Vision sensors for recognition and assessment of objects and scenes.
Competence in application-specific solutions. The right choice is decisive.

Object recognition type O2D

Object inspection type O2V

Identification type O2I

Three-dimensional object recognition type O3D

Compare contours

Count pixels

Read codes

Detect dimensions
<table>
<thead>
<tr>
<th>Feature</th>
<th>Object recognition</th>
<th>Object inspection</th>
<th>Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>No colour contrast to the background</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objects smaller than 1 cm²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable shape</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Moving objects, variable orientation and position</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Moving 1D and 2D codes, variable orientation and position</td>
<td></td>
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</tr>
</tbody>
</table>

For objects with defined geometry.
For assessment of presence and completeness, for position detection and for sorting tasks.
Use for quality assurance in assembly automation and on machine tools.

For objects and scenes with variable features.
For optical level monitoring, for full / empty monitoring and fault and hole recognition.
Use for quality assurance in assembly automation and on packaging machines.

For 1D and 2D codes.
For monitoring processes in industrial automation.
Use in product tracking, control and identification.

For the three-dimensional detection of objects and scenes using the time of flight measurement.
For the assessment of level, distance and volumes.
Use in conveying and packaging technologies.
Flexible:
Orientation-independent contour verification. 32 scenes with up to 24 different objects can be saved in the unit.

Reliable:
The sensor reliably detects the defined geometries at close and long range even with changing lighting conditions or backgrounds.

Safe:
Password protection against unauthorised access.

Everything at a glance:
Variants with different viewing angles for different field of view sizes in direct illumination or backlighting method.

Light:
Integrated and / or external illumination.

Everything documented:
Extensive service options with statistics file and image tank.
Object recognition for assembly, production and quality control.

With an intuitive step-by-step interface and good / bad parts the user can simply create a model of the object to be recognised. The recognition software compares the object with the stored ideal, regardless of orientation, and transmits the results (good or bad, position, orientation) to the higher-level PLC. The sensor can manage up to 32 separate tasks with a maximum of 24 models each.

In the photo on the left the contour sensor checks the correct diameter of the wheel nut drills on a brake disk.

Presence monitoring in automated assembly: In this application, three body clips are positioned on a panel. By monitoring the contours of several clips, the missing parts are identified. Applications that otherwise could only be solved using several photoelectric sensors can now easily and reliably be adjusted and controlled by means of only one system.

The O2D vision sensor checks the correct position of small parts on automated feeders, e.g. vibratory conveyers, bad parts are rejected.

Monitoring presence or completeness for assembly steps carried out manually or by machine. The choice is yours: Field of view sizes of 14 x 20 mm to 960 x 1280 mm for a large range of applications from fine to rough processes. Objects can also be detected irrespective of the position like the clip in this example.

Extremely flat backlights with an overall height of just 9.2 mm

Further information at www.ifm.com/gb/object-recognition
Flexible:
Extensive assessment parameters for a reliable object inspection by means of variable features. 32 scenes with up to 24 different objects can be saved in the unit.

Everything at a glance:
Variants with different viewing angles for different field of view sizes.

Safe:
Password protection against unauthorised access.

Everything documented:
Data logger with fault memory.

Whereas common vision sensors check parts on the basis of defined contours (like the contour sensor O2D) the new O2V pixel counter compares on the basis of variable features.

The pixel counter checks the presence or position of weld seams, weld spots or areas that went blue in variably degrees due to the high welding temperature. Even irregularly applied materials such as glues or greases are detected.
Object inspection for packaging, production and quality control.

Instead of a defined contour the user determines relative features used by the sensor to assess an object or a scene. Within freely selectable tolerances the sensor determines features such as area, size, roundness or compactness of an object.

Furthermore, the grey-scale values can also be used for assessment. The O2V vision sensor is reliably used for the full/empty control of transport and production vessels.

The photo on the left, for example, shows a 100 % empty control of a chocolate mould.

The vision sensor checks the presence of adhesive labels or imprints, such as production or best before date. The sensor also reliably detects colour marks such as mounting points or defect marks – applied by machine or by hand.

Dual-sheet detection for automated gripper systems as is frequently used in the automotive industry is just as possible as the counting of sheets or fastening clips. Due to their varying reflections it is difficult to represent them by means of a contour.

Further information at www.ifm.com/gb/object-inspection
Flexible:
Orientation-independent reading of 1D and 2D codes.

Versatile:
The sensor recognises more than 20 different code types.

Intelligence in the sensor:
Code comparator system integrated into the sensor.
This reduces data transmission.

Everything at a glance:
Variants with different viewing angles for different field of view sizes.

High reading reliability:
Automatic setting of the exposure time, adaptation by segmented illumination for critical surfaces.

Easy installation:
Setting aid by means of a laser pointer.

Multicode reader type O2I
Reliable identification of 1D and 2D codes.

Powerful identification.
In addition to the Data Matrix code ECC200, the ifm multicode reader handles further 2D and 1D codes. Reading is not dependent on the orientation of the code to the sensor. Even damaged or soiled codes are reliably identified, even if 28% of the information has been damaged.

The compact unit is installed using the suitable mounting set and connected to the controller (PLC) via the process interface. Parameter setting is done via an Ethernet cable using a common PC.
Identification for industrial automation.

The professional software of the multicode reader takes the high reading reliability of the Data Matrix code to a new dimension. Top choice for price / performance: The multicode reader provides high functionality and performance at the price of a sensor.

A wide range of applications.
There is a wide range of applications for the multicode reader in industry. Its applications include product tracking, product control and product identification.

Optimum illumination.
In addition to an automatic exposure setting, manual adjustment is also possible. Four illumination segments can be deactivated and activated manually. So optimum results are achieved even with highly reflective metal surfaces.

Mini format or difficult surfaces:
Reliable identification of standardised 1D and 2D codes – printed, engraved by laser or dot-peened onto a metal surface.

Control of solar module production at Conergy AG: The decision in favour of the multicode reader was made due to its high reading rate. The compact dimensions and integrated illumination ensure installation requiring very little space.

Further information at www.ifm.com/gb/multicodereader
Distance:
With the 3D sensor, the measurement of distances from irregular surfaces is no longer a challenge. 3072 precise distance values replace a multitude of standard photoelectric sensors.

Award winning:
The first industrial 3D sensor that detects objects in three dimensions at a glance. The sensor operates on the principle of time of flight measurement based on PMD technology.

Precise:
The resolution of 64 x 48 pixels results in 3072 distance values per measurement for the detailed assessment of the application.

Independent:
Illumination, time of flight measurement and evaluation are integrated into an industrially compatible housing.

Easy:
Switching outputs and analogue outputs for the simple integration into the control environment.

Far sight:
Range up to 6.5 m, robust against extraneous light.
**Three-dimensional object recognition for conveying and packaging technologies.**

**efector pmd 3d** also is a clever alternative to ultrasonic sensors, optical distance sensors or laser scanners.

In the application example on the left a missing bottle in the crate triggers a switching signal.

**Volume:** Irrespective of the distance between sensor and object, efector pmd 3d determines the volume of any object. The sensor moreover enables subdivision of the field of view into separate windows. Areas of no interest can be ignored and relevant areas can be inspected in detail. Up to 64 windows can be monitored for the same adjustable threshold.

**Level:** The sensor determines the level above the previously defined background in the search zone. The shape of the bulk material does not matter.

**Distance**

Level with an irregular surface: Level measurement of any bulk materials such as granulates, cereals or vegetables in silos. The level is monitored irrespective of shape, colour or material as shown here for the processing of deep-frozen vegetables. Another application in the food industry: The 3D sensor detects the correct filling of packs.

**Volume**

Checked for completeness: By means of volume measurement the filling status of conveyor belts or pallets is detected. It is also possible to monitor whether vessels are completely empty.

**Level**

efector pmd 3d can also be used for the constant detection of the volume of moving objects on conveyor belts.

Further information at www.ifm.com/gb/pmd3d
Vision sensors from ifm electronic.
Powerful like a camera system, simple like a sensor.

In automation technology vision sensors are today an integral part of assembly, production and quality control and last not least increase efficiency. They are cameras with application-specific evaluation, i.e. reliable electronic eyes at low cost with a high degree of integration.

From the camera to the sensor.
A few years ago high-price camera systems were needed. Due to technical developments and continuously falling prices for components ever more intelligent functions could be implemented at low cost in an ever smaller space. Compact vision sensors not only replace camera systems but also offer additional application options. For the variable position detection of objects or scenes they replace, for example, complex proximity sensors or multiple sensor solutions such as sensor bridges, when pallets or crates are monitored for completeness.

Easy to integrate.
One of the distinguishing features of vision sensors is their simplicity. Whereas image processing systems can usually only be integrated into the production process by qualified personnel or cost-intensive external integrators, vision sensors can be used without previous knowledge due to their application-specific nature. Easy “parameter setting” instead of complex “programming” is the motto. Ready-to-use function blocks support the integration into the PLC. An Ethernet process interface is used for data transmission, parameter setting and remote maintenance. Also, all units have switching outputs to signal successful testing. So vision sensors offer the same ease of use as binary sensors.

Robust and compact.
Another advantage: Due to their high protection ratings and wide temperature ranges ifm vision sensors can in the truest sense of the word be brought very close to what is actually going on. They are also distinguished by a particularly high degree of integration. In contrast to complex camera solutions, all necessary components such as illumination, optics, evaluation and output logic are integrated into the industrially compatible housing. Tasks such as quality control, monitoring completeness or reading 1D and 2D codes can easily be performed at low cost using ifm vision sensors.

Contour sensor:
As for a toy box: The O2D vision sensor can recognise and assign previously defined objects and their contours or structures in order to check completeness, position and orientation.

Pixel counter:
Comparable to a counting frame or slide rule, the O2V vision sensor counts all pixels of the areas of identical grey-scale values of an image. Furthermore, it can group accumulations of certain grey-scale values to individual objects and assess by different criteria.

Code reader:
Today bar codes are widely used and can be understood as font styles to be read from right to left. 2D codes encode the information in the area. Similar to a domino puzzle, unambiguous information is conveyed which is read by the O2I vision sensor.

3D sensor:
Similar to a bed of nails, the O3D 3D sensor scans the current scene in depth. These more than 3000 measured distance values can be used to create a multitude of virtual sensors, for example to check that a crate is complete with any kind of bottles.

Photo source: R.B./pixelio.de
## Accessories vision sensors

- **Type E21168**
- **Type E21166**
- **Type E21165**
- **Type E21172**

### Protective glass lens for types O2D, O2V, O2I

### Protective plastic lens for the food industry for types O2D, O2V, O2I

### Plastic diffuser for types O2D, O2V, O2I

### Daylight filter for types O2D, O2V, O2I (infrared)

## Overview operating distance / field of view size

### Field of view size [mm]

- **Type O2D222**
  - A 66 x 47
  - B 32 x 24
  - C 20 x 15

- **Type O2D220**
  - A 264 x 189
  - B 128 x 96
  - C 80 x 60

- **Type O2D224**
  - A 132 x 94
  - B 64 x 48
  - C 40 x 30

### Operating distance [mm]

- **A Type O2D222**
  - 100
  - 200
  - 400
  - 1000
  - 2000

- **B Type O2D220**
  - 500
  - 1000
  - 2000
  - 4000
  - 6000

- **C Type O2D224**
  - 264 x 189
  - 320 x 240
  - 200 x 150

### Daylight filter for types O2D, O2V, O2I (infrared)

- **Type O3D200**
  - 420 x 290
  - 840 x 580
  - 1680 x 1160
  - 3360 x 2320
  - 5040 x 3480

### Protective plastic lens for the food industry for types O2D, O2V, O2I

### Plastic diffuser for types O2D, O2V, O2I

### Daylight filter for types O2D, O2V, O2I (infrared)
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