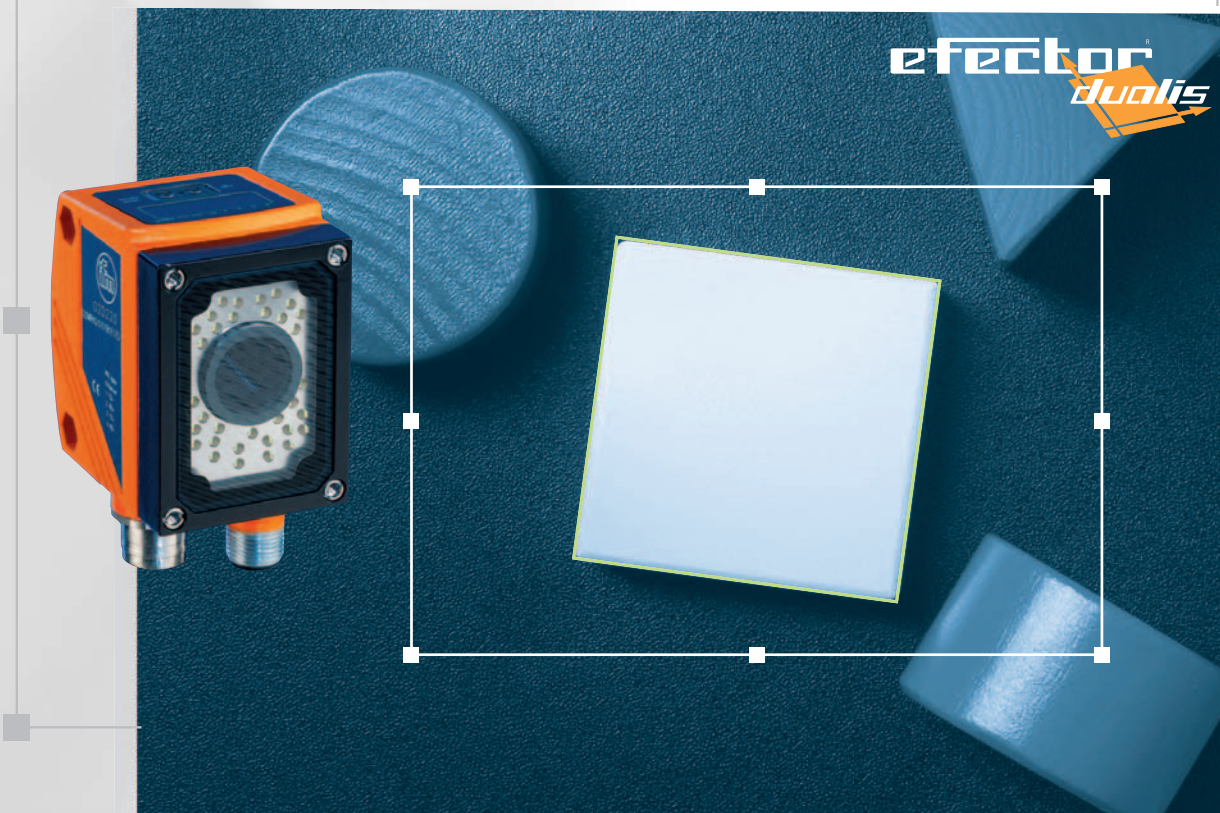
ifm electronic

efector dualis Vision Sensor

Part verification for error-proofing

Contour matching
Orientation
Part presence

efector dualis Vision Sensor
Product / Application Guide



efector dualis Vision Sensor
Part verification for error proofing

The efector dualis Vision Sensor can solve a variety of inspection and error-proofing applications throughout the manufacturing process.

The compact CMOS image sensor provides reliable performance in production control. Components are reliably detected and precisely evaluated with the sensor's fast image capture and processing algorithms.

The sensor's Ethernet process interface allows quick adjustment to an application. 128 mb RAM enables teaching up to 32 applications.

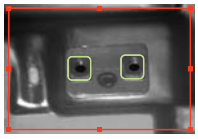
Applications include:

- *Contour matching*
- *Sortation*
- *Verification*
- *Part / no part*
- *Orientation*
- *Object character verification*
- *Recipe*
- *Measurement*

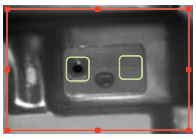
efector dualis solves a variety of error-proofing applications

efector dualis includes an image sensor, evaluation electronics and lighting integrated in a robust, industrially compatible housing. The sensor provides the correct amount of image brightness at close range. For longer distances, a backlight can be used. Setup is achieved via Ethernet interface and menu-guided PC parameter setting.

Part / no part

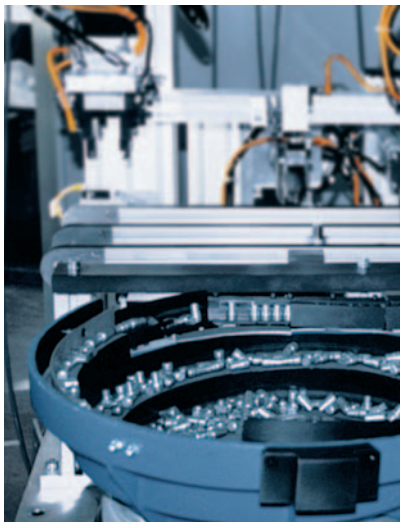


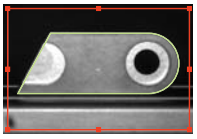
Hole present



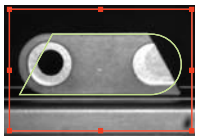
Hole missing

Orientation





Correct orientation



Incorrect orientation

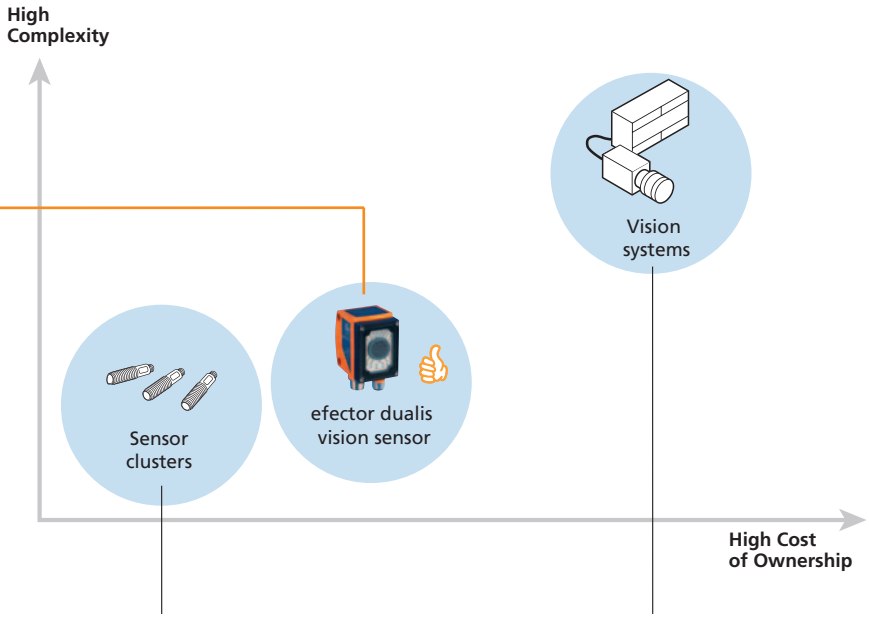
The power of a vision system with the simplicity of a sensor

efector dualis bridges the gap between sensor clusters and vision systems

The best of both worlds

The efector dualis CMOS vision sensor provides the simplicity of a standard sensor and the high performance of a vision system.

- Eliminates the added maintenance needed for sensor clusters.
- Provides a reliable alternative to high-end vision systems.
- Price-to-performance ratio allows the sensor to be used throughout a plant for error-proofing applications.



Challenge: Sensor clusters

Sensor clusters are the least expensive option, but cause problems when multiple devices are used for error-proofing.

Additional challenges:

- *Complex wiring*
- *Multiple mounting brackets*
- *Time-consuming installation*

Challenge: Vision systems

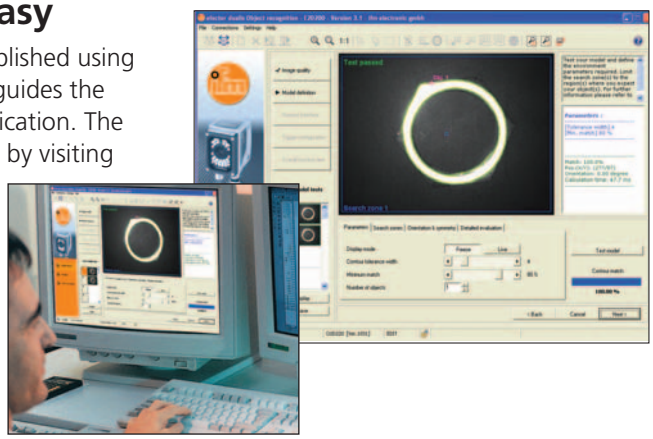
Visions systems offer high performance but are complex and often require vision specialists.

Additional challenges:

- *Additional computer processing power*
- *External lighting*
- *Integration that increases costs*

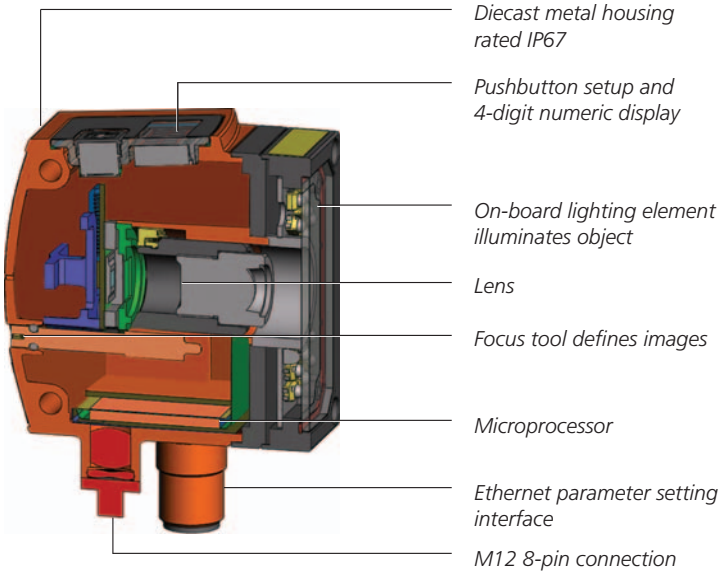
Minutes vs. hours
Setup Wizard makes it easy

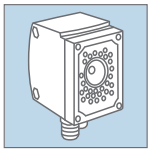
Application parameters are quickly established using the sensor's Setup Wizard. The Wizard guides the user in a few steps to configure an application. The software can be downloaded at no cost by visiting www.ifm.com/uk.



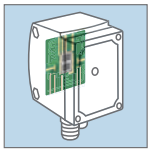
Reliable functionality with a new benchmark for performance and value

Robust industrial CMOS image sensor can withstand tough industrial applications

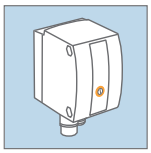




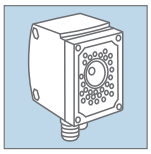
Robust housing
Robust design and compact metal housing provide long life and reliability in industrial environments.



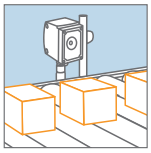
High performance
CMOS image sensor and Digital Signal Processor with no moving parts for durability.



Fast image capture
The efector dualis focus tool quickly defines images.



Integrated lighting
Integrated lighting provides the correct amount of image brightness at various ranges. For longer distances, a backlight can be used.

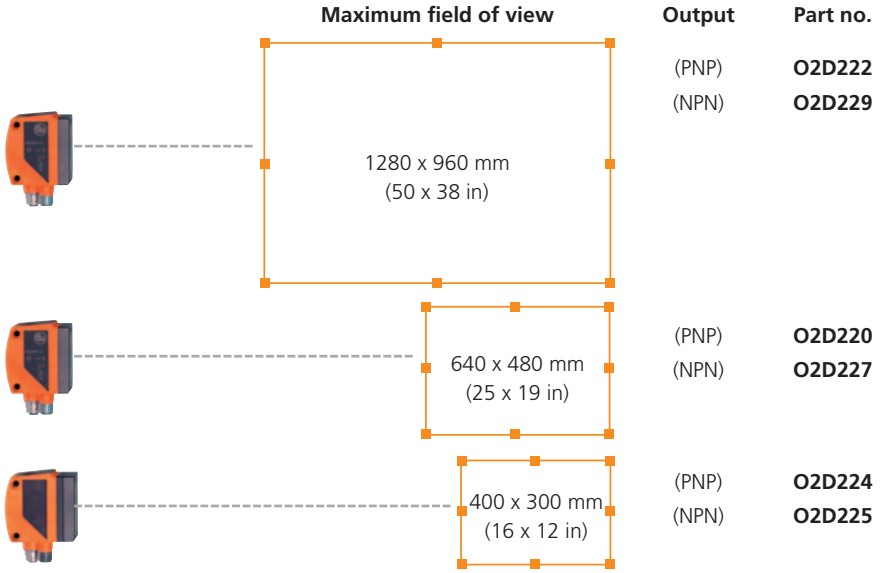


High speed
dualis can be applied in conveyor and dynamic applications with moving targets.

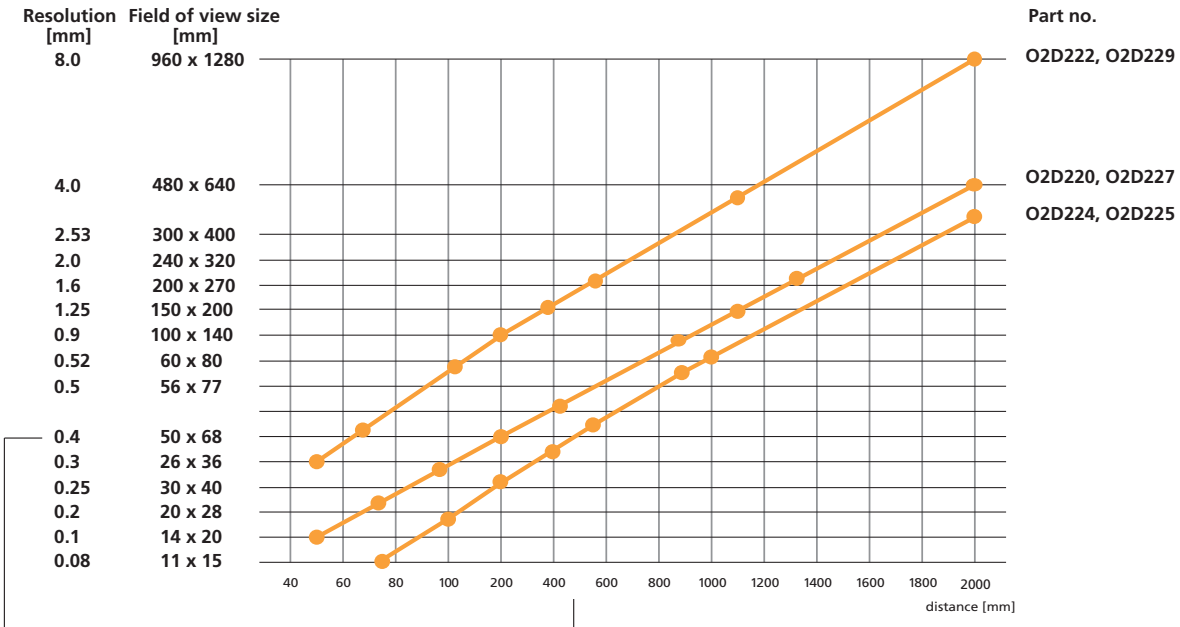
Easy setup
Easy application Setup Wizard guides you step-by-step with advanced functionality for demanding applications.

Flexible connection
Supports Allen-Bradley's Ethernet IP and standard Ethernet TCP products.

Select the optimum solution for your application



Selection Chart



Step 1

Define the necessary resolution for your application (the smallest change to the contour). Check whether the field of view size is sufficient (all search zones must be within this field of view size).

Step 2

The maximum distance to the object can be read from the intersection point with the horizontal black line. This allows you to determine the optimum solution for your application.

Example:
An 0.4 mm resolution and field of view of 50 x 68 mm can be accomplished at 200 mm with the 02D220.

Getting started: efector dualis can be setup in three easy steps

Required components:

A standard M12 8-pin cable is used for digital I/O and power.
Please see wiring diagram below.

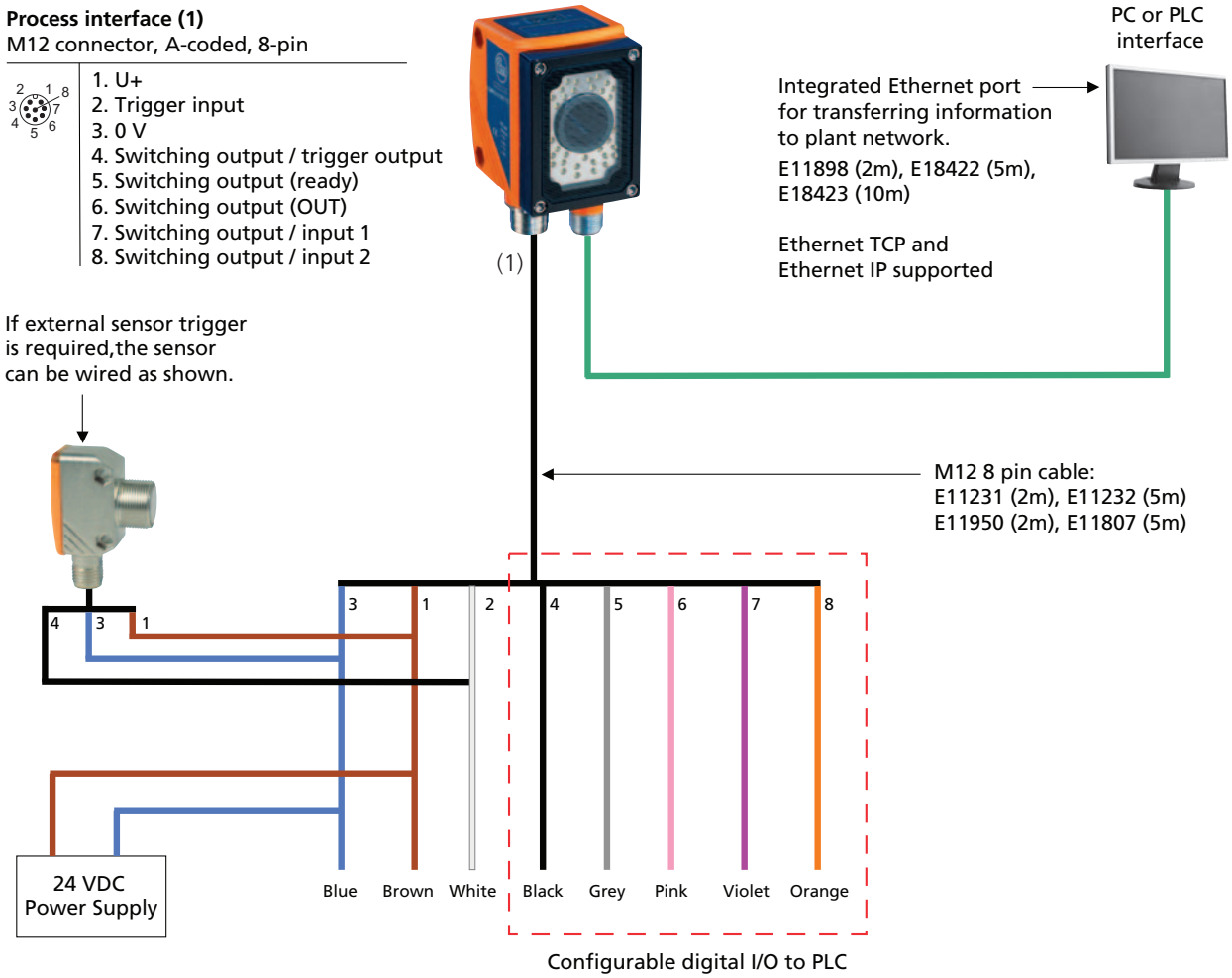
Ethernet cable and PC are required to configure the sensor

The default IP address is set to 192.168.0.049.
Please make sure that your PC is set to the same domain 192.168.0.xxx

The sensor is configured using the Object Parameterization Wizard Version 3.1.
http://www.ifm.com/ifmus/web/dualis_download.htm

1. Wire the sensor

The sensor can be setup as a standard digital device and/or transmit information via Ethernet port.



2. Focus the sensor

Simple adjustment focus tool captures component images quickly

It is important to have a focused image to obtain a good contour.
Simply adjust the focus tool on the back of sensor until the image is sharp.

3. Sensor setup

Five easy steps to setup an application

Step 1:
Set image quality

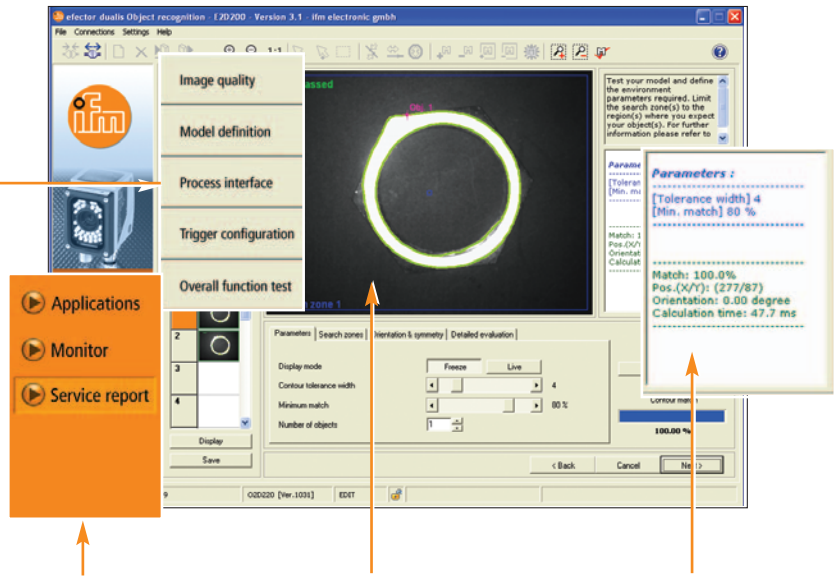
Step 2:
Define model

Step 3:
Configure process interface

Step 4:
Select trigger configuration

Step 5:
Perform overview function test

A typical software screen



Service Report Mode allows you to view the last pass and fail images that are stored in the camera.

Image display allows easy identification of the contours being evaluated.

Result window provides clear information on percentage pass, evaluation time, X and Y positional information, and orientation of the object.

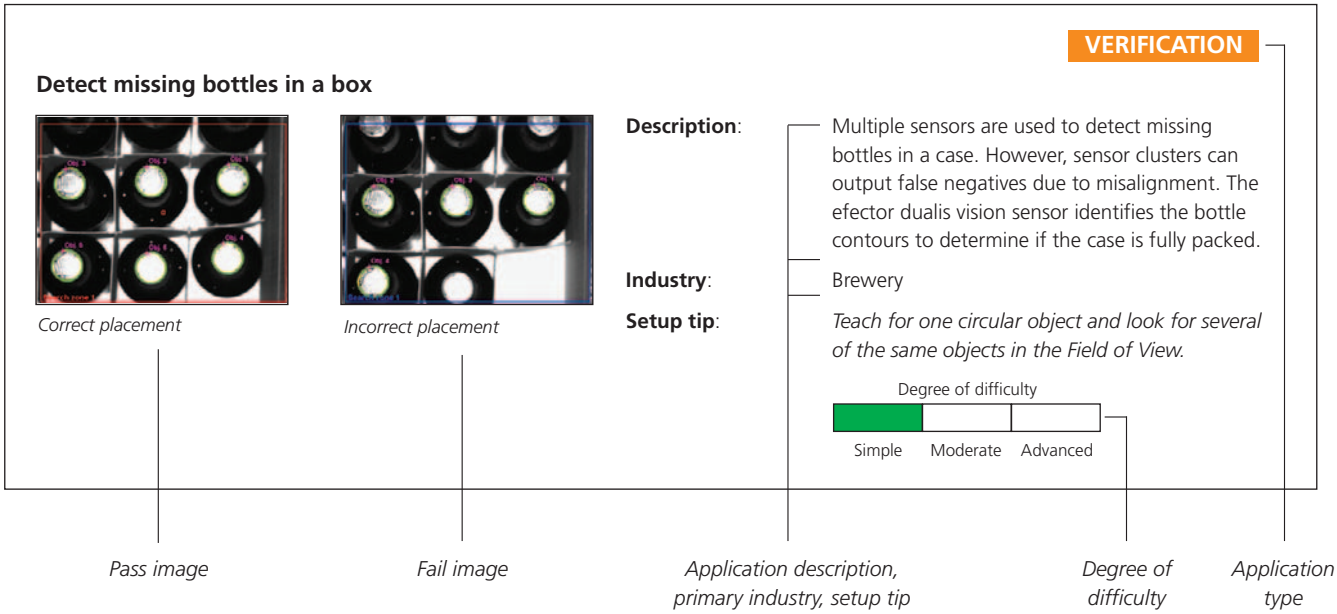
Proven success in solving a broad range of applications

The following pages list a broad range of error-proofing and inspection applications that the efector dualis vision sensor has had proven success in solving. These include verification, orientation, sortation, part / no part, recipe, object character verification and measurement.

The template below illustrates a typical application example that includes:

- Application type
- Pass / fail images
- Application description
- Primary industry
- Setup tip (where applicable)
- Degree of difficulty

Example of application template



Applications defined by "Degree of Difficulty"

Simple applications are indicated with a green bar and are typical error-proofing applications that require simple parameter setup. Setup time is less than 5 minutes.

Moderate applications are indicated with a yellow bar and may require some advanced parameter settings and mounting techniques. Setup time is less than 10 minutes.

Advanced applications are indicated with a red bar and will require advanced parameter settings. Setup time may take up to 30 minutes.

Setup Time

Less than 5 minutes

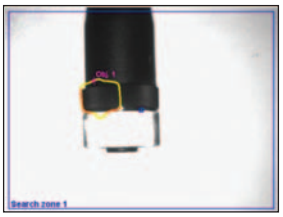
Less than 10 minutes

Up to 30 minutes

1. Sort connectors by knurled nuts and hex nuts

SORTATION

Correct nut



Incorrect nut

Degree of difficulty

Simple Moderate Advanced

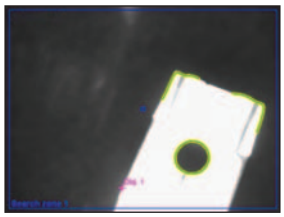
Description: In this application, connectors are being sorted by knurled nut or hex nut. Using the hex nut contour, the efector dualis vision sensor can differentiate between connector types.

Industry: Assembly automation

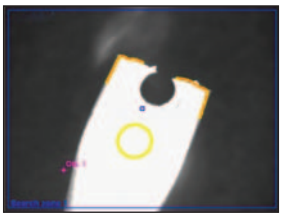
Setup tip: *The reflection on the side of the hex nut provides an easy contour to differentiate between hex or knurled nut.*

2. Verify correct position of punch-out on a steel rod

VERIFICATION



Correct part



Incorrect part

Degree of difficulty

Simple Moderate Advanced

Description: Verifying the correct punch-out position is imperative to the process. If left undetected, an improper crimp or punch-out position on a steel rod would lead to scrap metal. Here, the efector dualis vision sensor detects the incorrect part by comparing the punch-out contours.

Industry: Stamping

Setup tip: *Set a high exposure rate to wash out any stray or undesired contours.*

3. Proper orientation of washer fluid cap

ORIENTATION

Correct orientation

Incorrect orientation

Degree of difficulty

Simple Moderate Advanced

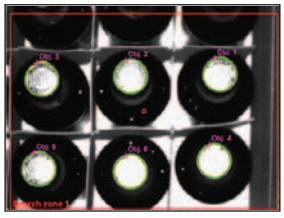
Description: Proper orientation (± 60 degrees) of the windshield washer fluid cap is required. If mistakes are found, all existing stock must be rechecked.

Industry: Automotive

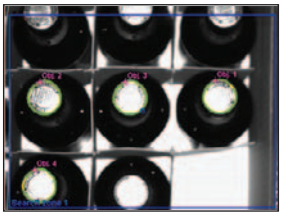
Setup tip: *Set the orientation setting to ± 60 degrees.*

4. Detect missing bottles in a box

VERIFICATION



Bottles detected



Bottle missing

Degree of difficulty

Simple Moderate Advanced

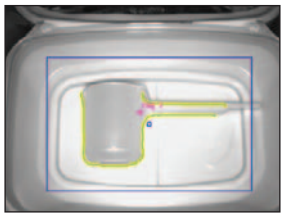
Description: Multiple sensors are used to detect missing bottles in a case. However, sensor clusters can output false negatives due to misalignment. The efector dualis vision sensor identifies the bottle contours to determine if the case is fully packed.

Industry: Brewery

Setup tip: *Teach for one circular object and look for several of the same objects in the Field of View.*

5. Verify correct position of scoop

VERIFICATION



Correct placement

Incorrect placement

Description: A powder scoop must be placed correctly in the container of powder or it will cause a puncture in the foil seal. The efector dualis vision sensor compares the scoop contour to determine the correct placement.

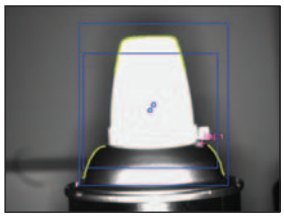
Industry: Food

Degree of difficulty

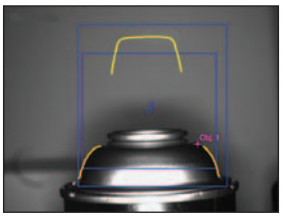
Simple Moderate Advanced

6. Identify cap on top of spray can

PART/NO PART



Part found



Part missing

Description: In this application, identifying missing components is performed manually at the plant. By automating this process with the efector dualis vision sensor, spray caps are verified leading to efficiency and cost savings.

Industry: Food

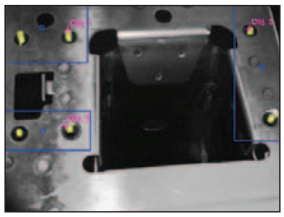
Setup tip: *Use anchor points such as the container itself to locate the top of the cap.*

Degree of difficulty

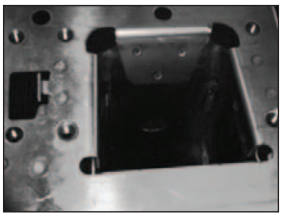
Simple Moderate Advanced

7. Identify weld nuts and studs on a truck panel

PART/NO PART



Part found



Part missing

Description: Detecting the presence of weld nuts and studs on a truck panel is important to the assembly process. The efector dualis vision sensor is programmed to identify six indentations on the panel to confirm part found.

Industry: Automotive

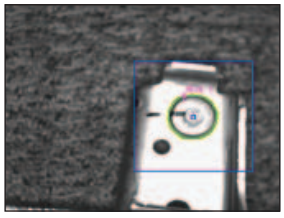
Setup tip: *Reflections within the holes enable the sensor to confirm that the weld nuts and studs are present.*

Degree of difficulty

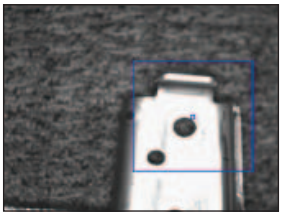
Simple Moderate Advanced

8. Identify welded washer on a part

PART/NO PART



Part found



Part missing

Description: In this application, the contour of a circular washer is detected on a part. When the circular contour is not detected, the part is determined missing.

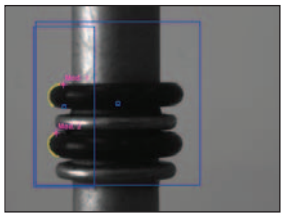
Industry: Automotive

Degree of difficulty

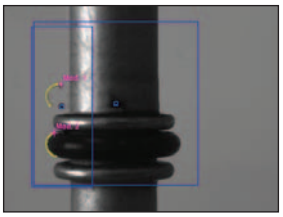
Simple Moderate Advanced

9. Identify presence of two O-rings

PART/NO PART



Part found



Part missing

Degree of difficulty

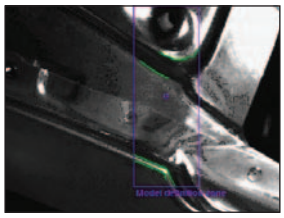
Simple Moderate Advanced

Description: Two O-rings are required on a brake line. By identifying the side contour of the O-rings, the efector dualis vision sensor can determine whether both parts are present.

Industry: Automotive

10. Verify alignment of a car panel and windshield

VERIFICATION



Correct placement

Incorrect placement

Degree of difficulty

Simple Moderate Advanced

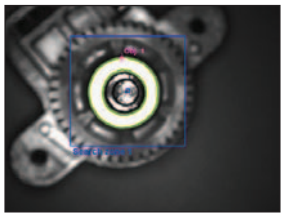
Description: To verify that a car panel and windshield header are aligned correctly before welding, the placement contour is detected. If misaligned, the whole car must be scrapped.

Industry: Automotive

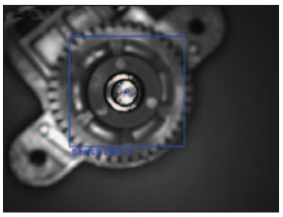
Setup tip: *Using simple contours, the sensor can be used for relative measurements. If the panel is aligned correctly, the distances between the contours are correct. Any misalignment results in a different distance or orientation of the contours.*

11. Identify presence of a washer on a gear shaft

PART/NO PART



Part found



Part missing

Degree of difficulty

Simple Moderate Advanced

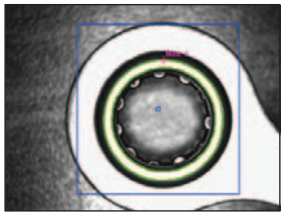
Description: The efector dualis vision sensor identifies the presence of a washer on a gear shaft. The circular contour is detected in the sensor's field of view.

Industry: Automotive

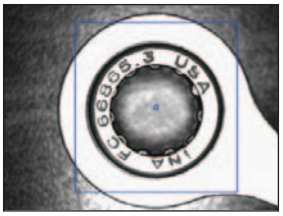
Setup tip: *The washer has a shiny surface which allows for a very defined contour.*

12. Verify correct orientation of inner bearing

ORIENTATION



Correct orientation



Incorrect orientation

Degree of difficulty

Simple Moderate Advanced

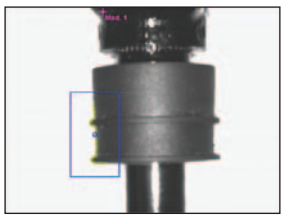
Description: The correct orientation of the inner bearing is critical to the process. If the bearing is oriented incorrectly, this will lead to engine failure. The efector dualis vision sensor can easily identify the orientation by detecting the bearing pattern.

Industry: Automotive

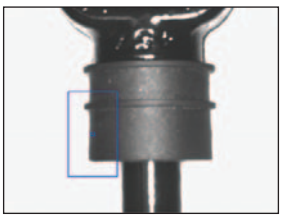
Setup tip: *Teach for the different widths of the bearing.*

13. Detect correct orientation of steering gear

ORIENTATION



Correct orientation



Incorrect orientation

Degree of difficulty

Simple Moderate Advanced

Description: The correct orientation of the steering gear is critical to the assembly process. If the part is assembled incorrectly, the gear will be scrapped and existing stock will be rechecked. By identifying the side contour of the gear, the proper position is confirmed.

Industry: Automotive

14. Sort the correct clamp and screw type

SORTATION

Correct part

Incorrect part

Degree of difficulty

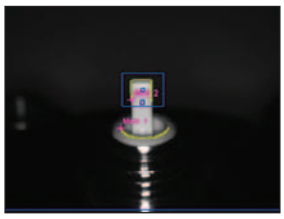
Simple Moderate Advanced

Description: In this application, different types of clamps and screws must be sorted. A high-end camera system was originally used for this application, but required vision specialists and additional computer processing power. The efector dualis vision sensor easily sorts the parts by identifying the contour of the screw.

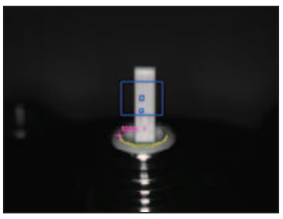
Industry: Automotive

15. Verify the correct depth of an air sensor

VERIFICATION



Correct placement



Incorrect placement

Degree of difficulty

Simple Moderate Advanced

Description: An air sensor assembly used on an automotive AC unit must be inserted to a specific depth or risk failure of the component. The correct depth of the air sensor is detected within the efector dualis vision sensor's field of view.

Industry: Automotive

Setup tip *Use an anchor point to determine correct distance.*

16. Identify the correct orientation of a symbol

ORIENTATION

Correct orientation

Incorrect orientation

Degree of difficulty

Simple Moderate Advanced

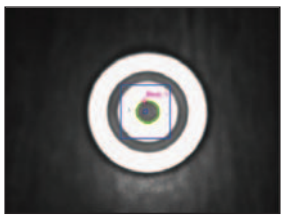
Description: Small components can easily rotate in the wrong position during the assembly process. The efector dualis sensor can quickly verify the correct orientation of locking symbols on a car door.

Industry: Automotive

Setup tip *Use "most similar model" logic to define the possible orientations.*

17. Detect position of a key in a valve engine

VERIFICATION



Correct part

Incorrect part

Degree of difficulty

Simple Moderate Advanced

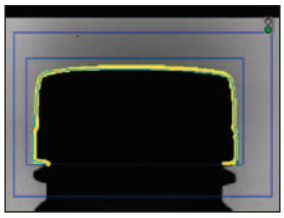
Description: A laser was used to detect a key that was inserted into an engine valve spring. When the laser detected the key seams, it provided a false negative. As a more reliable alternative, the efector dualis vision sensor can identify the key and ignore the seams that can cause false signals.

Industry: Automotive

Setup tip: *Unfocus the image so that the seams are not shown.*

18. Confirm bottle cap is sealed correctly

VERIFICATION



Correct placement

Incorrect placement

Degree of difficulty

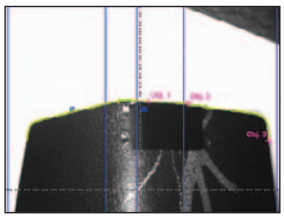
Simple Moderate Advanced

Description: Using the contour of a bottle cap, the correct placement of a bottle cap is verified.

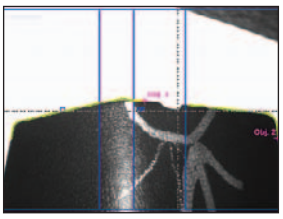
Industry: Food

19. Verify edges on a plastic molded part

VERIFICATION



Correct part



Incorrect part

Degree of difficulty

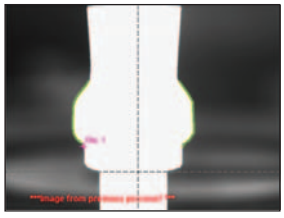
Simple Moderate Advanced

Description: Quality control is a challenge with plastic injection molded parts. This process was a manual inspection and parts had been shipped with incomplete edges. As an alternative, the efector dualis vision sensor can identify an incorrect part by matching the contour of the part's edge.

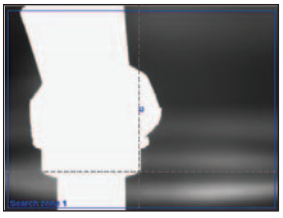
Industry: Automotive

20. Verify correct installation of dental scrubber

VERIFICATION



Correct placement



Incorrect placement

Degree of difficulty

Simple Moderate Advanced

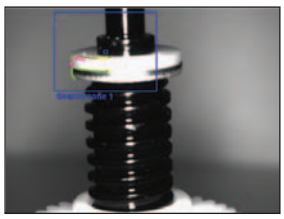
Description: In this application, dental scrubbers are monitored for correct installation. If the scrubber is installed incorrectly, the non-matching contour indicates incorrect placement.

Industry: Assembly automation

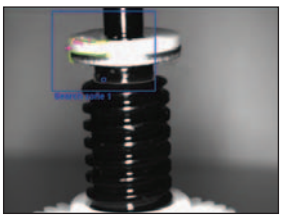
Setup tip: *Set high exposure rate*

21. Verify correct order of washers on a gear shaft

VERIFICATION



Correct placement



Incorrect placement

Degree of difficulty

Simple Moderate Advanced

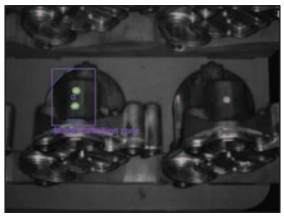
Description: To verify that the correct order of washers are placed on a gear shaft, the unique features of the washer sequence are compared.

Industry: Automotive

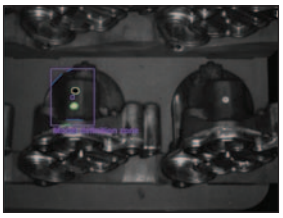
Setup tip: *Width of the first washer is thicker than the second. "Teach" the width of the first washer.*

22. Verify same type of filters on pallet

VERIFICATION



Correct part



Incorrect part

Degree of difficulty

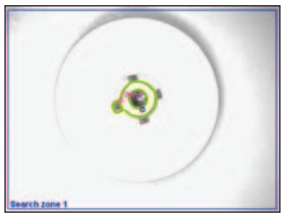
Simple Moderate Advanced

Description: Automotive filters are packaged on a pallet. Differences are marked by the number of white dots on each filter. If wrong parts are sent, the whole pallet can shipped back. The efector dualis vision sensor can identify incorrect filters by detecting a missing dot in its field of view.

Industry: Automotive

23. Identify presence of washers and pins

PART/ NO PART



Correct part

Incorrect part

Degree of difficulty

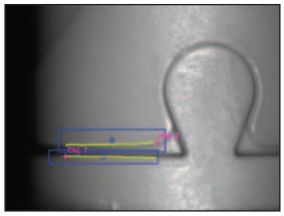
Simple Moderate Advanced

Description: To determine if washers and pins are correctly installed, the washer contour and pin contour are matched to confirm the correct part is in place.

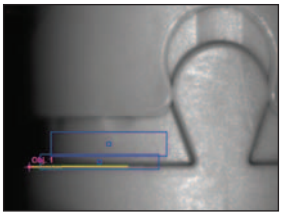
Industry: Assembly Automation

24. Verify that a cap is fully seated

VERIFICATION



Correct placement



Incorrect placement

Degree of difficulty

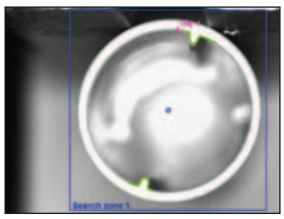
Simple Moderate Advanced

Description: In the assembly process, proper seating of a part is essential to the process. If a cap is not properly seated, the rest of the assembly process will be adversely affected. The efector dualis vision sensor can verify that a cap is fully seated by detecting the unique features of its position.

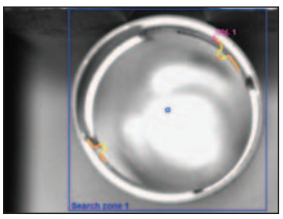
Industry: Assembly Automation

25. Verify correct orientation of cap

ORIENTATION



Correct orientation



Incorrect orientation

Degree of difficulty

Simple Moderate Advanced

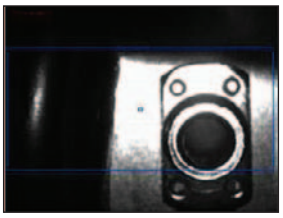
Description: To determine the correct orientation of housing cap, its circular contour is matched. If the cap is installed upside down, it will damage the next installed component.

Industry: Assembly Automation

26. Verify correct alignment of part

VERIFICATION

Correct placement



Incorrect placement

Degree of difficulty

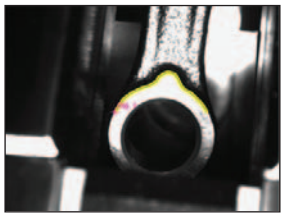
Simple Moderate Advanced

Description: Prior to the welding process, components must be aligned properly. The efector dualis vision sensor can detect the correct orientation of a part by comparing contours.

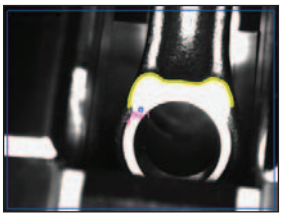
Industry: Automotive

27. Identify correct piston rods

SORTATION



Correct part #1



Correct part #2

Degree of difficulty

Simple Moderate Advanced

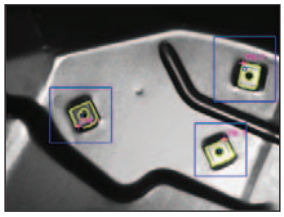
Description: Verifying the difference between two types of piston connecting rods can be achieved by programming two contour styles in the sensor's field of view.

Industry: Automotive

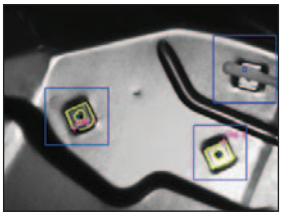
Setup tip: *Create two different models and use the "most similar model" logic to detect the best match.*

28. Identify clips on a panel

PART/ NO PART



Part found



Part missing

Degree of difficulty

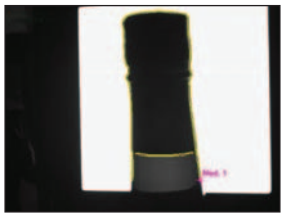
Simple Moderate Advanced

Description: In this application, three body clips are positioned on a panel. By monitoring the contours of multiple clips, the missing parts are identified.

Industry: Assembly Automation

29. Verify placement of label

VERIFICATION



Correct placement

Incorrect placement

Degree of difficulty

Simple Moderate Advanced

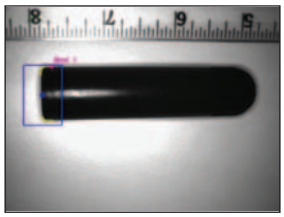
Description: Verifying that a wine label is applied to a bottle is easily achieved by matching the contour of the label.

Industry: Packaging

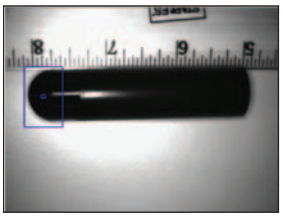
Setup tip: *Requires the use of a backlight*

30. Correct orientation of a part

ORIENTATION



Correct orientation



Incorrect orientation

Degree of difficulty

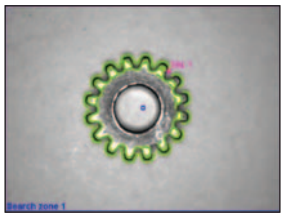
Simple Moderate Advanced

Description: If a part is positioned only millimeters in the wrong direction, the assembly process will be affected. By detecting that the part is within the sensor's field of view, the correct orientation is confirmed.

Industry: Assembly Automation

31. Sort gears by pitch and teeth

SORTATION



Correct pitch and teeth

Incorrect pitch and teeth

Degree of difficulty

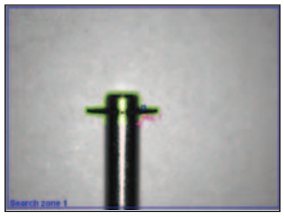
Simple Moderate Advanced

Description: The efector dualis sensor can sort the difference between a 24-pitch gear with 16 teeth compared to 32-pitch gear with 20 teeth.

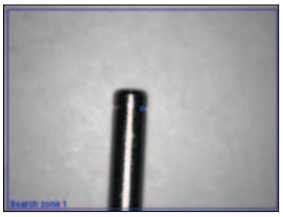
Industry: Assembly Automation

32. Identify presence of an E-clip on a pin

PART/ NO PART



Correct placement



Incorrect placement

Degree of difficulty

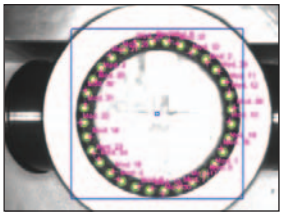
Simple Moderate Advanced

Description: The goal of this application is to determine the correct placement of an E-clip on the shaft of a metal pin. The E-clip's unique features are verified and the correct placement is confirmed.

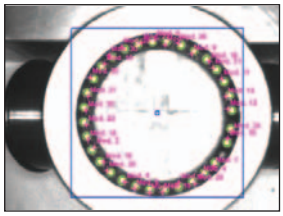
Industry: Assembly Automation

33. Detect the correct number of needle bearings

PART/NO PART



Part found



Part missing

Degree of difficulty

Simple | Moderate | Advanced

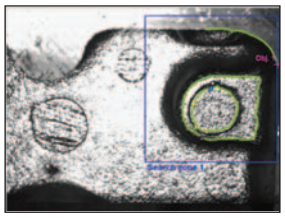
Description: The correct amount of needle bearings is critical to the steering operation. If one bearing is missing, it will lead to malfunction of the system. A high-end camera was used and required extensive programming. As an alternative, the efector dualis vision sensor can find the correct amount of bearings with minimal configuration.

Industry: Automotive

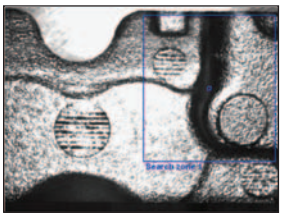
Setup tip: *The taught model is one bearing and a parameter is set to find 32 identical models in the field of view. Unfocus the image to provide clean needle bearing contours.*

34. Correct orientation on engine head

ORIENTATION



Correct orientation



Incorrect orientation

Degree of difficulty

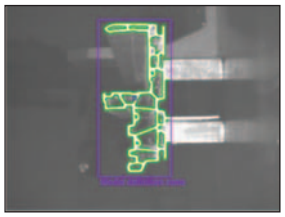
Simple | Moderate | Advanced

Description: If an engine head is not oriented correctly, it will cause a tool crash in a down-the-line process. To verify the correct orientation, the unique features of an engine head are matched.

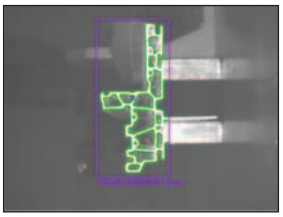
Industry: Automotive

35. Verify that the correct profile has been loaded

RECIPE



Correct profile



Incorrect profile

Degree of difficulty

Simple | Moderate | Advanced

Description: In this example, 15 different vinyl window profiles can be loaded into the machine. The efector dualis vision sensor is used to verify that the correct recipe has been loaded in the machine.

Industry: Window manufacturing

Setup tip: *Use the contour smoothing adjustment to make edges more defined.*

36. Verify that a date code is printed on an object

OBJECT CHARACTER VERIFICATION

Code detected

Code not found

Degree of difficulty

Simple | Moderate | Advanced

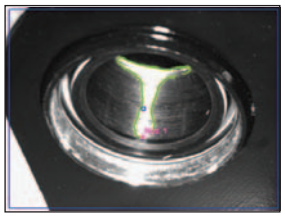
Description: A legible date code is required on all shipped products. If one unit is found to have a missing date code, the whole container must be shipped back. The efector dualis vision sensor can detect and match the contours of characters.

Industry: Food

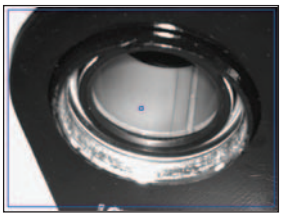
Setup tip *Must use an external white spot light due to different color prints.*

37. Identify seal in a shock absorber

PART/NO PART



Correct part



Incorrect part

Degree of difficulty

Simple Moderate Advanced

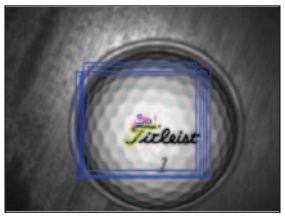
Description: Detecting a seal within a shock absorber is essential to the assembly process. By matching the contour, the correct part is confirmed.

Industry: Automotive

Setup tip *Use the reflection of the shiny surface to detect if a part is missing. Object and sensor must always be in the same position to insure that the reflection is consistent.*

38. Sort golf balls by brand names

SORTATION



Correct brand

Incorrect brand

Degree of difficulty

Simple Moderate Advanced

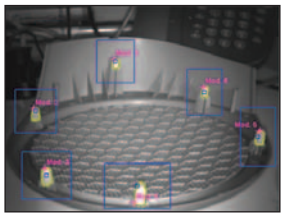
Description: Multiple golf ball brands are required to be sorted on the machine. Within the field of view, the characters of a logo can be verified and then sorted.

Industry: Assembly automation

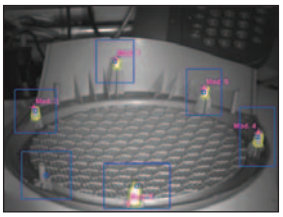
Setup tip: *Multiple models must be setup in the Wizard with the various brands of golf balls.*

39. Detect broken speaker tab after molding process

VERIFICATION



Correct part



Incorrect part

Degree of difficulty

Simple Moderate Advanced

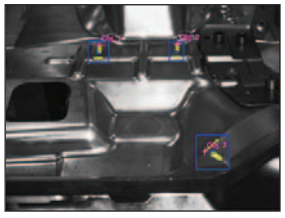
Description: In this application, laser sensors were used to detect broken speaker tabs after the molding processes. Any slight movement in the speaker fixtures would cause false negatives. As an alternative, the efector dualis vision sensor is applied, providing improved reliability.

Industry: Automotive

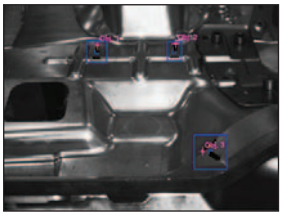
Setup tip: *Create multiple models for each speaker tab.*

40. Detect copper studs on truck panel

PART/ NO PART



Part found



Part missing

Degree of difficulty

Simple Moderate Advanced

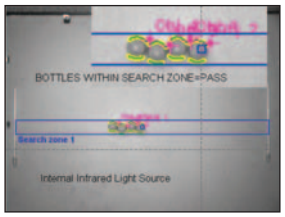
Description: The original system used prox sensors for the detection of copper studs on a truck firewall panel. This proved to be unreliable and difficult to change out when a sensor failed.

Industry: Automotive

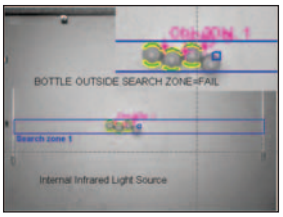
Setup tip: *Use an anchor point to determine correct distance.*

41. Verify the alignment of missing contact lens bottle

VERIFICATION



Correct placement



Incorrect placement

Description: Verify the alignment or missing contact lens bottles to within 1/8" tolerance.

Industry: Pharmaceuticals

Setup tip: *The search zone must be defined carefully to meet the 1/8" tolerance.*

Degree of difficulty

Simple Moderate Advanced

42. Verify that part is fully threaded

VERIFICATION

Correct part

Incorrect part

Description: Quality control for thread detection on the part is essential to the process. The number of threads can be verified by matching the contour threads.

Industry: Automotive

Setup tip: *Reduce the contour smoothing setting to help define the thread.*

Degree of difficulty

Simple Moderate Advanced

43. Confirm cap is assembled correctly

VERIFICATION

Correct placement

Incorrect placement

Description: In this application, a more expensive camera was used to determine if a clear plastic cap was assembled correctly on the cylinder body to within ±1 degree tolerance. The efector dualis vision sensor was a better alternative to solve the application by using contour matching.

Industry: Assembly automation

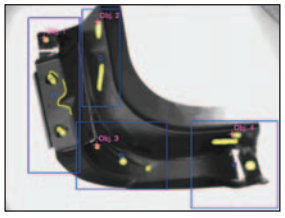
Setup tip: *The use of a red spot light created a uniform contrast on the clear plastic.*

Degree of difficulty

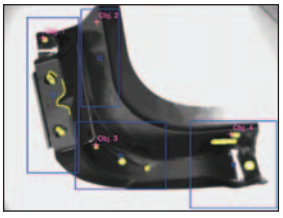
Simple Moderate Advanced

44. Verify part has been manufactured correctly

VERIFICATION



Correct part



Incorrect part

Description: To verify that the molded plastic part has been manufactured with the correct number of holes and inserts, the part's unique features are compared.

Industry: Injection molding

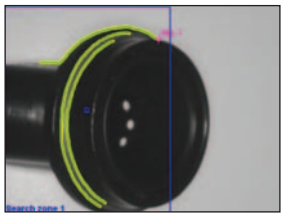
Setup tip *The sensor is mounted 22 inches away in order to see the whole part. Four models are created to verify each zone of interest.*

Degree of difficulty

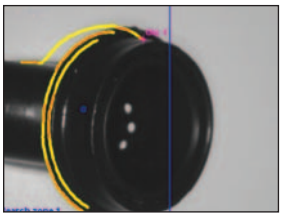
Simple Moderate Advanced

45. Verify presence of O-ring

PART/NO PART



Part found



Part missing

Degree of difficulty

Simple Moderate Advanced

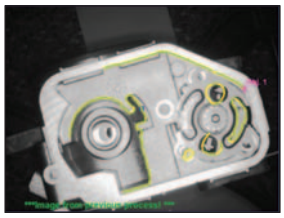
Description: Determine the presence of a brown O-ring by comparing its double-edged contour.

Industry: Assembly Automation

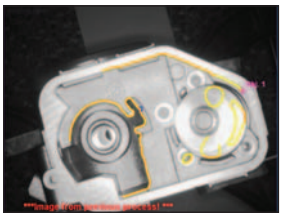
Setup tip *Mount the sensor at a slight angle in order to emphasize the contrast of the O-ring.*

46. Verify motor is installed correctly on throttle body

VERIFICATION



Correct placement



Incorrect placement

Degree of difficulty

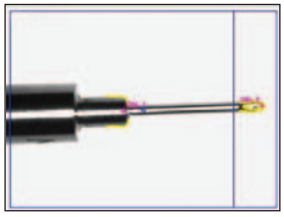
Simple Moderate Advanced

Description: To verify that the motor assembly has been correctly installed on the throttle body, the efector dualis vision sensor compares its unique features. If not installed correctly, this can lead to a non-functioning motor.

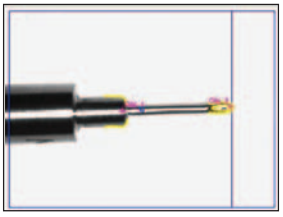
Industry: Automotive

47. Measure needle length

MEASUREMENT



Correct length



Incorrect length

Degree of difficulty

Simple Moderate Advanced

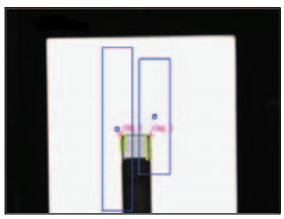
Description: In this application, the needle length is measured to maintain quality control. The correct needle length is identified in the sensor's field of view.

Industry: Pharmaceuticals

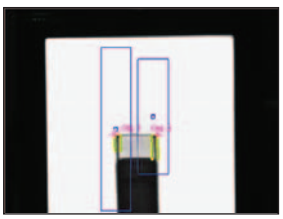
Setup tip *Using the X-Y coordinates from the two objects, the needle lengths can be measured.*

48. Measure width of test tubes

MEASUREMENT

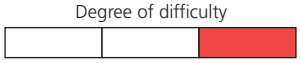


Correct width



Incorrect width

Degree of difficulty



Simple Moderate Advanced

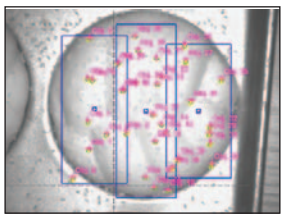
Description: To differentiate between 13 mm and 16 mm wide test tubes, efector dualis vision sensor compares two unique features.

Industry: Robotics

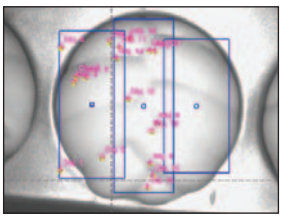
Setup tip *Using the X-Y coordinates from the two objects, the test tube widths can be measured.*

VERIFICATION

49. Count number of seeds on a hamburger bun



Correct number



Incorrect number

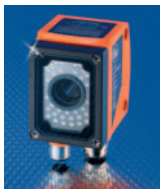
Degree of difficulty

Simple Moderate Advanced

Description: Counting the number of sesame seeds on a fast food bun can be achieved by creating three zones. Below a certain tolerance, the bun will be rejected.

Industry: Food

Setup tip: *Create 3 zones of interest and set the minimum number of models that need to be found.*



efector dualis Vision Sensor selection guide

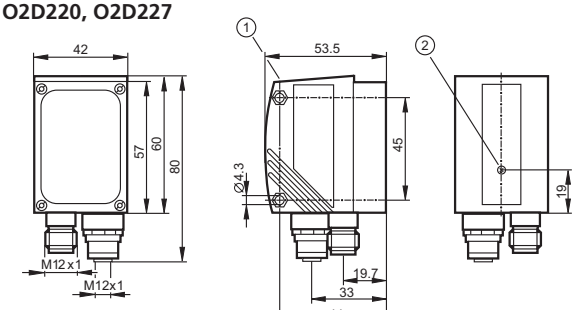
Max. Field of View Size	Min. Field of View Size	Max. Resolution	Min. Resolution	Max. Distance	Min. Distance	Output	Part No.
1280 x 960 mm (50 x 38 in)	46 x 32 mm	8.0 mm	0.3 mm	2000 mm	50 mm	PNP	**O2D222**
		8.0 mm	0.3 mm	2000 mm	50 mm	NPN	**O2D229**
640 x 480 mm	20 x 14 mm	4.0 mm	0.1 mm	2000 mm	50 mm	PNP	**O2D220**
		4.0 mm	0.1 mm	2000 mm	50 mm	NPN	**O2D227**
400 x 300 mm	15 x 11 mm	2.53 mm	0.08 mm	2000 mm	75 mm	PNP	**O2D224**
		2.53 mm	0.08 mm	2000 mm	75 mm	NPN	**O2D225**

efector dualis Technical Specs

Maximum load current:	100 mA (per switching output)
Supply current:	< 300 mA
Detection rate:	20 Hz
Maximum motion speed:	1 m/s
Lighting:	infrared 850 nm
Operating voltage:	24 VDC ± 10 %
Short-circuit protection, pulsed:	Yes
Reversed polarity, overload protection:	Yes
Operating temperature:	14…122 °F (-10…50 °C)
Protection:	IP 67, III
Material:	Housing: die-cast zinc, Front pane: glass, LED window: polycarbonate
Trigger mode:	External 24 V PNP, continuous TCP/IP
Switching outputs:	100 mA per output
Connection external lighting:	24 V DC PNP
Parameter setting:	Ethernet 10 Base-T
Process data interface:	Ethernet TCP Ethernet IP
Wiring diagram:	See page 6

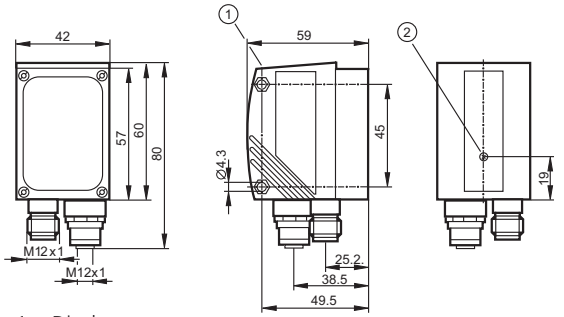
Dimensions (mm)

O2D222, O2D229
O2D220, O2D227



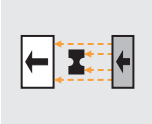
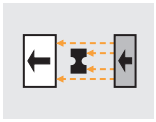
1 = Display
2 = Focus setting

O2D224, O2D225



1 = Display
2 = Focus setting

Optional Lighting

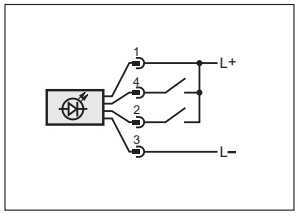
	Function	Dimensions [mm]	Illuminated Area [mm]	Connection	Current Consumption (mA)	Part No.
Backlight · infrared 880 nm						
		34.4 x 66.5 x 9.2	25 x 25	Cable w/ M12 connector	50* / 25**	**O2D906**
		81 x 103 x 9.8	50 x 50	Cable w/ M12 connector	200* / 100**	**O2D907**
		133 x 156 x 9.8	100 x 100	Cable w/ M12 connector	450* / 250**	**O2D908**
Spot light · transmitter red light 630 nm						
		42 x 54 x 31	–	M12 connector	180*/90**	**O2D909**

*Continuous operating mode **High intensity operating mode

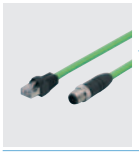
Lighting Technical Specs

Supply voltage:	24 VDC ±10%
Reverse polarity protection:	Yes
Overload protection:	Yes
Temperature protection:	Yes
Housing material:	Aluminum
Lens material:	PMMA
Ambient temperature:	0…50 °C
Protection:	IP 65
LED display:	Status: yellow Power: green Excess temp: red

Wiring for lighting



Cordsets and accessories for efector dualis vision sensor

Type	Description	Part No.
	M12 Micro DC (8-pin) 2 m, PUR	**E11231**
	M12 Micro DC (8-pin) 5 m, PUR	**E11232**
	M12 Micro DC (8-pin) 2 m, PUR	**E11950**
	M12 Micro DC (8-pin) 5 m, PUR	**E11807**
	Ethernet cable, 2 m, M12 D-coded / RJ45, cross-link	**E11898**
	Ethernet cable, 5 m, M12 D-coded / RJ45, cross-link	**E18422**
	Ethernet cable, 10 m, M12 D-coded / RJ45, cross-link	**E18423**
	Mounting Set, 100 mm rod	**E2D110**
	Mounting Set, 100 mm rod with rail mount cube	**E20938**
	Glass protective lens	**E21168**
	Plastic protective lens for food and beverage applications	**E21166**
	Plastic lens for diffusing light	**E21165**

Cordsets for lighting

	M12 Micro DC (4-pin) 2 m, PUR	**EVC001**
	M12 Micro DC (4-pin) 5 m, PUR	**EVC002**

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- Flow sensors
- Pressure sensors
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