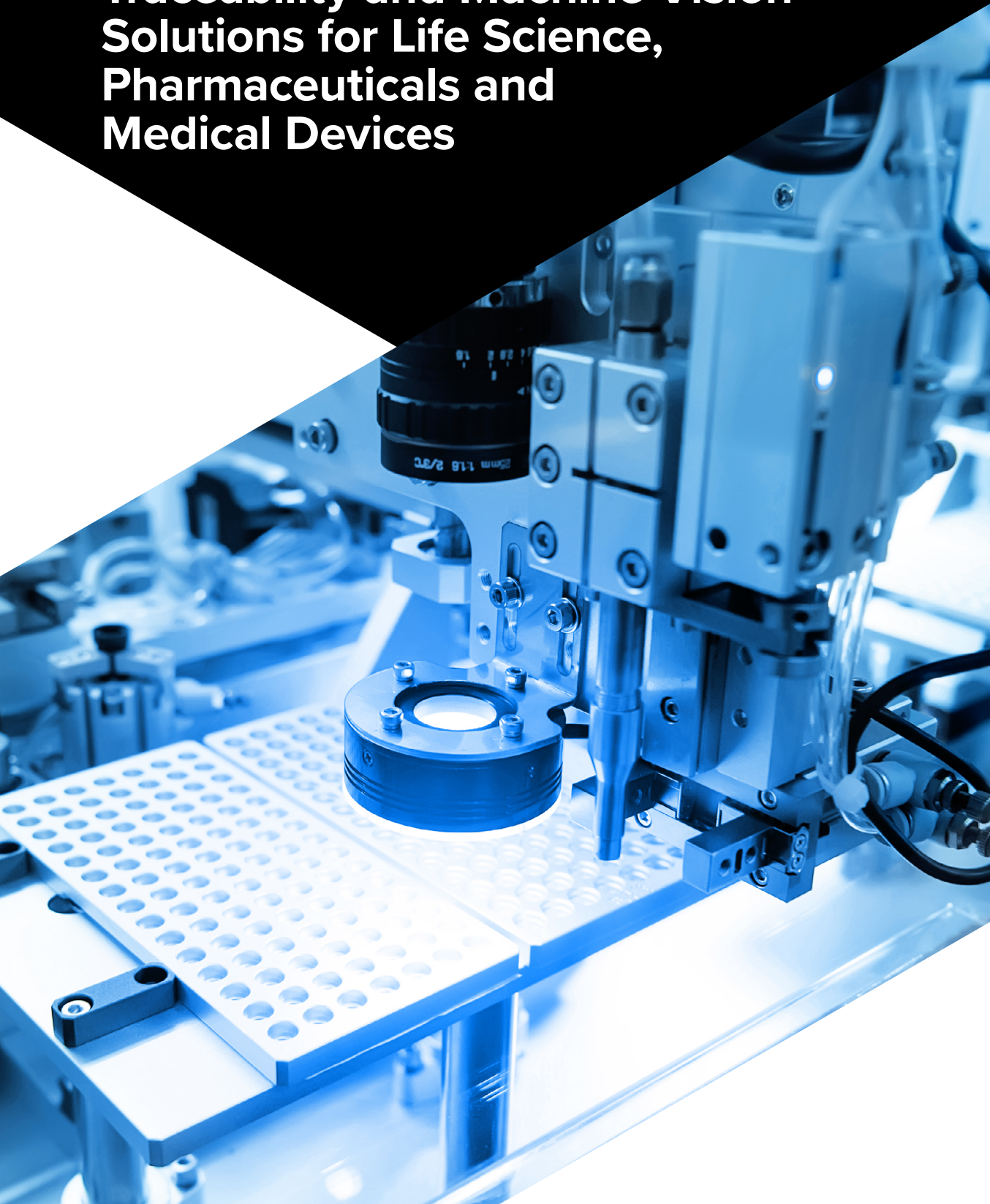




Traceability and Machine Vision Solutions for Life Science, Pharmaceuticals and Medical Devices



Vision Powered Solutions Ensure Product Quality, Labeling Accuracy, and Package Compliance

Thanks to Zebra's wide range of technologies—including fixed industrial scanners, smart cameras, machine vision cameras, software, industrial vision controllers, and frame grabbers—complying with patient safety and traceability requirements in life science, pharmaceuticals and medical devices has never been easier or more cost-effective. Pharmaceuticals, medical devices and bioscience products have similar needs. Whether in the lab, manufacturing, packaging or distribution supply chain processes, maintaining the highest standards for product quality, package and label integrity, inventory visibility and process automation helps ensure profitability.

Because of the need to improve patient safety, protect the brand and eliminate product and package labeling recalls, the use of machine vision in life science process automation, pharmaceuticals and medical device manufacturing is more widespread today than ever before. Basic barcode and label reading can be handled with fixed scanners, while machine vision technology enables more complex inspections, 3D volumetric measurements and vision-guided robotics. Both are essential to ensure accuracy and reliability of data where labs and manufacturers must meet regulatory requirements while simultaneously increasing throughput.

Increasing global competition, increased liability for defective products, inconsistent quality and new regulations all pose challenges to profitability in the health care market. Quality assurance, inventory control, process monitoring, error-proofing and life cycle traceability are all critical for the safe and reliable production and distribution of bio-products, pharmaceuticals, medical devices, surgical instruments, medical device components and implantable devices. From receiving to shipping, Zebra's automatic identification and machine vision tools can assist through every step of the manufacturing and packaging process.

For today's automation and inspection challenges, Zebra Technologies offers fixed industrial scanners with simple software that enables uncomplicated inspections beyond 1D, 2D and DPM codes, as well as 2D and 3D cameras, smart cameras, machine vision and deep learning software, frame grabbers and industrial vision controllers. Zebra machine vision solutions offer compact designs, robust construction, reliable performance and greater flexibility for machine builders and manufacturing equipment suppliers serving pharmaceutical, medical device and life science companies.

This comprehensive guide looks at some of the most common life science, pharmaceutical and medical device inspection, assembly and sorting applications that rely on machine vision to help ensure product quality, package integrity, consumer safety and package compliance.



Life Science, Pharmaceutical and Medical Device Quick Reference Guide

Described within this guide are five key applications for machine vision that life science, pharmaceutical and medical device manufacturers commonly deploy in production, packaging and logistics/warehousing environments. Within each category are common use cases followed by a list of Zebra Technologies products that deliver the automated imaging capabilities that labs, manufacturers, packagers and their equipment suppliers need to detect defective products, verify that packaging and labeling are correct and ensure that products meet requirements while minimizing product recalls and associated damage to brand reputation.



Barcode Scanning and Data Capture

Applications: 1D, 2D and DPM code reading; Unique Device Identifiers (UDIs); package completeness inspection; label verification; order picking optimization

Solutions: FS fixed industrial scanners; Aurora Focus™ software, Iris GTX or VS smart cameras; Aurora Imaging Library™ software; Aurora Design Assistant™ software; Aurora Vision Studio™ software

Highlights: Fixed industrial scanners and high-resolution smart cameras have simple software to enable uncomplicated inspections, beyond just scanning 1D, 2D and DPM codes, using user-friendly drag-and-drop tools.



Inspection and Quality Control

Applications: Product inspection; final assembly verification; contents inspection; kit inspection; blister packaging inspection; fill-level inspection; foreign material detection; cap-and-seal inspection; label/graphic verification; logistics packaging inspection

Solutions: Iris GTX or VS smart cameras; 3D sensors; Aurora Imaging Library software; Aurora Design Assistant software; Aurora Vision Studio software; FS fixed industrial scanners; Aurora Focus software

Highlights: High-resolution and color-smart camera options, 3D sensors and a vast array of proven software tools provide a deep toolbox that includes color inspection and presence/absence, pattern and object recognition.



OCR and OCV

Applications: Predefined OCR/OCV; deep learning OCR; date and lot code inspection; track-and-trace beyond barcodes

Solutions: Iris GTX or VS smart cameras; Aurora Imaging Library software; Aurora Design Assistant software; Aurora Vision Studio software; FS fixed industrial scanners; Aurora Focus software

Highlights: Zebra's FS fixed industrial scanners offer barcode reading, visual inspections and capture of barcode and character data in a single integrated device that can be set up in less than five minutes without complex training or font teaching. Alternatively, the fast, high-resolution image sensors and efficient dual-core embedded processors inside Zebra's Iris GTX smart cameras also deliver accurate OCR/OCV and registration of barcode data as part of their machine vision toolset.



3D Inspection and Volumetric Measurement

Applications: Location, sortation and volumetric measurements; product quality inspection; container and fill-level inspection; cap-and-seal integrity verification; missing product detection

Solutions: Altiz and Altiz 4200 3D laser profilers; 3S series 3D sensors; Aurora Imaging Library software; Aurora Design Assistant software; Aurora Vision Studio software

Highlights: High-speed 3D imaging; complementary rules-based/deep learning software tools; high-fidelity 3D imaging; dual-camera/single-laser parallel and sequential structured light 3D sensors



Label Inspection

Applications: Label quality inspection; OCR/OCV; UDI; label inspection; mislabeled product prevention

Solutions: Iris GTX or VS smart cameras; Aurora Imaging Library software; Aurora Design Assistant software; Aurora Vision Studio software; FS fixed industrial scanners; Aurora Focus software

Highlights: High-resolution and color-smart camera options; complementary rules-based/deep learning software tools; deep software toolbox for color inspection and presence/absence; pattern and object recognition; deep learning-based OCR tools

Barcode Scanning and Data Capture

It is easy to integrate 1D, 2D and DPM code reading, data capture and simple machine vision inspection to increase operational capabilities and perform quality checks in real time with Zebra products. With user-friendly drag-and-drop tools, FS fixed industrial scanners perform simple but powerful inspections that go beyond just scanning 1D, 2D and DPM codes to include simple presence/absence inspections and basic character reading.

Applications include reagent track-and-trace; reading codes marked directly on containers or on parts such as surgical instruments and knee implants; reading barcodes and text on labels, flexible films and solution bags; checking for package completeness and label presence; label verification on primary and secondary packages; pick order optimization and more.

For more complex applications, the fast, high-resolution image sensors and efficient dual-core embedded processors inside Zebra's Iris GTX smart cameras deliver registration of barcode data, character reading, and machine vision inspection capabilities.



Through Zebra's Barcode+ application, track-and-trace capabilities expand beyond barcodes to add valuable data to the process, reducing waste, increasing quality and preventing theft. Besides reading and reporting barcode data, Zebra's Barcode+ verifies graphics and warning labels for compliance, checks for blemishes and assesses placement accuracy.



Zebra's label inspection solutions verify that label content is accurate and readable and contains all the necessary information, such as patient instructions, warnings and safety risks, expiration dates and lot and batch serial numbers.

1D, 2D and DPM Code Reading

The ability to read 1D, 2D and DPM codes ensures proper labeling, tracking and verification of products. Manufacturers can scan barcodes on products to verify that they are packaged and shipped correctly; they can also track inventory levels, work in process and products throughout the production and distribution process with accuracy and efficiency. Zebra's suite of hardware and software products help labs, manufacturers and packagers achieve improved customer satisfaction through better supply chain management, streamlined operational efficiency and reduced costs, shipping errors and delays.

Label Presence Inspection

With Zebra's smart cameras and sensors, labs, manufacturers and packagers can efficiently verify that each product label has been applied correctly prior to shipping. As a result, there is less chance of customer confusion or complaints, which contributes to improved customer satisfaction and brand reputation. The process also ensures legal compliance with product labeling regulations.

Label Verification

Label verification ensures that the contents of a package match the information on the label and that any printed codes, symbols or instructions are readable. With Zebra smart cameras, sensors and software, companies can prevent issues such as mislabeling, which can result in inconvenience and even safety concerns. Labs, manufacturers and packagers also rely on Zebra's solutions to maintain inventory control, comply with industry standards and reduce product recall and liability risks.

Order Picking

In logistics operations, Zebra delivers cost-effective modular code reading, distributed and centralized computation options, with barcode reading and machine vision tasks centralized in one device, optional hands-free scanning to improve efficiencies and a connectivity gateway to remove processing inefficiencies. Zebra hardware and software read 1D and 2D barcodes to help accurately and efficiently fulfill customer orders. Zebra products contribute to customer satisfaction and sales growth through the reduction of errors and delays in getting products to customers. Furthermore, optimizing order picking reduces packaging, handling and shipping costs, improving profitability for manufacturers.

Zebra's Iris GTX or VS smart cameras and Aurora Design Assistant or Aurora Vision Studio software can be reliably deployed for common barcode scanning and inspection tasks, while its FS fixed industrial scanners and Aurora Focus software can support traceability and improved efficiency through the entire manufacturing and supply chain.



Inspection and Quality Control

Product Inspection

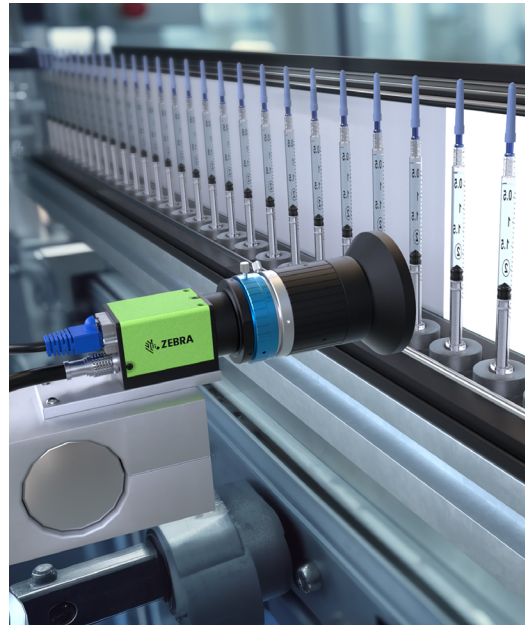
To ensure success, hospital supplies and medical technology manufacturers must conduct quality inspections. That's why many best-in-class manufacturers choose from Zebra's wide range of inspection and Auto ID solutions. Zebra's machine vision solutions can help optimize product quality and process control, and its fixed industrial scanners can support traceability through the entire manufacturing and supply chain.

Parts entering a process can be prequalified with machine vision systems by inspection and the ejection of nonconforming parts, preventing downstream product or package failures by removing flawed products up front. In-line inspections such as gauging surgical equipment, detecting joint replacement defects and inspecting stent webbing or transdermal patch products improve overall line efficiency, increase throughput and provide superior quality control by minimizing downtime, labor, waste and rejects.

Final Assembly Verification

When a medical device or electromechanical assembly is complex, the chances of an error occurring during production increase—and visual verification becomes more challenging. Zebra's high-resolution smart cameras and machine vision systems capture detailed images so that all potential defects in a device or final assembly can be detected.

Such imaging solutions not only detect missing screws, loose connectors, misrouted cables and misplaced components but, when combined with deep learning software, can discern subtle but critical variations, such as randomly occurring scratches, dings, dents and even embedded particles. By detecting minute errors in electronic and mechanical assemblies, Zebra solutions ensure the absolute quality of high-value, high-risk products such as medical devices. Zebra provides automation for superior speed, precision, repeatability, consistency and quantification of defects in complex inspection environments as well as data for trending and continuous quality improvement.



Machine vision can be used for final assembly verification of medical devices and drug delivery products in applications such as measuring the gauge angle, diameter and distance between marker bands of catheters and syringes.

Vision-Guided Robotics

When used in conjunction with robotics, machine vision eliminates costly precision part fixtures and allows manufacturers to process various part types without changing tooling, whether they are picking loose products off conveyors to feed a process or palletizing cases for distribution. By reducing the risk of contamination caused by human contact, vision-guided robotics can also improve product safety and facilitate clean room assembly and packaging operations. Along with picking and placing parts or guiding robots to assemble components, machine vision systems can also inspect, measure and read linear barcodes and data matrix codes on products during handling and assembly.

Laboratory and Diagnostic Device Automation

Biotechnology, drug discovery and clinical diagnostics all benefit from laboratory automation. Machine vision and traceability not only help automate lab processes to make scientific experiments and processes faster, more accurate and more efficient, they also allow researchers to run experiments on a larger scale while reducing the likelihood of human error. By managing larger volumes of samples and data, lab automation allows researchers to conduct experiments 24/7 without the need for human intervention, freeing up humans for other activities. Zebra offers solutions for liquid level measurement, diagnostic device automation and pipette alignment and guidance, as well as color imaging for samples such as blood, urine and tissue in clinical analyzers.

Content Inspection

Inspection of package contents, performed before packaging or after products have been placed inside, ensures that each package contains the correct amount and type of product. A number of powerful tools are included in Zebra smart cameras and software for content inspection, ensuring that pharmaceutical, bio-product and medical device manufacturers deliver products that are safe for consumers and comply with regulations. Content inspection may involve checking for missing, incorrect or damaged capsules in blister packs or verifying that all items in a medical or vaccine kit package are present and in the correct location and orientation before sealing.



Before sealing, Zebra smart cameras and software ensure that each package contains the correct amount and type of product.

Packaged Kit Inspection

Packaged kit inspection is a process of checking and examining prepackaged kits or sets of items to ensure they are complete, in good condition and ready for use. Examples of packaged kits are first aid kits, surgical kits and vaccine kits. It's important to check that all the items are present and placed in the correct compartments before sealing the package. Zebra's smart cameras and software can inspect and categorize each section of a package or tray to ensure that all items are present and in the correct location.

Seal Inspection

Seal inspection involves inspecting and verifying the contents of a package after it is sealed and then validating the integrity of the heat seal by examining the thermal signature of the package. Contrast-based inspection can also help identify a quality seal. Voids, debris, wrinkles or breaks in the smooth visual line where layers of plastic are sealed together may indicate a faulty seal. If the packaging is opaque, certain wavelengths of light—shortwave infrared (SWIR), for example—can in many cases help the vision system effectively identify the contents.

Blister Packaging Inspection

Pharmaceuticals and medical devices are packaged securely in blister packaging, also known as blister packs or blisters. Each blister pack has at least one clear plastic cavity, pocket or bubble, plus a backing. Machine vision software and smart cameras from Zebra provide the necessary tools for verifying contents, the adhesion of blisters to backing and the printed graphics on backings and foils. In pharmaceutical and medical device packaging, these tools are used to check contents before and after sealing, to verify seal integrity and to ensure that product has not interfered with the vacuum sealing process.

Foreign Material Detection

Detecting foreign materials helps ensure that products are safe for use. Foreign material is any substance that is not part of the product and could potentially harm the consumer, such as metal, glass or plastic. Foreign material that is accidentally introduced into the production or packaging process and ends up in the final product can lead to injury or illness, which can have legal and financial consequences for the manufacturer. Preventing such incidents requires detecting and removing foreign material before it leaves the factory. Zebra offers a range of smart cameras and machine vision software tools can help identify unwanted materials in the production or packaging process, ensuring that products are safe and of high quality.



From industrial scanners, smart cameras and 3D sensors to software and deep learning tools, Zebra has a comprehensive suite of quality control inspection solutions.

Cap-and-Seal Inspection

Cap-and-seal inspection is crucial for pharmaceutical, medical and bio-product manufacturers because it ensures that containers are properly sealed, preventing leakage, tampering and contamination. Cap-and-seal inspection also helps manufacturers comply with regulatory standards and prevent any potential legal issues that may arise due to faulty packaging. Zebra's Altiz series 3D laser profilers, smart cameras and machine vision software feature powerful inspection tools for cap-and-seal inspection, which helps manufacturers deliver high-quality products that meet customer expectations and protect brand reputation.

Label or Graphic Verification

Whether inspecting the packaging of pharmaceuticals, medical devices or bio-products, Zebra smart cameras and software include powerful tools to ensure that preprinted graphics are of high quality and that applied labeling is properly placed, intact and not deformed. The same applies for embossed graphics in plastic packaging. In these inspections, speed is important, as is scalability. Manufacturers can also avoid label and packaging mix-ups with Zebra sensor, smart camera and machine vision software technology. By inspecting graphical content and barcodes and using OCV on medication labels, it is possible to prevent packaging errors that may endanger consumers.

Logistics Package Inspection

The Zebra range sensors, Altiz and Altiz 4200 3D laser profilers, 3S series 3D sensors, smart cameras and machine vision software includes powerful tools for inspecting packages and containers in logistics and warehousing. By measuring volume, these tools can perform high-quality validation prior to closure to confirm that the correct product is present and that the box is the right size. Additionally, Zebra's tools can determine whether a box has too much product or filler, which could interfere with its proper closure. In addition to visually inspecting box taping and closing operations, machine vision technology can also verify labels and detect deformed packaging that could cause problems during transport.



Label inspection is the process of ensuring the presence and accuracy of labels on a product or package. Modern inspection methods seek to verify that the correct label is present, in the correct location and in the correct orientation.

Iris GTX or VS smart cameras and Aurora Design Assistant or Aurora Vision Studio software address even the most challenging package inspection and quality control applications, while FS fixed industrial scanners and Aurora Focus software support traceability and improved efficiency through the entire manufacturing and supply chain.



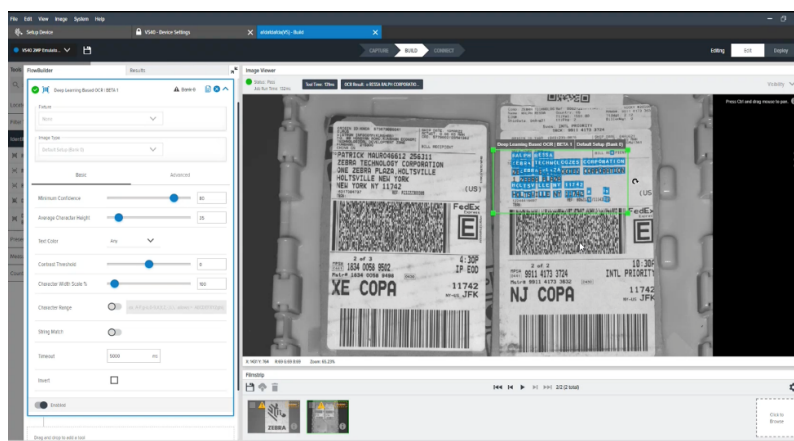
OCR and OCV

Technology such as OCR and OCV can ensure that text on packaging and labels is accurate and legible. With user-friendly drag-and-drop tools, FS fixed industrial scanners and Aurora Focus software provide an easier out-of-the-box approach to performing OCR and OCV to read printed text on packaging and labels, while offering simple but powerful inspection capabilities that go beyond OCR/OCV and barcode scanning to include simple presence/absence inspections.

When broader machine vision capabilities are required, Zebra smart cameras and machine vision software can also address OCR with powerful OCR tools that can read and verify characters with errors such as dropouts, smears, low contrast and stray ink. These machine vision technologies, along with industrial vision controllers and frame grabbers to support data capture and transmission, have long helped industries serving the health care market maintain quality and avoid sending products with inaccurate or illegible text out to consumers, which could lead to health risks and reputation damage.

Predefined OCR

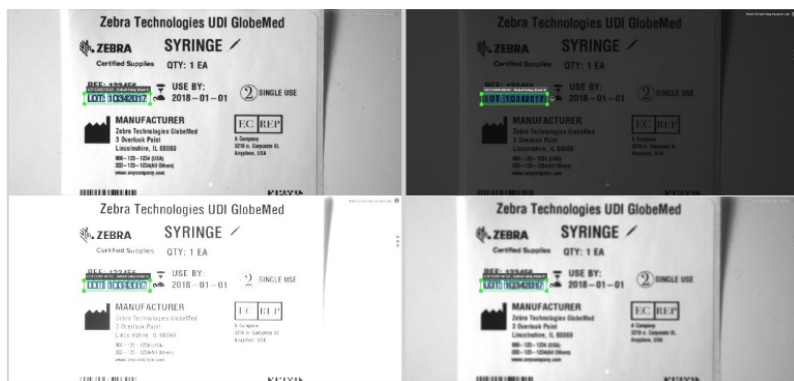
Using prebuilt models or templates, predefined OCR recognizes specific types of packaging, labels or other documentation, such as invoices. It is faster and more accurate to use prebuilt models or templates because they contain information about the expected layout, font and text patterns. Predefined templates allow OCR tools to focus on recognizing specific characters rather than analyzing a wide range of possible layouts and fonts. Due to the wide range of label and packaging layouts and fonts it has to analyze, general purpose OCR can be slow and inaccurate because it does not use predefined templates.



With Zebra Aurora Focus software, creating a new OCR application is as easy as drawing a box.

Deep Learning OCR

In situations involving low-contrast characters or hard-to-read characters on confusing backgrounds, Zebra's deep learning OCR tool provides a quick solution. Deep learning OCR tools, which use powerful convolutional neural networks trained on thousands of fonts and characters, deliver reliable, accurate reads without the need for coding or coding expertise. It is also possible to deploy this deep learning model directly on a camera and to provide users with a number of customization options, such as adjusting character heights or matching strings, via an intuitive interface.



Zebra's deep learning-based OCR tool can handle a significant amount of process variation. Its deep CNNs ensure maximum readability and throughput for packaging applications ranging from food and beverage to high-speed consumer goods scenarios.

Date and Lot Code Inspection

Whether in life science, pharmaceutical or medical device manufacturing, it's critical to check date, lot and expiration date codes for every product, package or pallet coming from or going into a facility. Date and lot codes help identify one batch from another and indicate when a product was made. As part of a quality control process, the codes—which can feature 1D symbology and printed text—must be present, legible and error-free. In the health care market, date and lot codes are FDA regulated, making OCR a critically important technology in this space. Zebra offers a range of OCR tools to accommodate high-speed, accurate character reading in mission-critical applications.

Track-and-Trace Operations

In most track-and-trace applications, barcodes are read. But in some instances, such as reading serial numbers and product information, OCR is required. For example, in a warehousing or logistics environment, boxes heading to trucks might have 10-digit identifiers. Some boxes even have Department of Transportation (DOT) numbers, which must be readable by humans for tracking. It's also important to read batch verification labels to confirm from which batch a particular product came. Zebra OCR technology is an effective means of automating track-and-trace requirements in all cases.

Unique Device Identifiers

Medical devices are identified throughout distribution and use with UDIs, which help to enable a safe and secure global distribution chain. When medical devices are marked and registered properly, it is much easier to identify faulty, recalled or expired products. In addition to helping address global issues such as counterfeiting, this also increases confidence in the quality of products among patients and doctors alike. Application standards define what types of symbology are acceptable, what ISO standards need to be graded against, the minimum grade, aperture size and X dimension range, lighting requirements and how data within the barcodes must be formatted. Whether using printed codes on labels or DPM codes, Zebra's range of sensors, smart cameras and software helps labs, manufacturers and packagers serving the health care industry meet UDI compliance requirements.

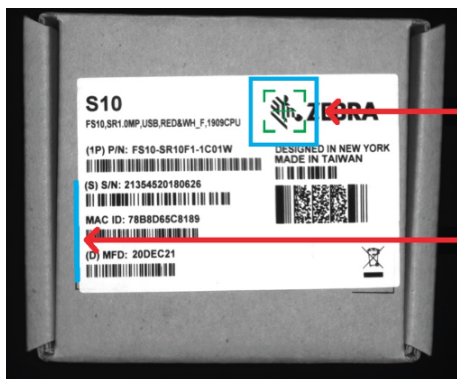


Package Completeness Inspection

Before a package leaves a facility, it is inspected for completeness to ensure that all products are properly packaged and to identify items that are missing or incorrect. Besides reading 1D and 2D barcodes, Zebra sensors, smart cameras and software can also detect package completeness, which reduces customer complaints and returns, protects brand reputation and reduces costs while maintaining customer satisfaction.

Hands-Free Pallet Scanning

Forklift operators must ensure that the correct pallet of goods is loaded onto the right truck for shipping. Zebra's forklift scanning systems provide hands-free scanning of multiple barcodes on pallets. In a typical setup, two fixed industrial scanners are mounted on the front of the forklift between its tines. Upon approach to a pallet, the scanners automatically scan the labels and transmit data to the forklift's onboard computer, saving significant time and reducing read errors, misloads and the amount of time spent loading and shipping.



Locate Object

- Trained pattern recognition based on a feature or logo (unchanging)

Locate Edge

- Finds gradient position (light to dark, dark to light or either)

In addition to reading barcodes, Zebra's Barcode+ platform incorporates valuable data into the track-and-trace process, improving quality, reducing waste and preventing losses. The software offers three methods to locate labels in the camera's field of view despite positional variation due to vibration or trigger and placement. Zebra's pattern matching tool, Locate Object, can be trained to identify and locate a pattern anywhere in the image consistently. The Locate Edge tool can determine label position by identifying the edge of a label, and the Locate Circle tool determines label location by referencing any circular feature, such as a drilled hole or graphic. These tools provide information on label presence, placement angle and relative positions of other tools to assess the accuracy of label printing.

Iris GTX or VS smart cameras and Aurora Design Assistant or Aurora Vision Studio software, and FS fixed industrial scanners with Aurora Focus software can solve both basic and complex OCR and OCV challenges, including those requiring the use of predefined OCR and deep learning-based OCR algorithms.



3D Inspection and Volumetric Measurement

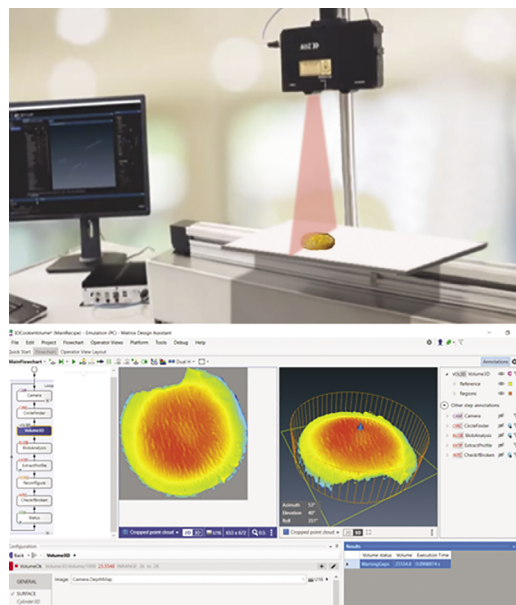
Life science, pharmaceutical and medical device manufacturers commonly rely on 3D machine vision techniques to measure volume, confirm dimensions and detect damaged products during production to reduce pharmaceutical process and packaging waste and to eliminate post-packaging rejection. Zebra's factory-calibrated Altiz and Altiz 4200 3D laser profilers and 3S series 3D sensors make it easy to perform these verifications by generating a surface map and returning width, length, height and volume information in real world units (i.e., millimeters).

Typical life science, pharmaceutical and medical device manufacturing applications include checking fill level and seal integrity, inspecting capping and lidding processes and detecting missing product in kitting and case packing operations. Zebra 3D sensors offer improved accuracy for measuring drug volume compared to conventional means and are suitable for high-speed, automated pharmaceutical inspection to detect damaged product or packaging before it is used and to ensure that caps on medicine are properly seated on containers.

Location, Sortation and Volumetric Measurements

In material handling, Zebra's factory-calibrated Altiz and Altiz 4200 3D laser profilers and 3S series 3D sensors rapidly and precisely gauge the dimensions, shape and height of swiftly moving items and verify that they meet quality standards. Laser profilers provide precise dimensions of objects such as tablets, capsules and lyophilization cakes. They generate a surface map of an object, returning its dimensions and volume in real world units. They are useful for scanning multidimensional packaging, inspecting tablets and capsules for damage and ensuring the presence of all items in a package.

They also help optimize placement in packages, such as cartons, cases or boxes, or on pallets. As part of certain sizing and sorting applications, 3D sensors scan the box size, enabling accurate categorization for palletizing or storing. To ensure accurate picking or palletizing, 3D sensors can also detect the placement, alignment and elevation of boxes and packages on conveyor belts.



As materials are moved through production, 3D sensors can perform quality inspection, sortation and volumetric measurements as well as verifying heights, flatness and component presence/absence.

Product Quality Inspection

During assembly, sorting and material handling, many life science, pharmaceutical and medical device manufacturers traditionally have used weight measurements for product inspection, but this approach has proven inadequate in identifying certain flaws, such as missing components or chipped coatings on tablets. By measuring the size, shape and height of fast-moving objects quickly and accurately, Zebra's 3D sensors offer an improved solution for detecting product damage, confirming dimensions and detecting unseated fasteners to ensure that each product meets stringent quality requirements.

Container and Fill-Level Inspection

When it comes to automating filling equipment in packaging operations, manufacturers rely on Zebra's 3D sensors to reduce waste and defects by detecting faults before containers are filled. In addition, 3D profilers make it easy to measure the height of contents in a carton, tub or other container to ensure proper filling. Everything from pharmaceutical products such as tablets and capsules to drug delivery devices such as syringes and transdermal patches can benefit from inspections supported by 3D sensors.

Cap-and-Seal Integrity Verification

Zebra's 3D sensors can guarantee the correct positioning of caps, lids and safety seals by measuring their height and checking whether they are level. High-fidelity 3D sensors can also examine the condition of a rim's structure and qualities of the surface used for sealing, such as its flatness. This is the perfect solution for tamper-evident safety seals on bottled products such as nutritional supplements and over-the-counter medications.

Missing Product Detection

In case packing and kitting assembly operations, Zebra's 3D laser profilers can confirm that all ampoules, vials, bottles and blister packs are present and appropriately packed into each carton. During kitting or tray assembly operations, 3D sensors can detect insufficiently filled, misplaced or absent product. Profilers, for instance, check that all the necessary items in a vaccine or surgical kit are present and that each item is in the correct compartment within the plastic tray before sealing.



From industrial scanners, smart cameras and 3D sensors to software and deep learning tools, Zebra has a comprehensive suite of quality control inspection solutions.

Zebra AltiZ and AltiZ 4200 3D laser profilers, 3S series 3D sensors and Zebra software can be reliably deployed for common packaging inspection tasks.



Label Inspection

It is important to inspect the labels of products to ensure they are safe to use and consume. Labels provide critical information about a product, such as ingredients, dosage instructions and expiration dates. Consumers can suffer serious health issues if a label is incorrect or missing vital information. Label inspections performed using Zebra smart cameras, sensors and software minimize the risk of product recalls and liability. Apart from protecting consumers' health and safety, label inspections can also ensure regulatory compliance, enhance product quality and protect a brand's reputation.

Label Quality Verification

Label quality verification ensures that product information is clear and readable. A clear and readable label is essential for allowing consumers to understand important information about a product, such as ingredients, dosage recommendations, expiration dates and warnings related to potential medication interactions. The label is also important in allowing distributors, hospitals and pharmacies to easily identify and track products. With Zebra's sensors, smart cameras and software, users can identify unreadable or smudged labels, which might cause confusion, misidentification of products or safety risks. In addition to helping the supply chain process run smoothly, label quality contributes to maintaining the integrity and safety of products.



The importance of accurate labels cannot be overstated. Missing text, symbols or warnings can result in unhappy customers, product recalls, legal liability and irreversible brand damage.

OCR/OCV Inspection

The use of OCR and OCV ensures that the text on product packaging and labels is accurate and legible. Smart cameras and software from Zebra include OCR/OCV technology that scans package and label text to verify that it is complete, readable and accurate, preventing confusion and potential health risks. If a product's expiration date is illegible or inaccurate, it could lead to consumption of an expired product that may not be potent enough to help the patient. Smart cameras, software and deep learning OCR technology from Zebra help guarantee that packaging and label information is correct, enhancing consumer satisfaction and brand trust.

Mislabeled Product Prevention

Life science companies as well as pharmaceutical and medical device manufacturers must confirm that the correct label is placed on the appropriate packaging. Labeling errors not only can harm a brand's reputation but can also result in costly recalls and potential liability risks. To avoid mislabeling, 1D and 2D barcodes or words printed on products or labels are scanned to confirm that packages contain all the required components. Zebra's fixed industrial scanners, smart cameras and vision software help manufacturers verify the accuracy of lids and containers, ensuring that they correspond with one another and properly reflect the package contents.



By counting the number of pixels within a specified region of interest (ROI) within a certain intensity range, Zebra VS40 cameras can detect missing or misplaced logos, stray print and other label defects. Pass/fail and intensity range parameters can be easily adjusted in the tool settings.

Iris GTX or VS smart cameras and Zebra software can support label inspection tasks such as reading barcodes, variable text, logos and symbols, as well as perform OCR, OCV and more on labels. With FS fixed industrial scanners, they help improve manufacturing and supply chain traceability and efficiency.



Machine Vision and Fixed Industrial Scanner Solutions



Iris GTX Smart Cameras

Iris GTX smart cameras feature CMOS sensors ranging from 2 to 16 MP, efficient dual-core embedded processing power and comprehensive I/O capabilities in a compact all-in-one vision system. These devices deliver fast, high-resolution imaging for high-speed web inspection, verification of codes, confirming proper alignment and placement of parts, and assessment of finished assemblies.

[Learn more](#)



VS Smart Cameras and Sensors

Zebra's machine vision sensors feature a family of smart cameras available with 1.2 to 5.1 MP image sensors. From simple track-and-trace to complex quality inspection checks, you always know what's happening and can anticipate issues before they impact operations.

[Learn more](#)



Altiz 3D Profile Sensors

Altiz high-fidelity, high-speed 3D profile sensors feature a dual-camera single-laser design that minimizes scanning gaps at critical surface junctures. These 3D profilers further aid inspections where image contrast or lighting pose challenges. Their high-resolution 3D imaging also helps ensure no contaminants compromise the safety or functionality of final assemblies.

[Learn more](#)



Altiz 4200 3D Profile Sensors

Zebra's Altiz 4200 3D profilers are distinguished by a compact single-camera design and tighter fields of view compared to legacy Altiz sensors, allowing Altiz 4200 models to deliver higher resolution, faster capture and richer 3D data. These sensors are well-suited for close inspection of fine details and inline inspection of adhesive beads.

[Learn more](#)



3S Series 3D Sensors

Zebra's 3S series 3D sensors use structured light technology to deliver best-in-class 3D scanning for a broad range of machine vision applications. 3S series 3D sensors can scan both static scenes and items in motion with submillimeter resolution and accuracy.

[Learn more](#)

Machine Vision and Fixed Industrial Scanner Solutions



Frame Grabbers

Zebra's industry-leading frame grabber lineup includes the Rapixo CXP, Radiant eV-CL and GevIQ series, and offers options ranging from entry-level models for cost-sensitive applications to boards that feature pre-processing capabilities and support single- or multi-source high-speed image and video acquisition. With flexible options for CoaXPress, Camera Link and GigE Vision interfaces—plus video sources from SD to HD all the way to UHD—these frame grabbers provide end-to-end support for EV battery manufacturing.

[Learn more](#)



Industrial Vision Controllers

Zebra industrial vision controllers feature a unique combination of processing power, expansion capabilities, optimized size and sturdiness, making them ideal solutions for demanding single high-rate or multicamera imaging and machine vision applications.

[Learn more](#)

Zebra
Aurora
Imaging Library™

Aurora Imaging Library Software

Tested and fine-tuned by machine vision experts, Zebra's Aurora Imaging Library is a vision software development kit optimized for expert programmers looking for total control over fully customized vision applications. It offers a deep collection of tools for image capture, processing, analysis, annotation, display and archiving.

[Learn more](#)

Zebra
Aurora
Design Assistant™

Aurora Design Assistant Software

Zebra's Aurora Design Assistant software allows users with minimal coding experience to configure powerful machine vision applications. Its development environment leverages an intuitive flowchart-based platform that includes ready-made templates to fast-track development. It offers a deep collection of tools for image capture, processing, analysis, annotation, display and archiving.

[Learn more](#)

Zebra
Aurora Vision
Studio™

Aurora Vision Studio Software

Zebra's Aurora Vision Studio is a dataflow-based software that empowers machine vision engineers without programming expertise to quickly create, integrate and monitor powerful vision applications with straightforward drag-and-drop functionality.

[Learn more](#)

Machine Vision and Fixed Industrial Scanner Solutions



Zebra
Aurora
Focus™

FS Fixed Industrial Scanners

Zebra's rugged FS Series of fixed industrial scanners feature a robust design with onboard lighting and a single cable for power and I/O. These plug-and-play devices can be plugged into the USB port of a workstation, laptop, tablet or other host device and begin capturing barcode data immediately using Aurora Focus software.

[Learn more](#)

Aurora Focus Software

One powerful tool controls all enterprise-wide manufacturing and logistics automation solutions, so your team requires less training and benefits from an unrivaled level of asset-management simplicity. Exclusive features such as ImagePerfect+, Golden Image Compare, Object Locate and more put Aurora Focus in a class of its own.

[Learn more](#)



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