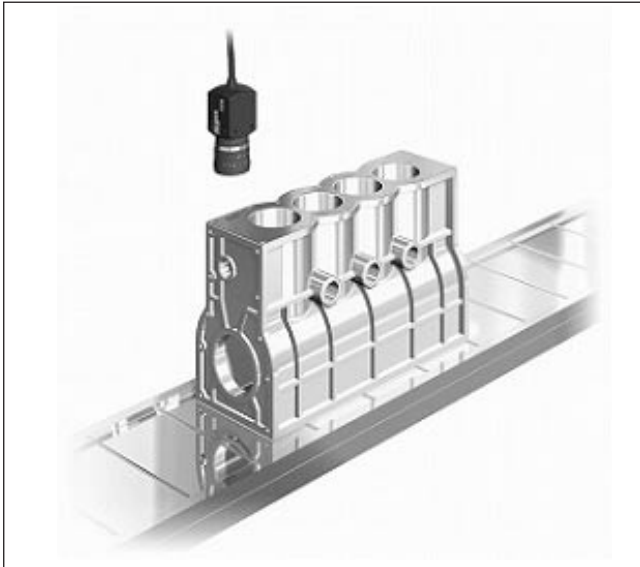# KEYENCE

MACHINE VISION
INDUSTRY APPLICATION GUIDE

Indexed by Industry

AUTOMOTIVE INDUSTRIES

● **Differentiating types of cylinder blocks**

Description

The vision system differentiates cylinder blocks of different bore diameters by detecting color marks. One vision system can sort a wide variety of models by registering multiple colors.
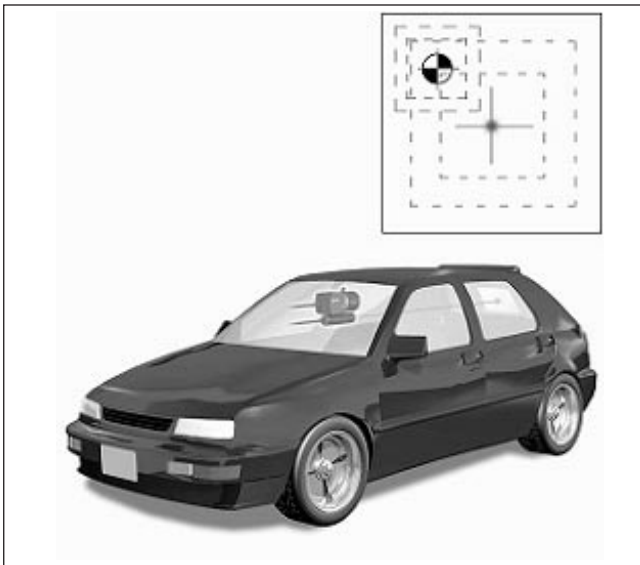
● **Controlling the position of a robot**

Description

The vision system detects the position of holes on a car body and feeds back the data to a robot. This saves an operator from checking the position of a workpiece because its position is automatically corrected. High-precision detection is provided using sub-pixel processing.
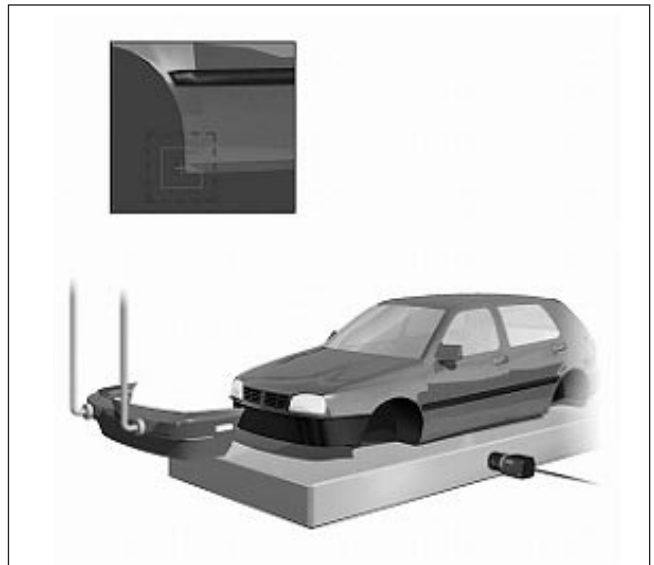
● **Measuring distortion of a car body**

Description

The vision system measures distortion of a car body by detecting the position of the spot from a laser pointer. The vision system provides a precise measurement because it detects the changes in a relative position with reference to the home position.
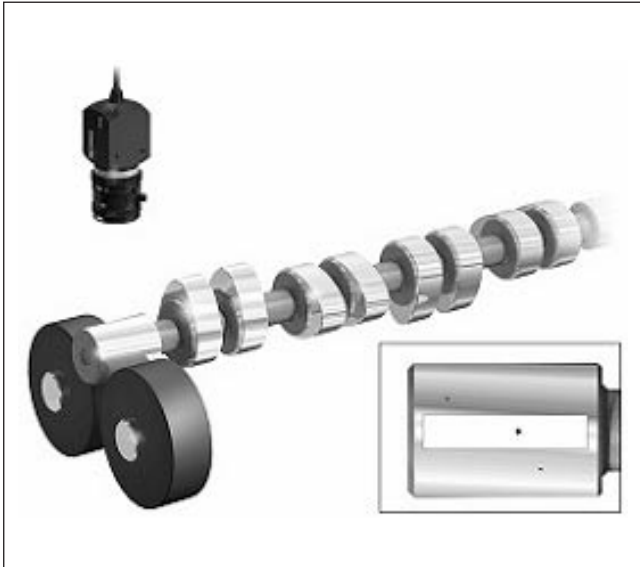
● **Detecting displacement of a car body**

Description

Using a telephoto lens, the vision system can easily detect the displacement of a car body from a long distance.

● **Detecting holes on a camshaft**

Description

The vision system automatically checks holes that occur on the sliding part of a camshaft. This provides a total inspection and reliable quality control.

● **Detecting missing balls in a bearing**

Description

The vision system checks for missing balls in ball bearings. Using COUNT, an image processing tool, it can quickly count the number of balls.

● **Checking for faulty components in a car stereo**

Description

The vision system checks the stereo switch assembly and the LED lighting. Using a color camera, it can also simultaneously check the color of the LCD backlight and the assembly of different types of LEDs.
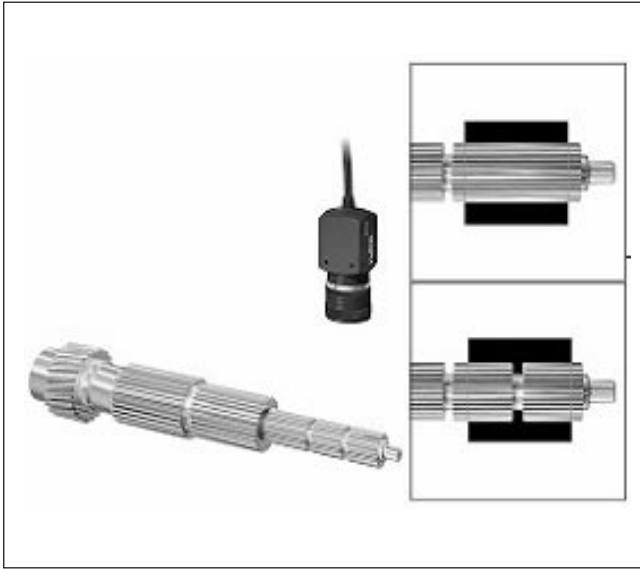
● **Preventing the mixture of different package types**

Description

The vision system prevents the mixture of different product types by detecting different package contents. Using a color camera allows for detection of items according to their color shade.
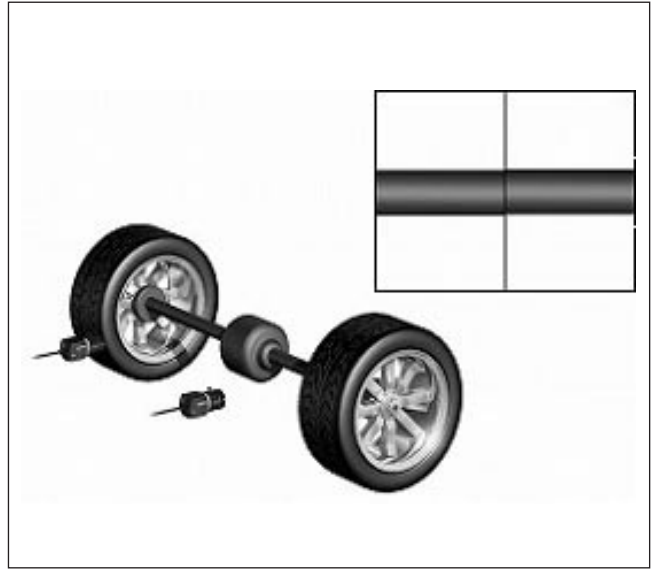
● **Differentiating gear types**

Description

The vision system differentiates gear types by checking the position of notches and the outside diameter. A multifunctional vision system performs a wide variety of complex inspections.
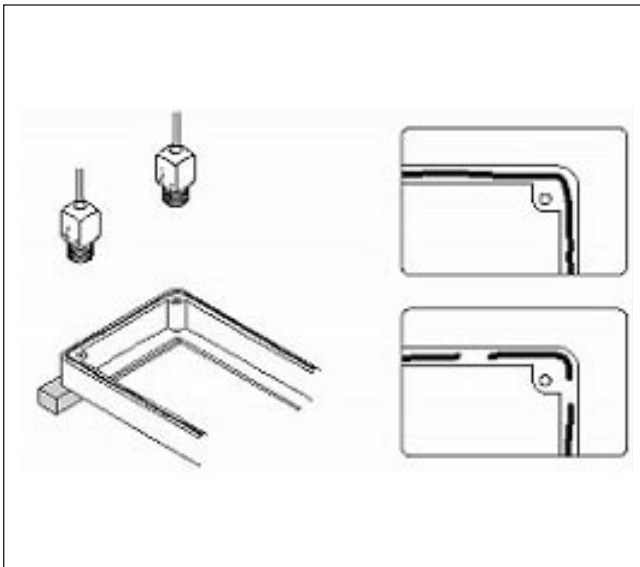
● **Measuring the parallelism of drive shafts**

Description

The vision system measures the parallelism of drive shafts by measuring the position of two shafts with two cameras. Using a telephoto lens allows high-precision measurement from a long distance.

● **Detecting a lack of sealing compound**

Description

The vision system detects the size, length, and absence of sealing compound. Unlike a visual check, the vision system detects a lack of compound with high reliability.

● **Differentiating various types of tires**

Description

The vision system checks the mixture of different types of tires by detecting the color mark on the tread. The vision system reliably detects different types because it extracts only the selected color of the specified tire.

● Checking an LCD panel

Description

The vision system checks the LCD display on panel meters by using image processing. It can check whether or not multiple displays are illuminated at once.

● Checking non-uniformity of O-rings

Description

The vision system checks the malformation, inside diameter, and outside diameter of an O ring on the production line. You can configure settings easily using the trend edge tool. Using this tool, the vision system finds the center position of the inside and outside diameters to detect displacement of the center or check non-uniformity of an O-ring.
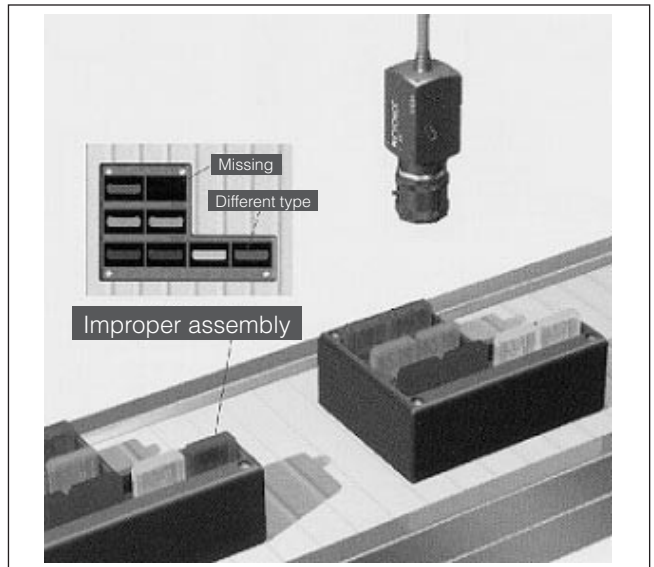
● Checking the assembly condition of doors
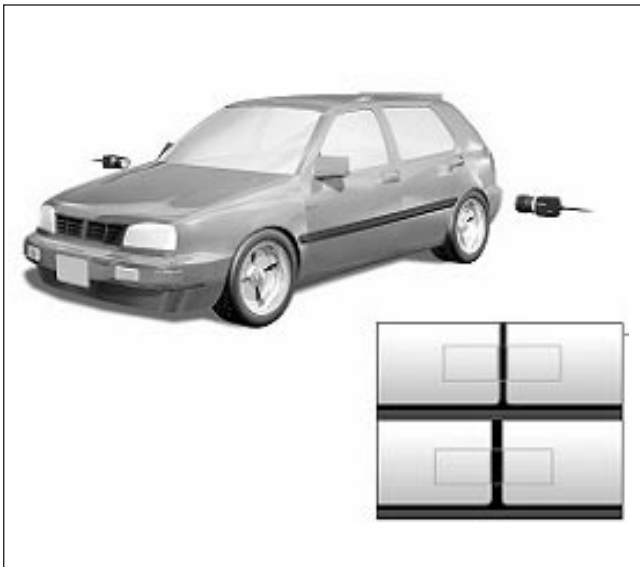
Description

The vision system checks the assembly condition of doors using image processing. It verifies whether the doors are assembled correctly by measuring the spacing between the car body and the doors.

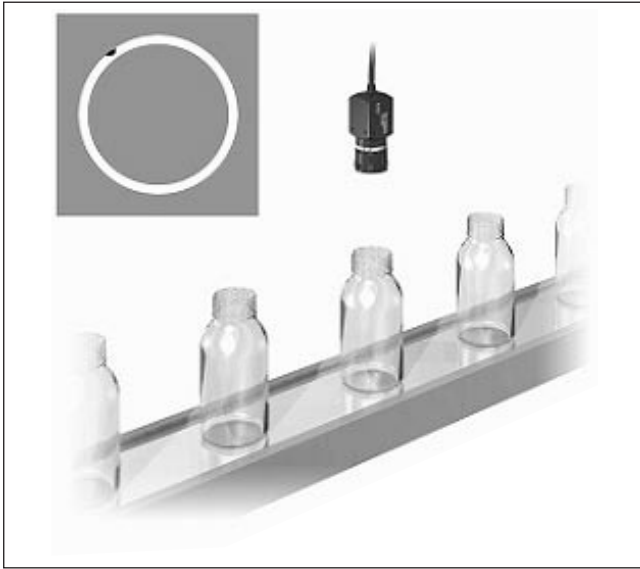### ● Detecting improper assembly of a fuse box

Description

The vision system detects a lack of components and faulty assembly by using a color camera. The vision system supports a wide variety of colors and configurations.
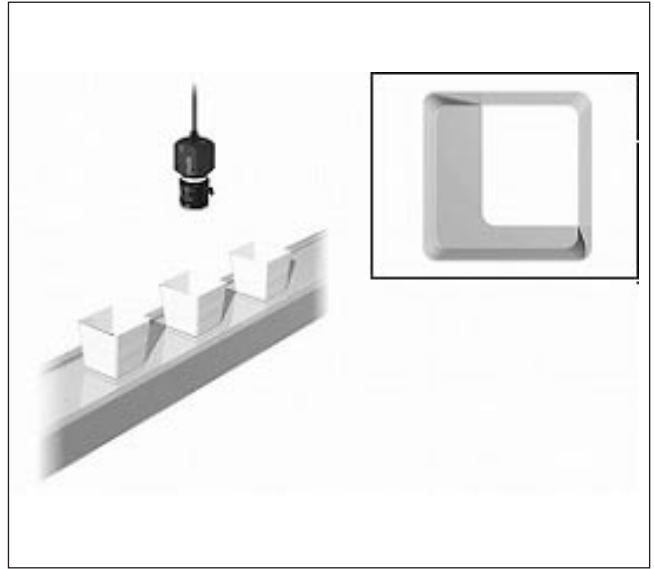
FOOD / PHARMACEUTICAL INDUSTRIES

● **Detecting chipping on the end of a glass bottle**

Description

The vision system detects chipping on glass, preventing broken pieces of glass from entering the bottle and ensuring contents do not leak after shipment.
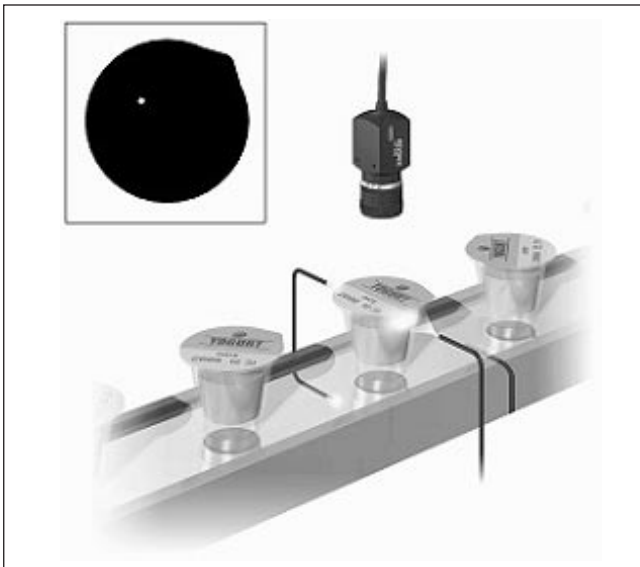
● **Checking for stains and dirt on food trays**

Description

The vision system automatically compensates for the change in size of a workpiece and inspects for foreign matter. Using a color camera allows for a reliable detection of low contrast defects.

● **Detecting pinholes in aluminum packaging material**

Description

The vision system detects pinholes and cracks in aluminum sheets used for caps. Now you can eliminate defective products before shipment by checking packaging material.

● **Checking the print on aluminum packaging material**

Description

The vision system checks the print on aluminum packaging material using image processing. Normally checking the print on aluminum is difficult because of specular reflections occurring on the surface of aluminum. Using dome-shaped lighting makes inspection easier.

● **Detecting heat sealing failures**

Description

The vision system detects failures that occur during heat sealing. It determines a fixed position of heat seals and checks whether a product is under the cutting edge. It occupies little space because the detection can be made from a long distance.

● **Detecting missing contents in an instant food package**

Description

Using its wide range of inspection tools, the vision system performs reliable detection of loose food packets that have broken from their its packaging.
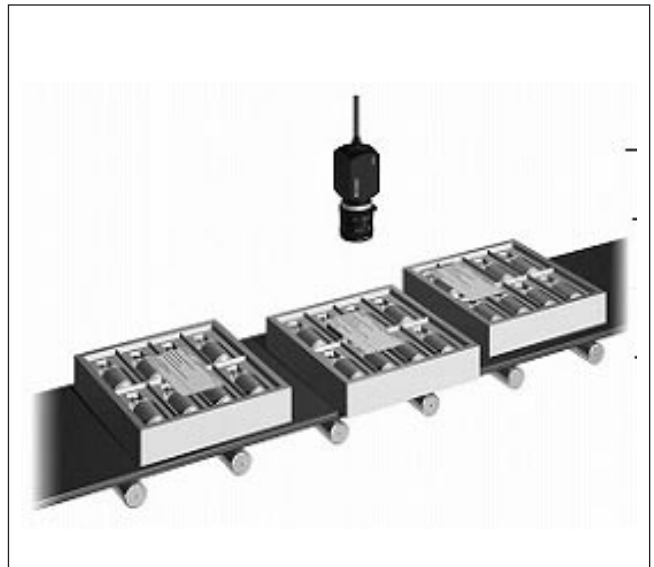
● **Detecting peeling of the lid on a chemical container**

Description

The vision system detects peeling of a lid on a container using image processing. Using a camera, it can reliably detect peeling on any part of the lid.
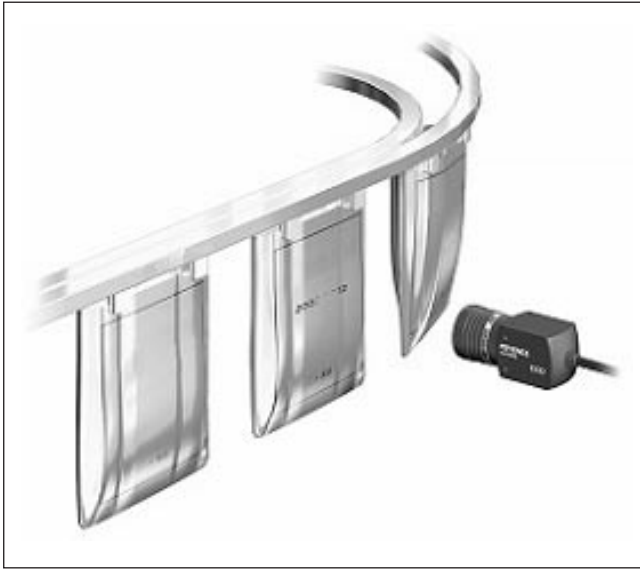
● **Detecting the presence/absence of the medicine instruction sheet and missing products**

Description

The vision system reliably checks for the presence of a medicine instruction sheet and measures the displacement of boxes. A task that is almost impossible with a conventional photoelectric sensor.
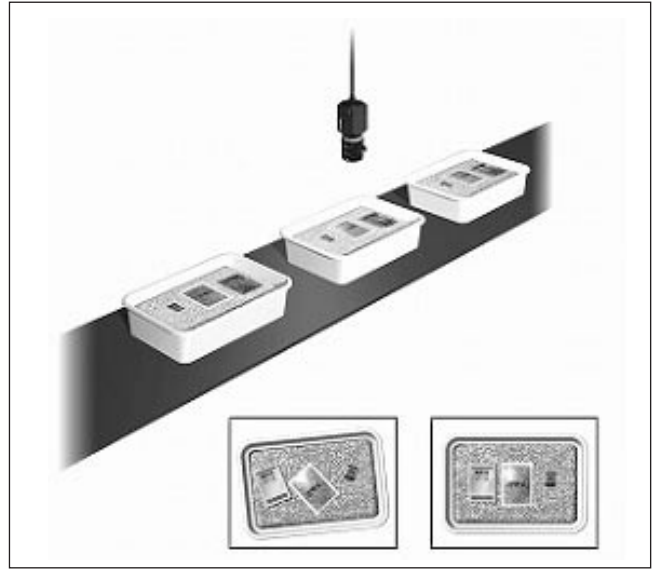
● **Checking the print on a retort pouch**

Description

The vision system detects the faded print on an expiration date printed on a retort pouch. It can perform a high-precision inspection without being affected by the print color changes or glare caused by surface irregularities.

● **Detecting seasoning bags in instant food packages**

Description

The vision system reliably detects seasoning bags regardless of the position of bags or packages by freely searching for the registered colors of multiple workpieces on the screen.

● **Various inspections of dairy products**

Description

The vision system checks the print on a label and differentiates the product types using color image processing. Using color processing allows a differentiation of various colors such as red, yellow, blue, green, etc.
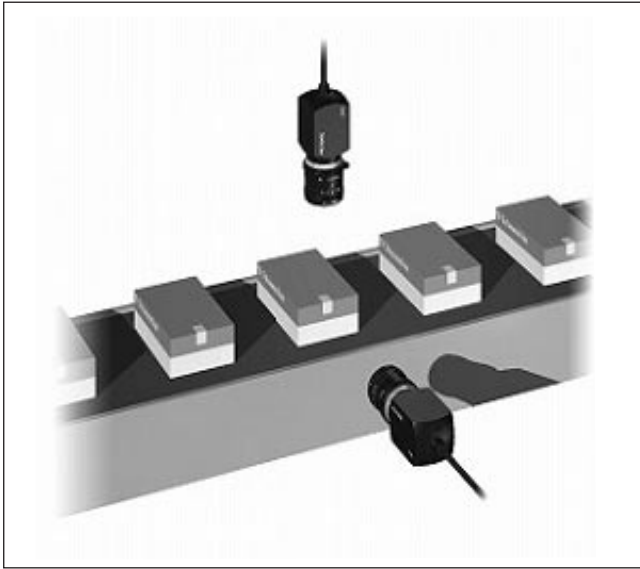
● **Checking the print on the label of a yogurt container**

Description

The vision system finds the position of a yogurt container and then checks whether the label contains print indicating an expiration date or lot number.

● **Detecting the presence/absence or peeling of sealing stickers**

Description

The vision system reliably detects only the color of a sticker with a color camera. During product change-over, the vision system can automatically call up the new color settings by utilizing a simple digital input. This eliminates the need for manual adjustments.
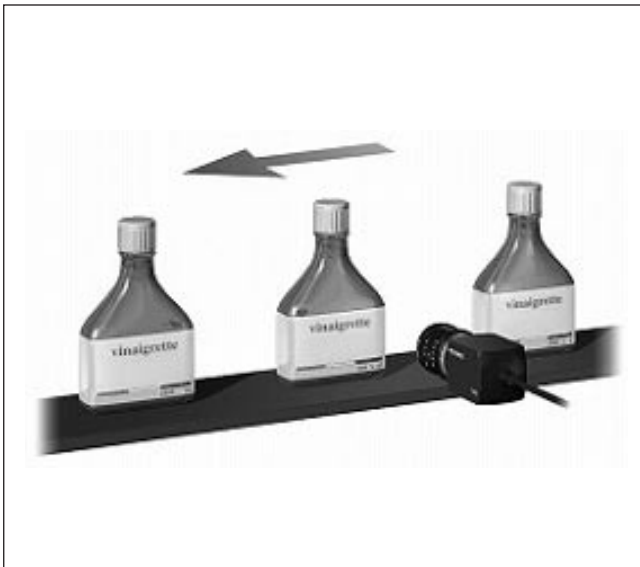
● **Detecting the presence/absence of a campaign sticker on canned drinks**
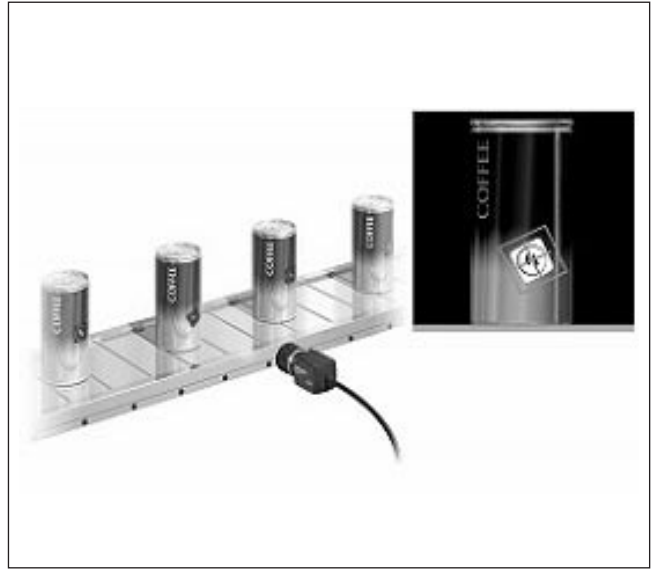
Description

The vision system detects the presence/absence of a campaign sticker on canned drinks using a color camera. It registers stickers by color even when they are upside down, tilted, or displaced on the can.

● **Complex inspection of dressing containers**

Description

The vision system inspects tightness of caps, the liquid level, positioning of labels, and the date print-ing at the same time. Even when the position of the workpiece is displaced, a position adjustment func-tion ensures high-speed detection.
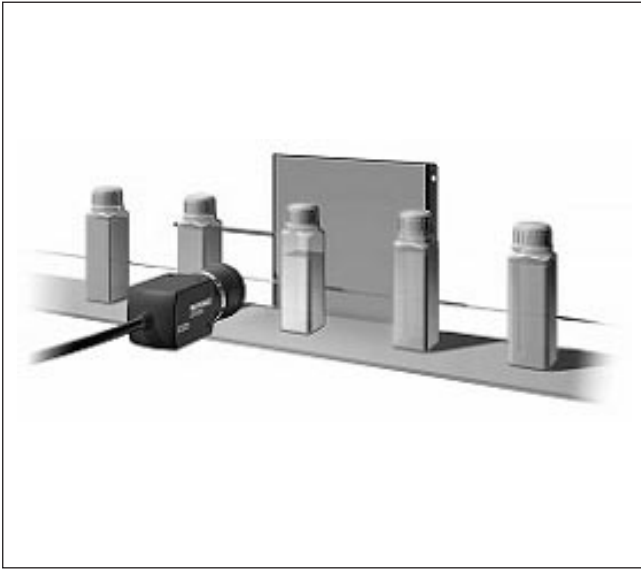
● **Inspection of inkjet printing**

Description

The vision system checks the print quality of an inkjet printer. It can check for out-of-shape and missing characters caused by static electricity on the surface of products.

● **Checking the liquid level in glass bottles**

Description

The vision system checks the level of the liquid using a backlight from behind the target. In a glass bottle, the liquid level may be different even when the filling amount is the same, because the volume of a bottle varies. Accurately checking the liquid level prevents customer complaints.
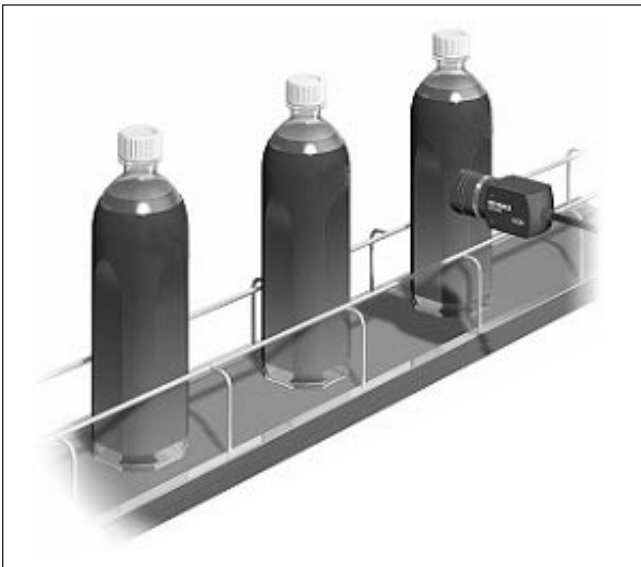
● **Detecting crushed PET bottles**
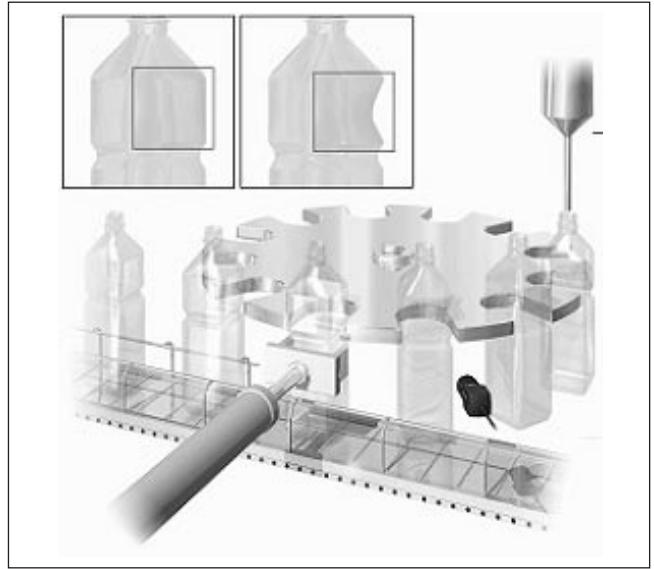
Description

The vision system detects crushed bottles on a star wheel.
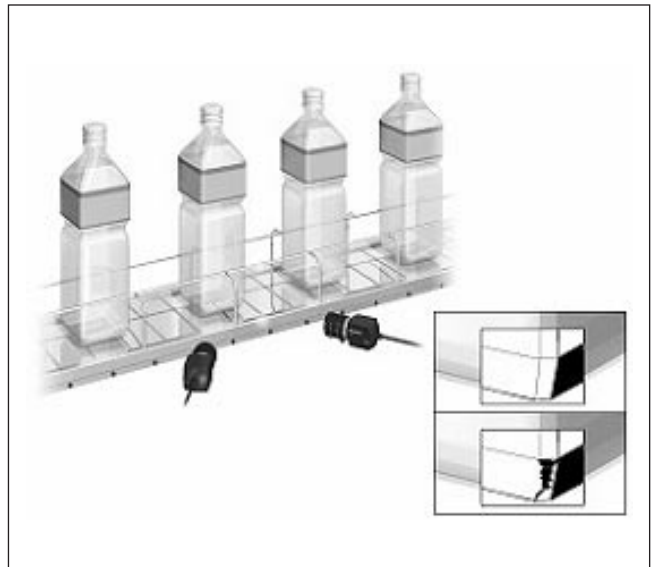
● **Visual inspection of PET bottled drinks**

Description

The vision system detects faults in the appearance of PET bottled drinks. One vision system can simultaneously check for loose caps, improper positioning of labels, and peeling of shrink wrap.
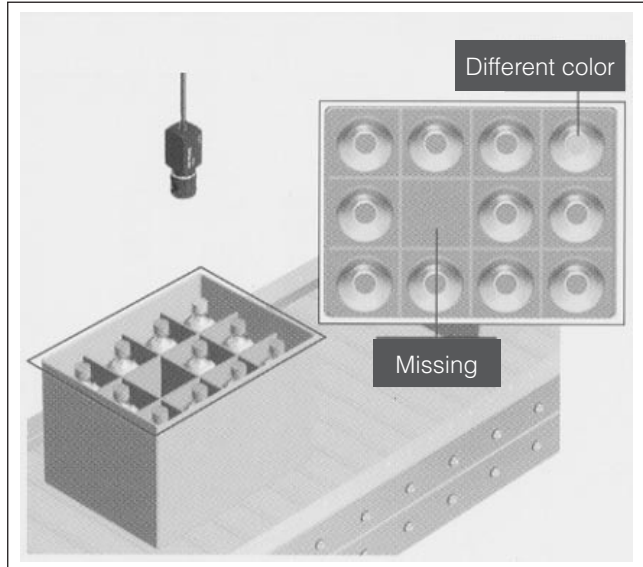
● **Detecting a crushed corner of a PET bottle**

Description

The vision system detects crushed corners of PET bottles using image processing. It also clearly detects wrinkles using different lighting angles.
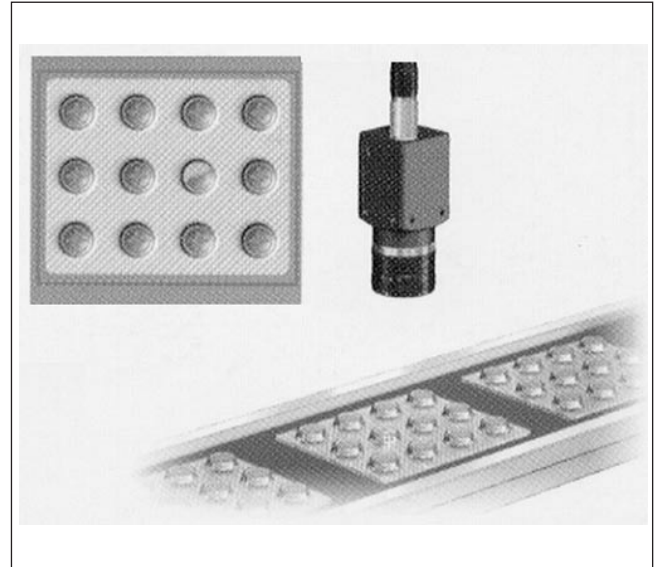
● **Checking bottles in a packaging box**

Different color

Missing

Description

The vision system checks the quantity of bottles in a box before shipment. It precisely counts bottles even when the box is displaced. Using color differentiation processing also allows different types of bottles to be differentiated.
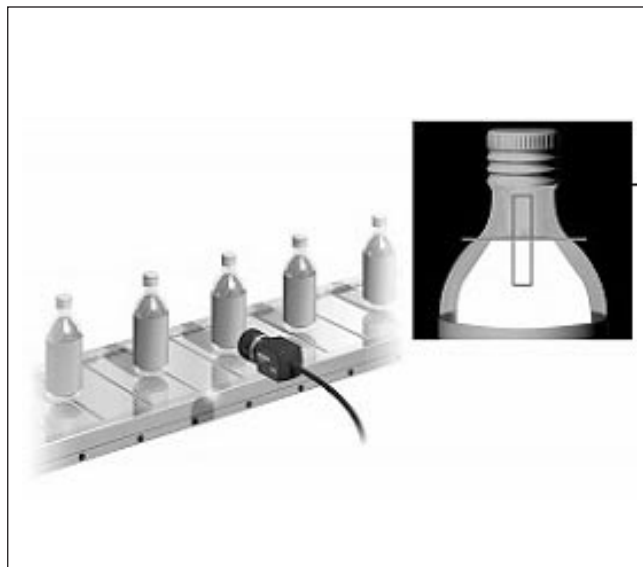
● **Counting the number of tablets**

Description

The vision system counts only normal-shaped tablets and detects chipped tablets at the same time. Using a color camera allows for detection of different colors of tablets.

● **Checking the liquid level**

Description

Conventionally a photoelectric sensor was used. However, the inspection was not stable because of the foam that collected on the surface of the liquid. Image processing allows a stable check of the liquid level even when there is foam on the surface.

● **Checking the liquid level of chemicals**

Description

The vision system checks the level of the chemical in test tubes. Conventionally a visual check was performed. However, the liquid level varied because of the surface tension of the liquid and the inspection quality was not stable. Image processing allows a stable check of the liquid level.

SEMICONDUCTOR / LCD INDUSTRIES

● **Wafer orientation flat positioning**
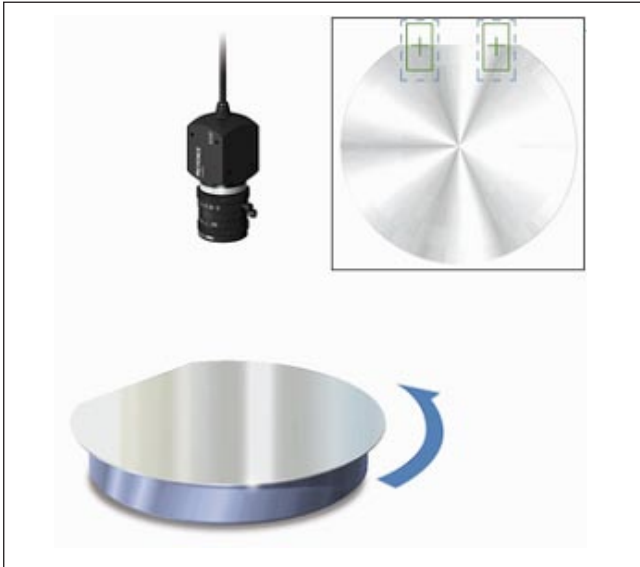
Description

The vision system is used for orientation flat positioning. Displacement leads to a yield reduction. The vision system measures the position of the orientation flat and calculates the tilt angle.

● **Detecting missing balls on BGA**

Description

The vision system can perform in-line inspection to detect missing balls on BGA. It can quickly check the position, footprint, and number of balls, resulting in improved productivity.

● **Detecting BAT marks with red ink**

Description

Using a color camera allows reliable target detection for marks on patterns or wafers that require different methods of after-treatment. Furthermore, the background of the target does not affect detection.
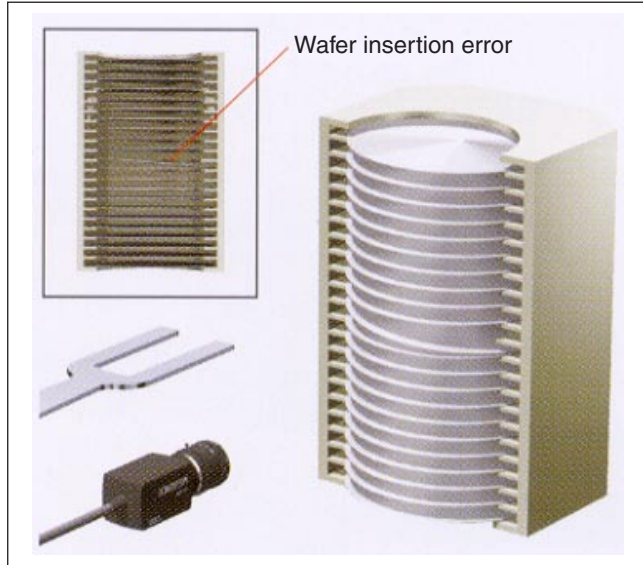
● **Measuring the position of a wafer at handling time**

Description

The vision system precisely measures the position of the wafer in order to reduce possible errors during handling.
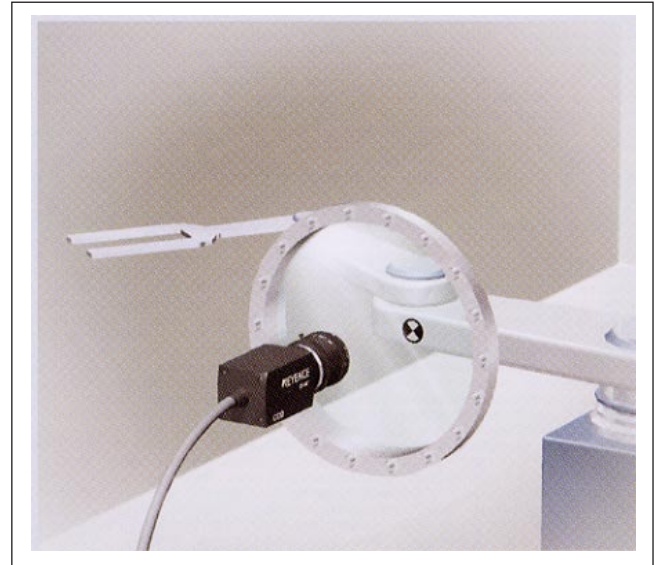
● **Checking the wafer position in a rack**

Wafer insertion error

Description

Following the wafer's insertion into the transfer rack, the vision system reliably measures the pitch between wafers to detect insertion errors.

● **Checking the position accuracy of a transfer arm**

Description

The vision system checks the repeatability of the stop position and the dynamic accuracy of a robotic arm. A simultaneous check in the X and Y directions from outside of the view port is possible. Using the vision system can prevent damage to devices and wafers caused by falling or drifting of the arm.

● **Detecting alignment marks on a glass substrate**

Description

The vision system detects the position of alignment marks and determines the positioning of the substrate.

● **Positioning when laminating an LCD display**

Description

The vision system checks the laminating position of LCD panels with the overlapping of frame and mark. The high-precision sub-pixel processing provides extremely accurate positioning.
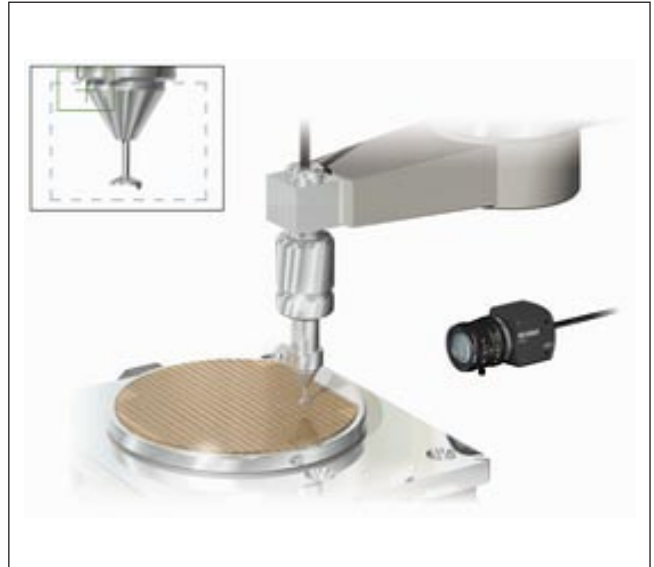
● **Checking the condition of a wafer during transfer**

Description

The vision system reliably checks the condition through the view port and prevents the yield reduction caused by breakage of wafers.
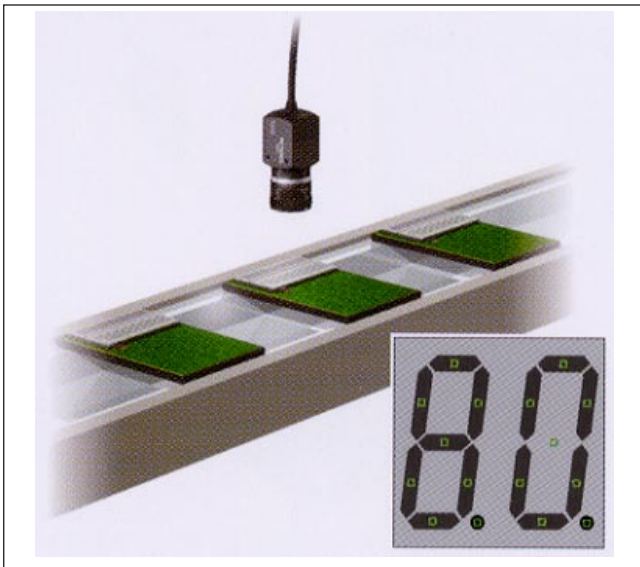
● **Inspecting for foreign matter adhesion on the tip of an attachment collet**

Description

The vision system monitors foreign matter (particles caused by dicing or other contaminants) adhesion, which causes faulty electrical continuity. It prevents faults using a high-speed response process.
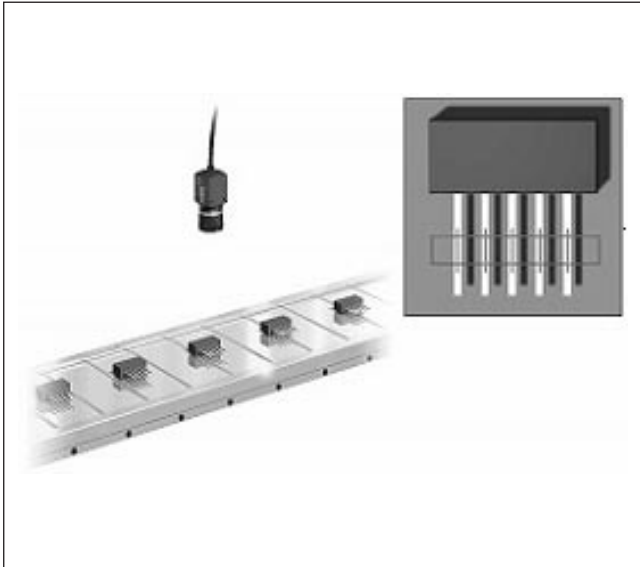
● **Checking LCD segments**

Description

The vision system verifies that the seven segment points of an LCD are illuminated. It can check the intensity of the points and detect lighting faults.
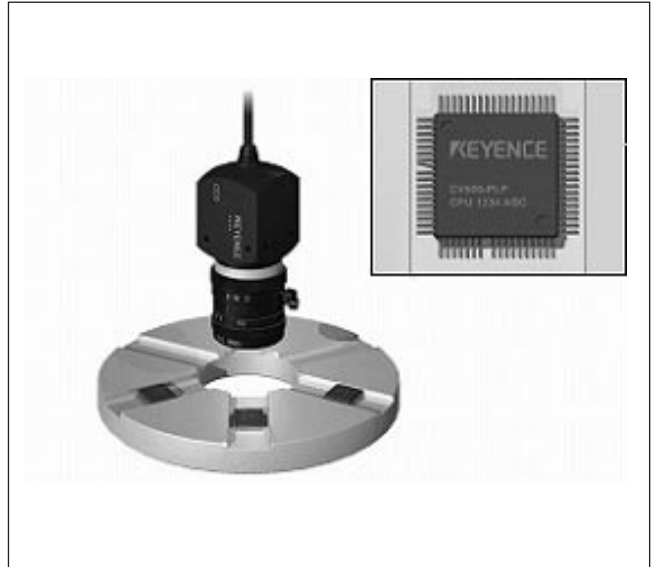
ELECTRONICS COMPONENT INDUSTRIES

● Checking the lead pitch of a connector

Description

The vision system measures the center pitch of a connector pin. The high-precision sub-pixel process allows for accurate measurement.

● Overall inspection of an IC

Description

The vision system is used for complex inspections that are typically performed by high-priced special purpose machines. It can quickly measure the center pitch of the IC leads, detect a bent or missing lead, and check the print and orientation.

● Checking the orientation of chips

Description

The vision system checks the orientation of electronic components in embossed tape. Registering the print pattern allows the system to check for different product types at speeds up to 3ms/part.

● Checking the color code of resistors

Description

The vision system confirms the color code by inspecting for a wide variety of colors at one time. Our proprietary color processing technique allows for automated examination on high-speed production lines.
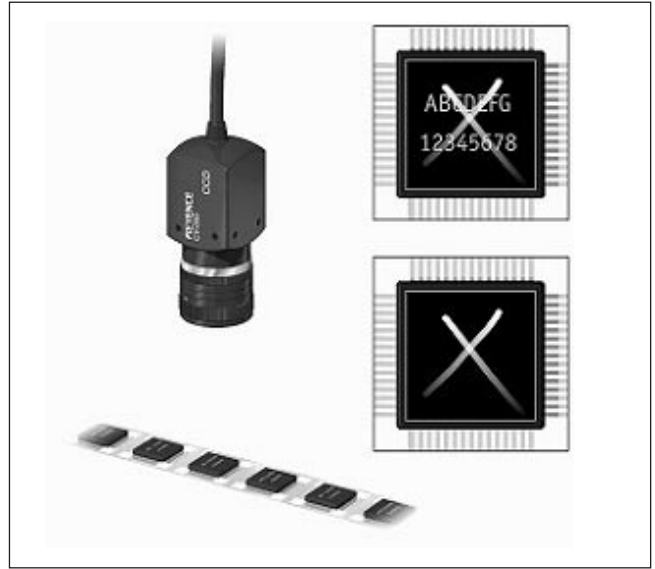
● **Various inspections of ceramic chips**

Description

The vision system corrects the position of chips using the pilot holes on embossed tape and checks the chips for any defects.
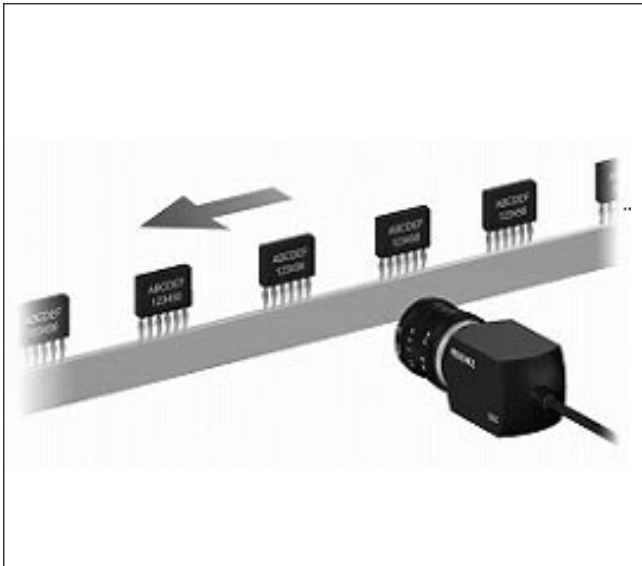
● **Checking the print on a transistor**

Description

The vision system makes a high-speed check along the production line. A complex high-speed inspection allows the integration of multiple cameras into one low cost package.

● **Differentiating between a BAT mark and a laser marker inscription**

Description

The vision system differentiates the slight difference between a BAT mark and a laser inscription using image processing. It also identifies the color difference using a color camera.
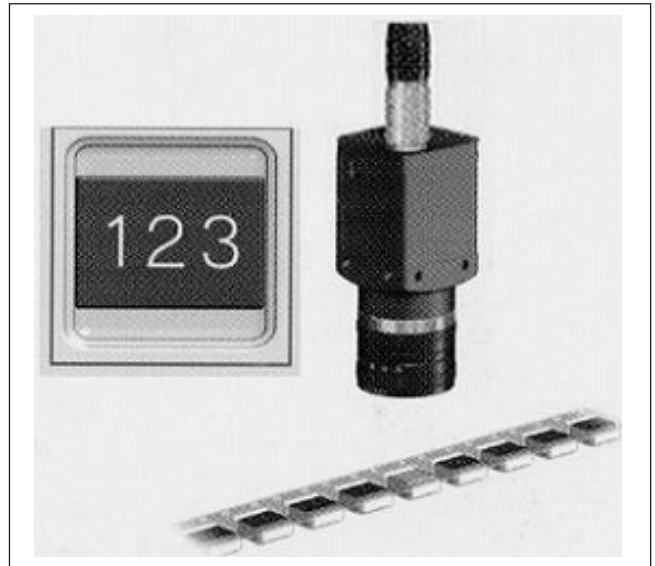
● **Differentiating between the front side and back side of chip components**

Description

The vision system differentiates between the front and back side of a chip by first determining its brightness, then checking concentration as well as the overall binary level of the surface. Ignoring the color differences caused by lot-to-lot variation enhances the reliability of the inspection.

● Detecting poor pasting on lead frames
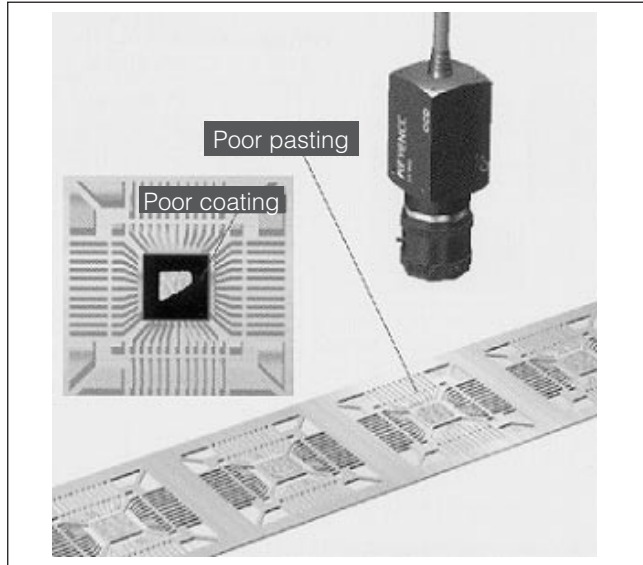
Description

Normally it is impossible to reliably inspect paste and soldering on copper frames. Using a color camera, the vision system can reliably differentiate the color of solder from that of copper to detect a poor coating.
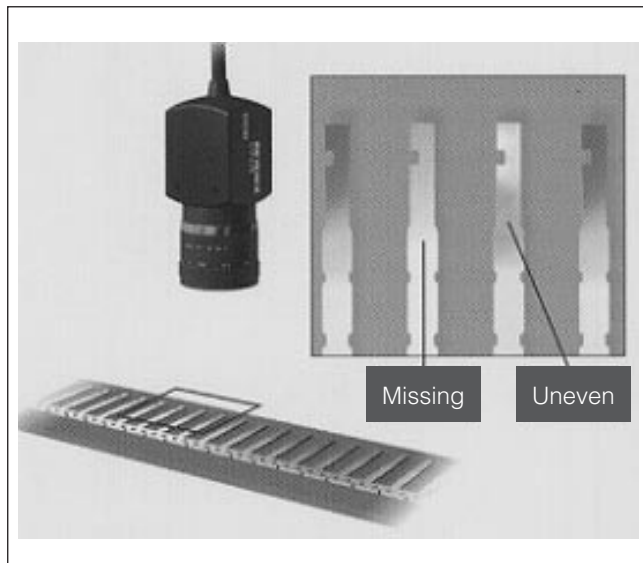
● Measuring the curve of lead wires

Description

Conventionally it was difficult to find the biggest curve of lead wire and its position on a workpiece because there is no way of determining where the curve occurs. Scanning the lead wire section has made it easier to find the maximum value of the wire curve.
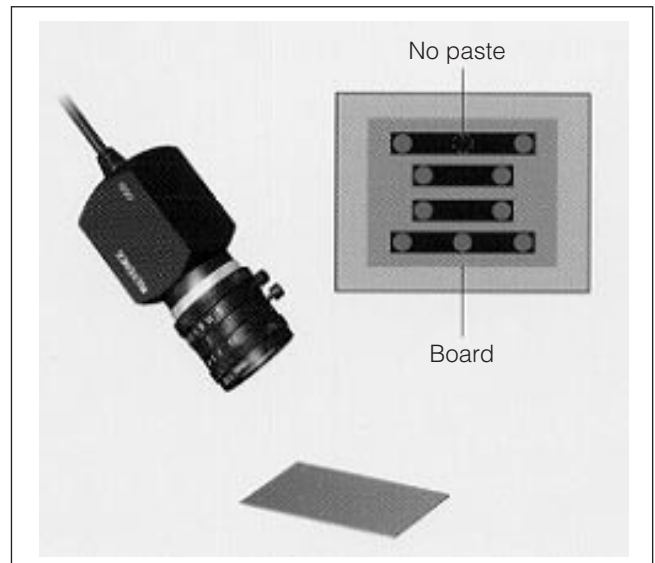
● Detecting poor plating at terminals

Description

The vision system detects poor plating on terminals. Using a color camera allows reliable differentiation between gold and silver, two colors that are difficult to differentiate between when using a monochrome camera.

● Detecting a lack of paste on a BGA board

Description

At an early stage in the production process, the vision system prevents high volume production of defective pieces by detecting poor adhesion caused by a lack of paste on a BGA board.
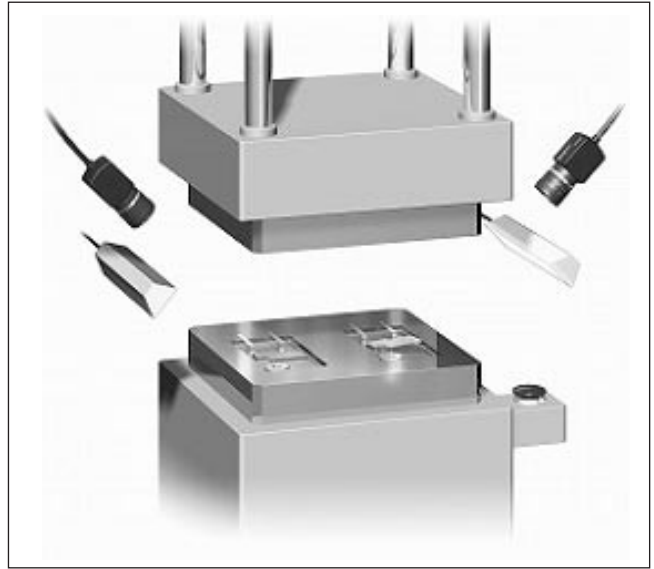
● **Visual inspection of a chip capacitor**

Description

The vision system detects the presence/absence of solder on chips. Using color processing allows a reliable detection of subtle color differences.
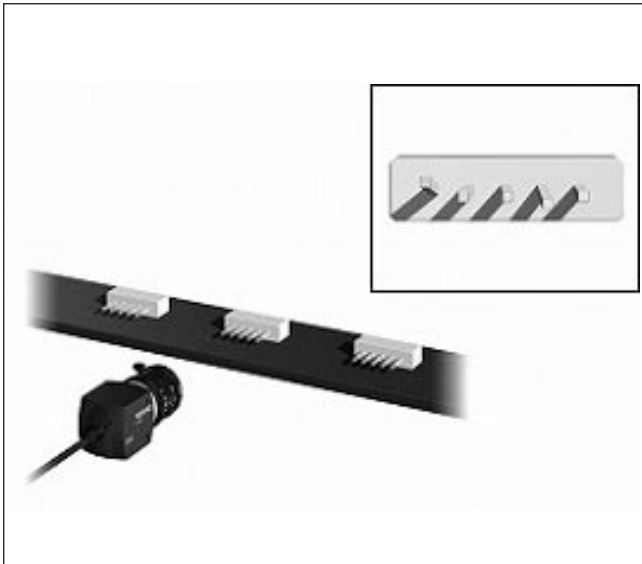
● **Checking displacement of workpieces before molding**

Description

The vision system uses image processing to ensure the workpiece is in a fixed position in the mold. Displacement of a workpiece leads to breakage of the mold.

● **Coplanarity check**

Description

The vision system measures variability in connector pins. It checks the orientation of each pin and measures the pitch with high-speed precision.

● **Checking for crushed pockets of embossed tape**

Description

Using coaxial illumination from above the target, the vision system detects only the crushed area. Even a slightly crushed pocket can be reflected with high contrast.
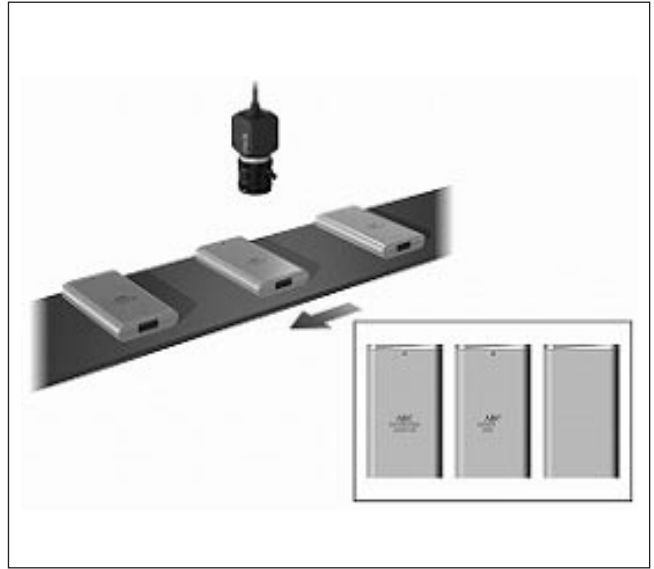
PLASTIC / RUBBER / PAPER INDUSTRIES

● **Detecting holes or stains on sheets**

Description

The vision system detects any foreign matter, stains, or holes on sheets. Color processing allows detection of subtle variations.
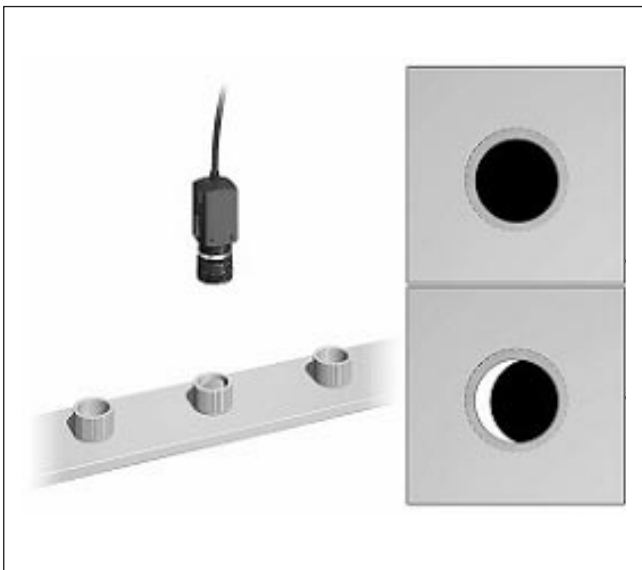
● **Inspection for flaws or chipping of plastic coated products**

Description

The vision system checks the surface of plastic coated products. The vision system can be easily set up because it detects the presence/absence of an inscription or flaw on the surface using a special-purpose flaw detection tool.
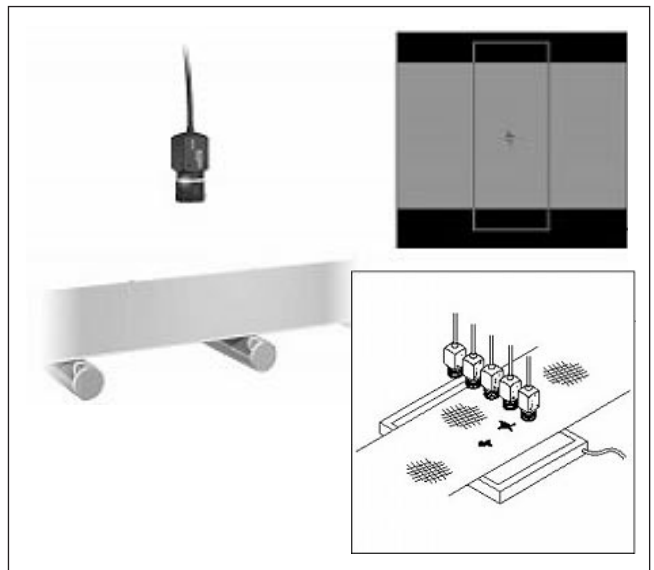
● **Detecting improper positioning of plastic caps**

Description

The vision system detects improper positioning of the insert inside the plastic cap. It can be easy configured to detect improper positioning because the insert changes the color and reflective properties of the cap when it is out of place.
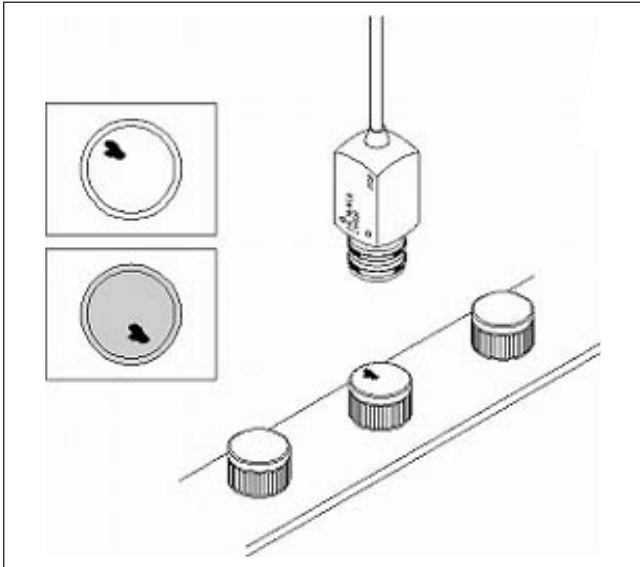
● **Detecting stains, dirt, or pinholes**

Description

The vision system detects foreign matter such as stains or defects. A high-speed vision system can support fast moving production lines.

● **Detecting burnt marks on plastic caps**

Description

The vision system detects burnt marks formed on plastic caps during the molding process. Using a color camera allows the detection of only burnt marks even when the color of the plastic caps changes.
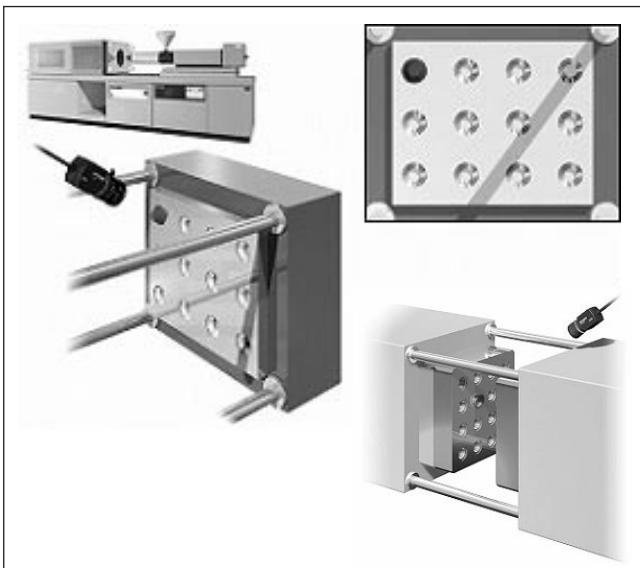
● **Preventing double coating of mobile phones**

Description

The vision system is used to prevent double coating. A color camera can differentiate slight color differences, allowing for reliable detection.
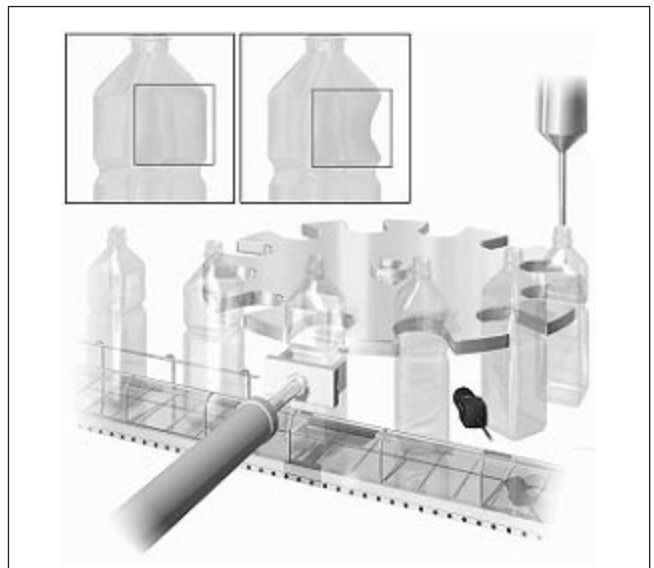
● **Detecting the residue of molded pieces**

Description

The vision system detects the residue of molded pieces, preventing breakage of the mold. A color camera can extract only the color of the target, allowing for reliable detection.
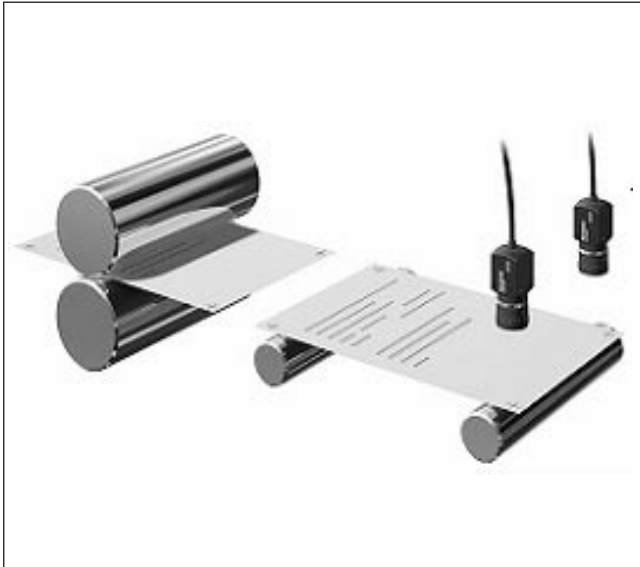
● **Detecting crushed PET bottles**

Description

The vision system detects crushed bottles on the star wheel.

● Checking displacement of the print in printing/ bookbinding

Description

The vision system detects displacements of the patterns and registration marks using two cameras. The color of paper or the pattern can be changed with one-touch operation. You can improve the product quality without changing the work procedure. This vision system is especially effective when adjusting for multi-color printing.
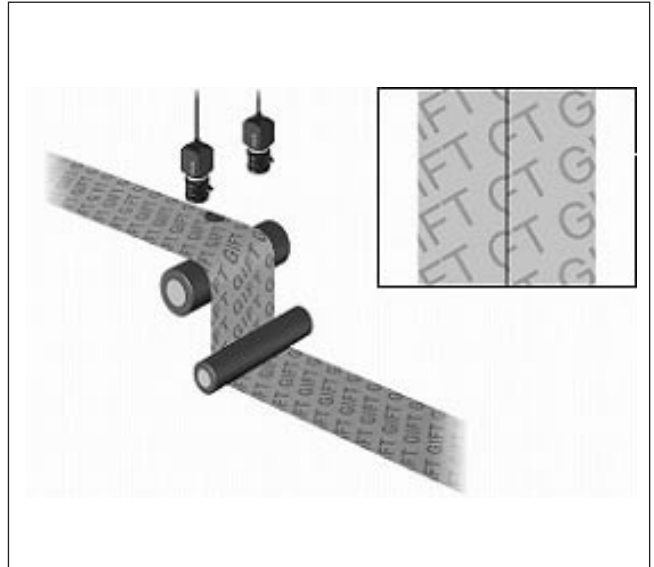
● Measuring the dimensions of construction material board
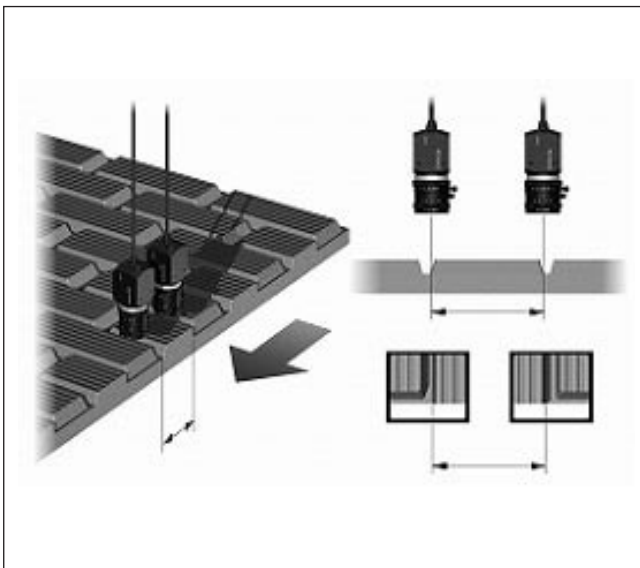
Description

The vision system measures the distance between patterns on construction material board using multiple cameras. An automatic inspection is possible during production because there is no need to use a vernier caliper.
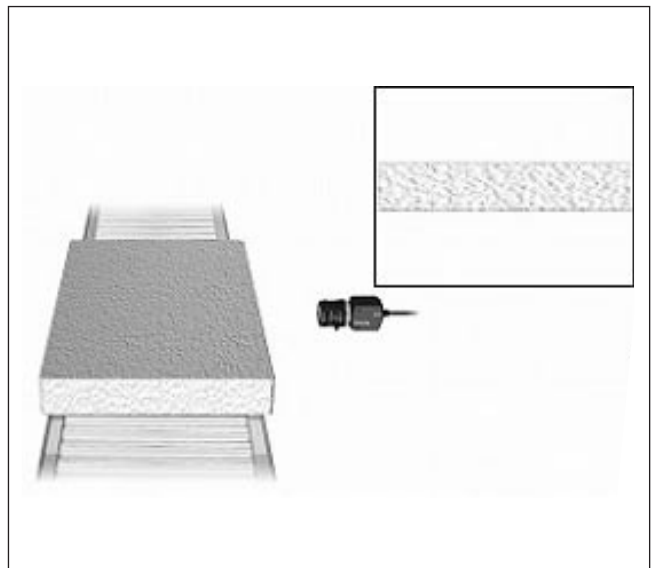
● Measuring the width of sheeting material

Description

The vision system detects the sides of a sheet by connecting multiple cameras and using the screen synthesis function for a large workpiece. All you have to do before measurement is place the cameras above both sides of the sheet.

● Measuring the thickness of construction material

Description

The vision system measures the thickness of construction material from the side, as a visual check does.
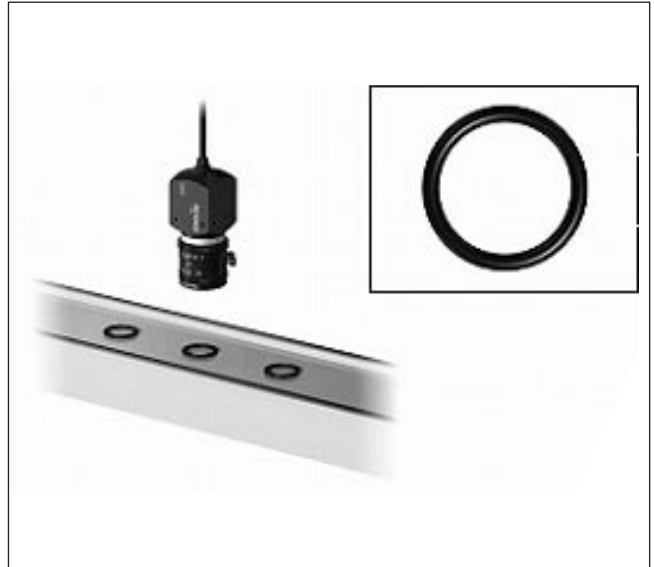
● **Measuring the amount of bank in rubber**

Description

Monitoring the amount of bank using image processing allows proper control of the quality of rubber.
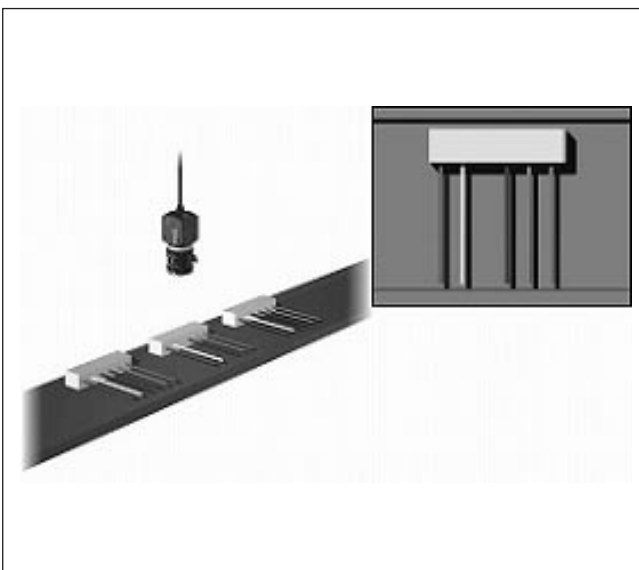
● **Detecting the position of chipping on packing**

Description

The vision system checks the position of chipping on both sides of the packing, preventing improper insertion in the next process.

● **Checking improper alignment of connectors**

Description

Using a color camera creates an easy inspection for missing connectors, different colors, different types, and improper alignment.

● **Detecting chips on rubber packing**

Description

The vision system detects chips on the circumference, flaws on the surface, non-uniformity, and other defects that cannot be detected by a visual inspection because of low color contrast. Low-angle lighting highlights chipping on the edge.

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