBOTIC GUIDANCE

Problem:

Inside modern hard drives, aluminum or glass platters mounted to a spindle hub spin at constant rates. Any distortion to the assembly will affect the reading and recording process. In order to avoid even the smallest amount of distortion, the robotic assembly arm requires precision guidance from a vision system.

Solution:

Cognex offers a multi-part solution to ensure precise hub and platter assembly with vision-guided precision. The In-Sight VC200 vision controller supports up to four In-Sight vision cameras that provide multi-view inspections for highly accurate assembly.
The In-Sight Laser Profiler acquires a profile of the assembly and conducts accurate measurements to ensure the components are assembled to the desired specification. Alternatively, VisionPro software with the Cognex Designer™ development environment can custom configure the movement and guidance of the robotic arms. Coupled with high resolution Cognex Industrial Cameras (CIC), the robotic arm can pinpoint the exact placement of the platter.

HEAD GIMBAL ASSEMBLY ROBOTIC GUIDANCE

Problem:

The slider at the end of the head gimbal assembly (HGA) helps hard disk drives read and write data. It is held up by the suspension arm, which requires a consistent head-to-disk floating height. Without the correct floating height or correct positioning of the slider head and suspension arm, the hard drive is unable to correctly read and write data.

Solution:

The inspection process of hard drive HGAs requires the precise measurement of a number of factors to meet strict tolerances. The In-Sight Laser Profiler extracts an accurate profile of the HGA assembly and measures the gap between the slider and suspension arm to verify whether there is sufficient head-to-disk floating height. After confirming the assembly conforms to required specifications, the hard drive can continue along the assembly process.

TRACEABILITY AND PROCESS CONTROL

Electronics manufacturers have systems in place to provide a trail of information that follows each item through the supply chain. To ensure product safety and efficient recalls, producers must be able to quickly identify and locate potentially faulty items in the supply chain that could pose a hazard to consumers. Traceability optimizes the availability and use of production tools and minimizes distribution of non-conforming products. Vision systems and image-based barcode readers are key components to a simple yet robust traceability system.

SUPPLY CHAIN TRACEABILITY

Problem:

Manufacturers apply label-based or DPM codes to electronic parts and assemblies to enable complete traceability throughout the manufacturing process and supply chain. This process allows defective products to be easily tracked in the event of a recall, prevents counterfeiting, and prevents the sale of product through unauthorized channels.

However, many barcode readers are unable to reliably read damaged and poorly marked codes, or codes in dimly lit environments. Electrostatic discharge from the barcode readers can damage electrical components.

Solution:

Cognex ESD-safe image-based barcode readers are equipped with industry leading barcode reading algorithms and ESD-safe protective housing to reliably read even the most challenging 1-D, 2-D and DPM codes. Flexible lighting and optics provide the clearest images and highest read rates under a host of installation and lighting limitations. Data Matrix technology, which has become the standard in traceability applications, stores all necessary data such as manufacturer, product ID, lot number, expiry, and even a unique serial number on virtually any finished good for product safety and efficient recalls.

PROCESS CONTROL

Problem:

Defective products and inefficient processes cost manufacturers valuable time and money. Many companies are seeking to move away from manual operations toward streamlined automated solutions that inspect 100% of products for defects.

Solution:

Cognex vision systems and industrial image-based barcode readers prevent defective products from reaching customers by identifying issues during manufacturing and tracking products throughout the supply chain. These quality control and traceability measures reduce waste and increase yield, maximizing profitability and enhancing brand reputation.

BUILD YOUR VISION

2D VISION SYSTEMS

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

www.cognex.com/machine-vision

3D VISION SYSTEMS

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

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

VISION SOFTWARE

Cognex vision software provides industry leading vision technologies, from traditional machine vision to Deep learning vision software, to meet any development needs.

www.cognex.com/vision-software

BARCODE READERS

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

www.cognex.com/barcodereaders

COGNEX

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

Corporate Headquarters **One Vision Drive Natick, MA 01760 USA**

Regional Sales Offices

Americas

North America	+1 844-999-2469
Brazil	+55 (11) 2626 7301
Mexico	+800 733 4116

Europe

Austria	+49 721 958 8052
Belgium	+32 289 370 75
France	+33 1 7654 9318
Germany	+49 721 958 8052
Hungary	+36 30 605 5480
Ireland	+44 121 29 65 163
Italy	+39 02 3057 8196
Netherlands	+31 207 941 398
Poland	+48 717 121 086
Spain	+34 93 299 28 14
Sweden	+46 21 14 55 88
Switzerland	+41 445 788 877
Turkey	+90 216 900 1696
United Kingdom	+44 121 29 65 163

Asia

China	+86 21 6208 1133
India	+9120 4014 7840
Japan	+81 3 5977 5400
Korea	+82 2 530 9047
Malaysia	+6019 916 5532
Singapore	+65 632 55 700
Taiwan	+886 3 578 0060
Thailand	+66 88 7978924

www.cognex.com

mallenom SYSTEMS

Cognex PSI in Russia and the CIS

21B Metallurgov St., Cherepovets,
Vologda region, Russia 162610

tel.: +7 8202 20 16 36
e-mail: info@mallenom.ru

www.mallenom.ru