



# ▶ Machine Vision

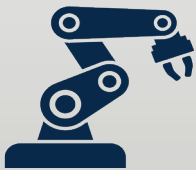
**WeAutomate**

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## Our Expertise



**Automation &  
Robotics**



**Industrial  
Controls**



**Machine  
Safety**



**Mechanical  
Solutions**



**Motion  
Control**



**Pneumatics**



## What is Machine Vision?

Machine vision gives industrial machines the ability to visualize and interpret digital images or video in real time. It enables machines to inspect, measure, identify, and recognize different objects or areas. This is especially useful in manufacturing industries, where machines can vision to spot defects, sort through items, or guide other equipment accurately and efficiently. Computer hardware and software together are used to perform the following tasks: **image & video capture, image processing & analysis, visual inspection & measurement, ID mark reading & verification and machine & robot guidance.**

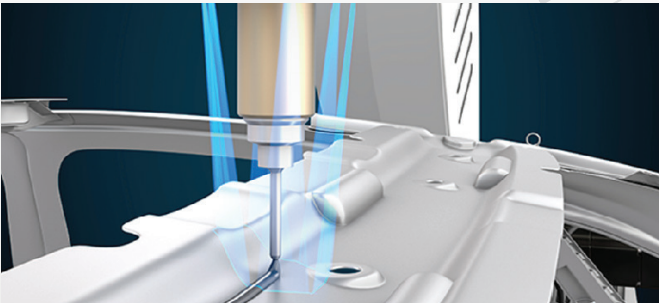
## Why Use Machine Vision?

Outcome:	Benefits:
Higher Quality	Inspection, measurement, gauging and assembly verification
Increased Productivity	<ul style="list-style-type: none"> <li>✔ Repetitive tasks formerly done manually are now done by Machine Vision</li> <li>✔ Improvement of the manufacturing process</li> </ul>
Production Flexibility	<ul style="list-style-type: none"> <li>✔ Measurement and gauging / Robot guidance / Inspection</li> <li>✔ Predictive maintenance</li> <li>✔ Customize production</li> <li>✔ Convert sampling to online verification</li> </ul>
Cost Reduction	<ul style="list-style-type: none"> <li>✔ Scrap rate reduction</li> <li>✔ Production errors</li> <li>✔ Operator/Labor worker</li> </ul>
Tighter Inventory Control	1D / 2D Barcodes, OCR and Identification
Increased Brand Protection	Address recalls, lawsuits

# Applications

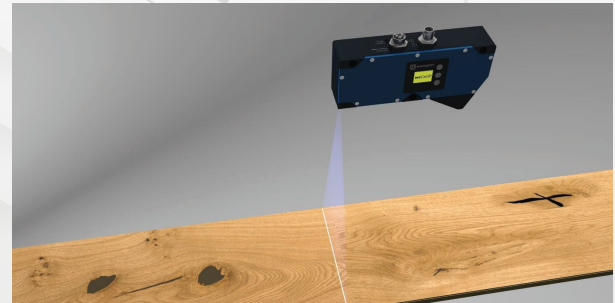
Machine Vision software library contains a deep collection of tools for image capture, image processing & analysis.

## Inspection



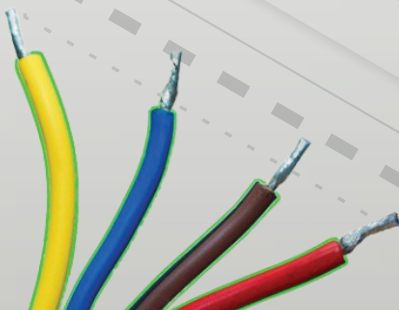
### Bead Inspection

A strip of malleable material, typically glue or bead. These beads are inspected typically to verify if the width falls within a certain range, if the bead is overly dispensed or if it has any gaps present. In many industries, such as manufacturing, beads can be used to bond objects together.



### 3D Inspection

Once a 3D point cloud and depth map is generated from a 3D sensor, the tool allows for the calculations of an object's height & volume. This is particularly useful in the 3D bin picking of objects or measuring the height variance of an object to ensure it meets a certain tolerance.



### Colour Analysis

Colour images contain 3 bands of data: red, green and blue (RGB). The color matching tool can perform simple color determination based on the RGB color spectrum.



### Measurement & Metrology

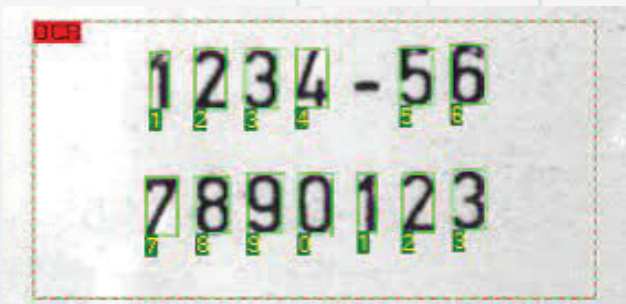
These tools can find edges, points, arcs, segments, lines & local frames. Meaningful information can be generated from these geometry calculators, establishing distance & angle relationships.

# Vision Guided Robotics



Vision Guided Robotics: Be able to communicate with industrial robot controllers to offer an integrated machine vision solution with the output of coordinates of an object of interest.

## Track & Traceability



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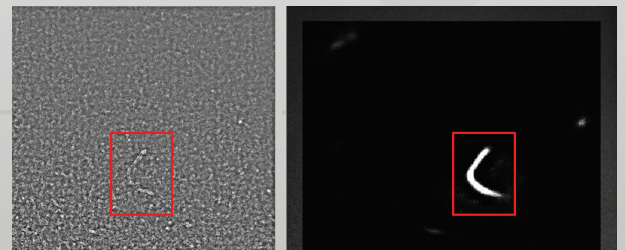
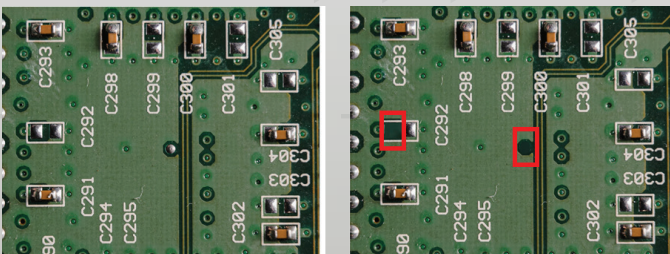
### OCR/OCV

This tool allows for the reading & verification of strings of characters based on the powerful feature-based recognition. It is invariant to changes in scale, aspect ratio, angle & perspective. In addition, the tool is designed to support user-defined grammar rules, multi-font definitions & dot-matrix text.

### Barcode Reading

1D and 2D barcode reading: this tool allows users to identify and store several types of 1D, 2D and composite codes on many types of surfaces.

## Object Detection



### Presence/Absence Check

Presence inspection is used to validate the presence/absence of parts, features or irregularities in an image. Typically, an image is compared to a golden template to validate the presence of features or components.

### Blob Analysis

Identify and count the number of connected regions of pixels within an image allowing users to calculate and evaluate selected features of those regions.

# Product Solutions

## VISION CONTROLLERS



Vision controllers offer the power and flexibility of a traditional PC-based system, but can better withstand harsh manufacturing environments. Vision controllers allow for easier configuration of 2D & 3D multi-camera applications and are set up to perform industrial protocol tasks with its I/O ports. This allows for more sophisticated applications to be configured in a cost-effective way.

## SMART CAMERAS



A smart camera is a self-contained, standalone vision system with a built-in image sensor in the housing of an industrial camera. Also known as a hybrid between a standard industrial camera and a vision controller, smart cameras have the ability to perform Machine Vision inspections all within its processor. These smart cameras with built-in processors can be offered both in monochrome and color varying in resolution from VGA up to 12 MP.

## INDUSTRIAL CAMERAS



Industrial cameras are built and intended for vision systems featuring multi-camera configurations. These cameras can offer monochrome and color capabilities, varying resolutions and are compatible with various industrial interface standards such as GigE Vision, USB3 Vision, Camera Link and CoaxPress.

## FRAME GRABBERS



Framegrabbers are used for integrating flexible high-speed acquisition and processing applications. They work with high speed industrial cameras such as Camera Link, CoaxPress and Serial Digital Interface. With frame grabbers, an industrial project can capture data with exceptional detail, allowing user to work on high precision projects with confidence and accuracy.

## 3D SENSORS



3D sensors boast a dual-camera single-laser design that enables it to scan stationary and moving parts with high reproduction fidelity. Unique algorithms within the sensor allow it to generate reliable 3D data in the form of individual profiles, depth maps, or point clouds.

# Accessories



Elevate your machine vision application with advanced industrial lighting, industrial grade lenses & shortpass, longpass, bandpass, polarizing, IR and UV type filters.

## Resolution Calculator

### Field-of-View (FOV) (W x L)

What size of image do you want to look at? The field of view can be defined by the width and length of a 2D area that is required for imaging. Typically, the larger value of the two is used for the succeeding calculations.

Width (mm) = W

Length (mm) = L

Working Distance (WD) : How far do you estimate the camera to be from the object?

### Resolution (R)

Once a field-of-view (FOV) has been defined it is important that there are enough details in the image to process data for the specific application. A rule of thumb is to define, the smallest object width or length in an image and divide it by 10. For example, a diameter measurement is required of a circular tube which has a nominal diameter of 40mm. Meaning, an image resolution of  $40/10 = 4\text{mm/pix}$  is the minimum resolution required.

### Smallest Feature $W_s$ (mm)

Image resolution (R) =  $W_s/10$

From this information it is now possible to calculate what resolution camera is needed. Use the larger value from the FOV length and width dimensions. You will then use this value to identify a camera from a catalogue. The chosen camera will have a sensor size in micro pixels (Sx) which is used to work out the focal length.

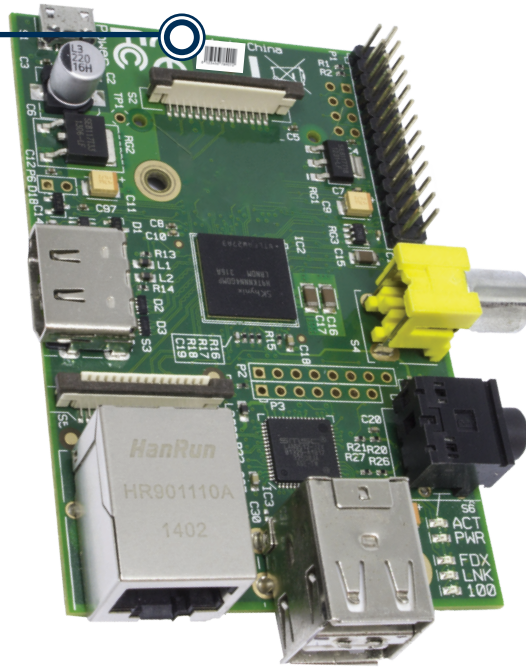
Camera Resolution =  $\text{FOV}/W_s = X$

# Solutions for Electronic Manufacturing



## Barcode Reading

- Component Traceability
- WIP Tracking
- Recall Management
- Time/Cate Stamping



## Machine Vision

Inspect Parts & Assembly

- Label Presence & Position
- Text (OCR & OCV)
- Reject Identification
- Absence/Presence of Components
- Dimensional Testing

# Solutions for Life Sciences & Pharmaceuticals



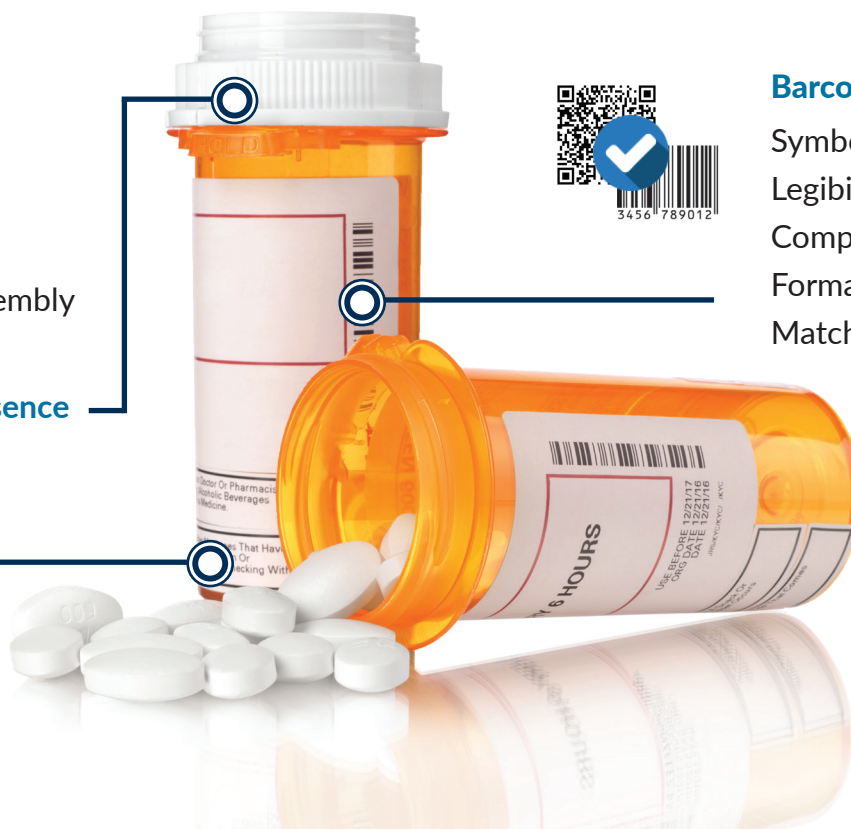
## Machine Vision

Inspect Parts & Assembly

Cap colour and presence

Label Quality

Text (OCR & OCV)



## Barcode Verification

Symbol Quality and Legibility GS1, HIBCC Compliance Data and Format Compare Data to Match String



# Solutions for Automotive



**Barcode Verification**  
Part Traceability  
Recall Managements



**Machine Vision**

**Interior**

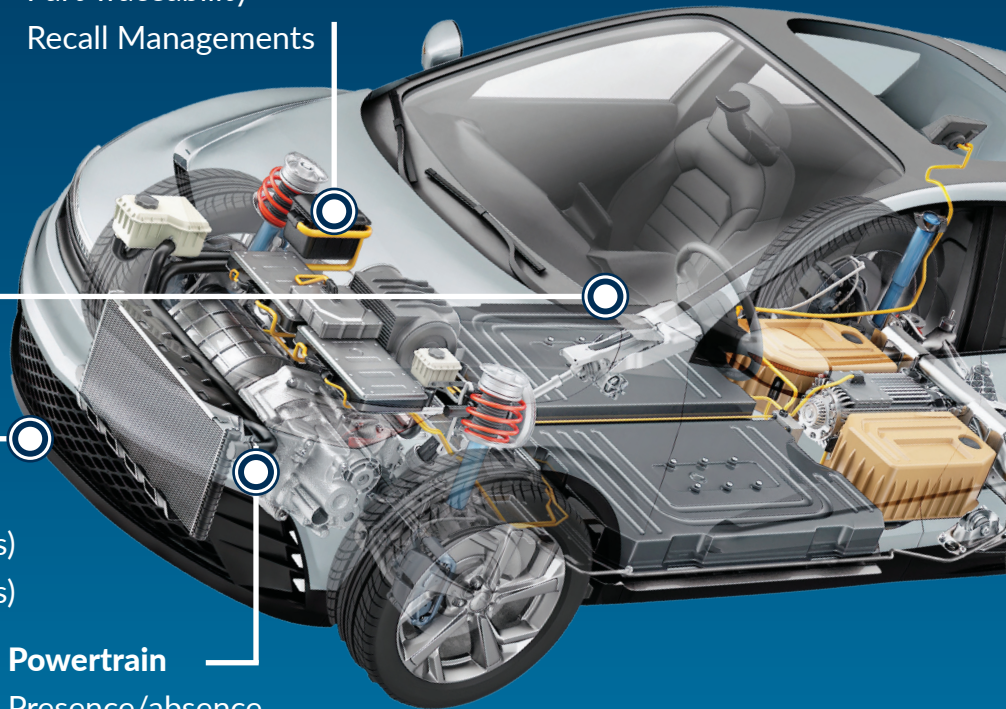
Thread Inspection  
Bead dispensing & verification

**Exterior**

Measurement & Metrology (panel gaps)  
Surface defects (scratches & impurities)

**Powertrain**

Presence/absence  
Verification of Components



# Solutions for Food & Packaging



**Barcode Verification**

Read any linear code or 2D symbol  
Symbol Quality and Legibility GS1,  
HIBCC Compliance Data and Format  
Compare Data to Match String

**Food Contaminants**

Blob Analysis (Product  
Dimension Specification)  
Text (OCR & OCV)  
3D Analysis



**Machine Vision**

# Shaping Traceability in Food and Beverage Packaging

In the food and beverage packaging industry, authenticity is essential. Consumers need to know that the foods they are purchasing consist of the things listed on their labels, as food allergies and expired foods can cause serious illness and possibly death. Since both public health and consumer satisfaction depend so heavily on product integrity, the food and beverage packaging industry is highly regulated.



One of the main things mandated by food and beverage regulation is traceability, the practice of maintaining thorough records on the origins and whereabouts of products and raw materials by scanning printed barcodes, direct part marks (DPMs) or radio frequency identification (RFID) tags throughout the production process and the supply chain. From raw material suppliers to production line to supermarket to customer; the creation and distribution of a particular food item should be as transparent as possible.

## Did you know?

Errors on labels and packaging are the most common cause of food and beverage recalls.

## What can you do about this?

Implement a comprehensive label verification system to ensure that machine-readable and human-readable information matches and that print quality is optimal.

Food and beverage manufacturers also benefit directly from traceability protocols that minimize the occurrence and effect of costly issues such as product recalls by providing real-time data on supplier materials, processes and machinery involved in production. These protocols can significantly reduce cost of a recall by isolating tainted items and making it unnecessary to pull large amounts of non-tainted product off the shelves.

The FDA proposed Section 204 of the Food Safety Modernization Act (FSMA) rule for additional traceability requirements will further escalate the need for using automation technologies that help enable compliance to these new regulations. These regulations are recognized by the Canadian Food Inspection Agency (CFIA) and the Safe Food for Canadians Act (SFCA).

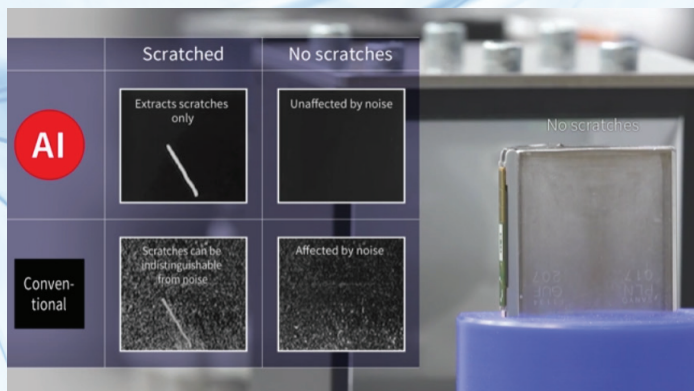


# Streamlining the EV Battery Inspection Process

Developing a precise EV battery inspection process is paramount to your overall quality control and inspection strategy. Automated AI inspection will dramatically reduce over-detected and overlooked defects.

## Challenge:

Seasoned visual inspection workers can provide support during the car battery inspection, but ever-changing, demanding quality requirements combined with an increased demand for EV batteries is making it more difficult for employees to manually complete this task. Reducing manual inspection is required.



## Solution:

AI solutions that enable intuitive image inspections that identify between defective and non-defective EV batteries. Omron AI features combined with image processing technologies allow for overall performance improvement of quality control and inspection processes.

AI solutions deliver reliable, high-quality inspections.

- Intuitive image-processing technology learns variations from individual images.
- AI technology identifies defects based on premium product images.
- Responsive inspection technology resists variation in high-quality products.

### Did you know?

There's no way to discover scratches without the sensitivity of human vision. Only a skilled and experienced inspector can determine a quality product.

### What can you do about this?

Omron is using AI to reproduce the visual sensitivity and experience of human inspectors.



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