Vision sensors for recognition and assessment of objects and scenes.

Industrial imaging

www.ifm.com/gb/vision-sensors

ifm electronic

Powerful like a camera system, simple like a sensor

Vision sensors

In automation technology visions 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.

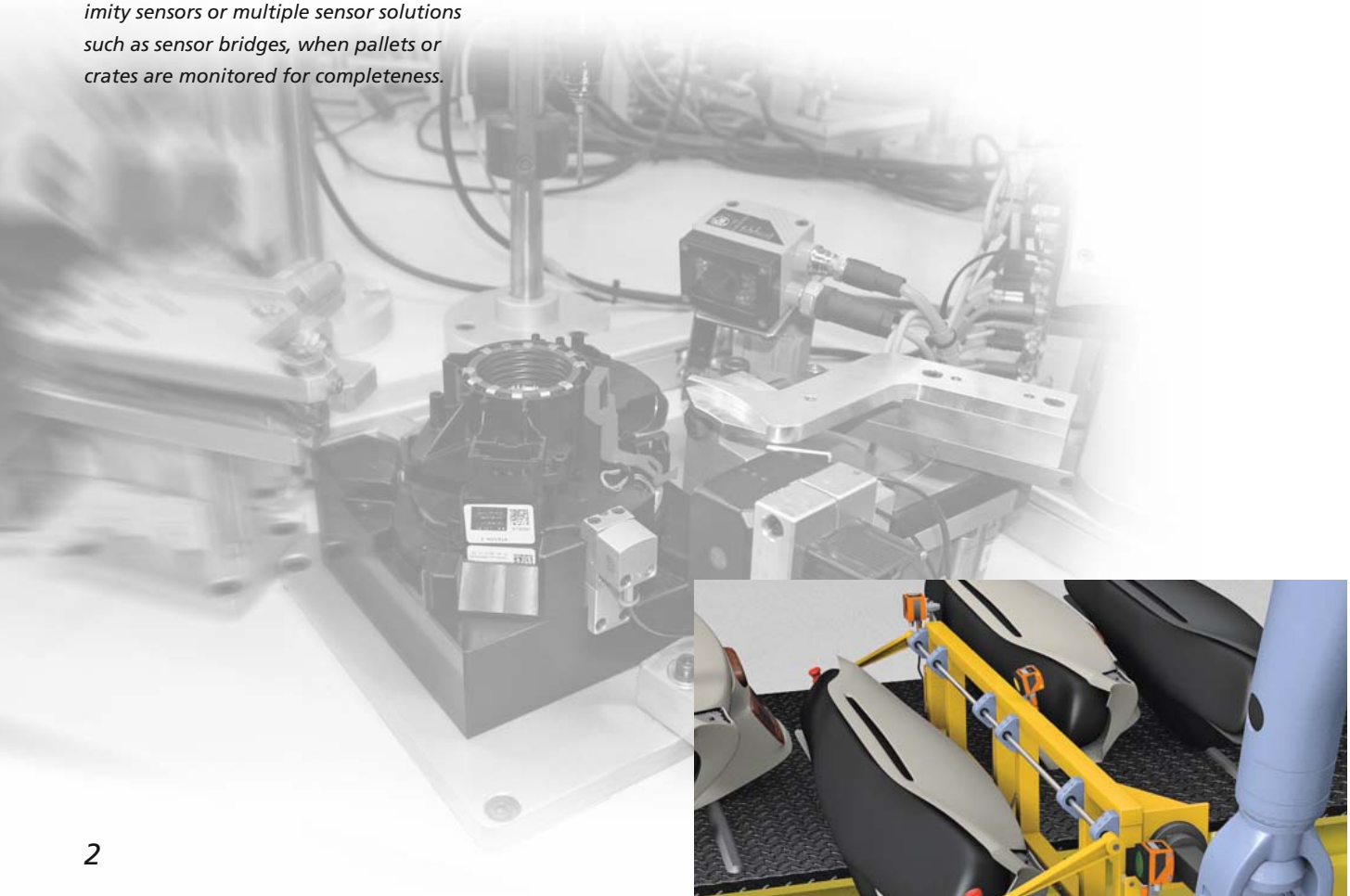
A few years ago high-price camera systems were needed. Due to technical developments and continuously falling prices for components ever more intelligent functions could be implemented at low cost in an ever smaller space. Compact vision sensors not only replace camera systems but also offer additional 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.

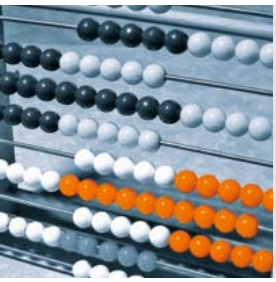
Robust and compact

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.



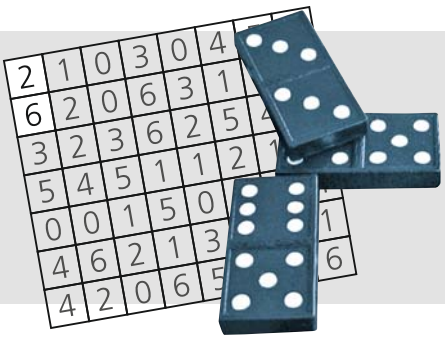
Contour sensor

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.

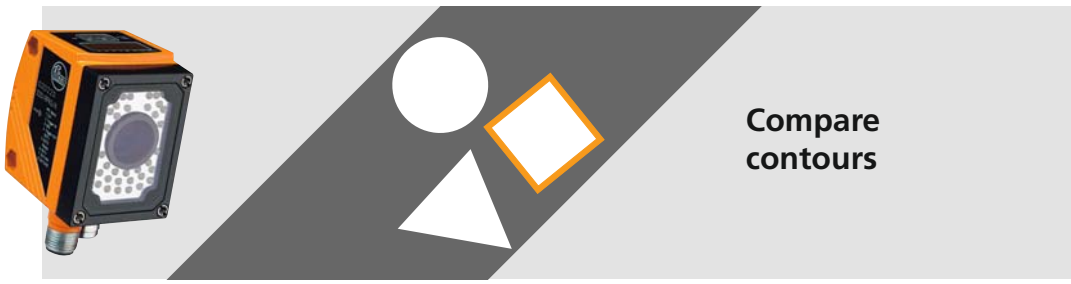
3D sensor

Similar to a bed of nails, the O3D 3D sensor scans the current scene in depth.
These more than 23,000 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.

Competence in application-specific solutions
The right choice is decisive

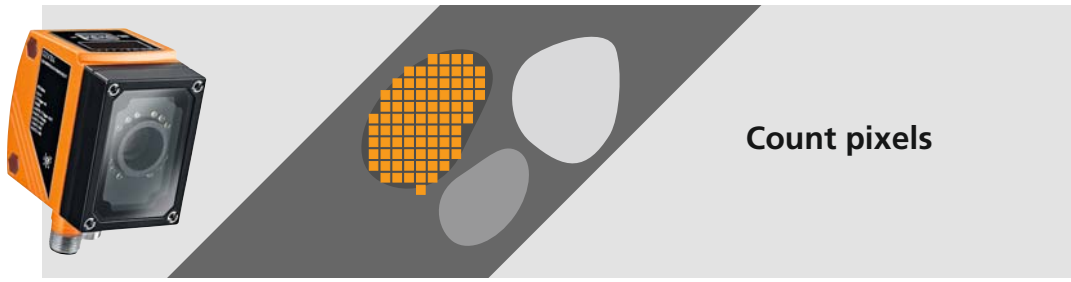
Vision sensors

Object recognition type O2D



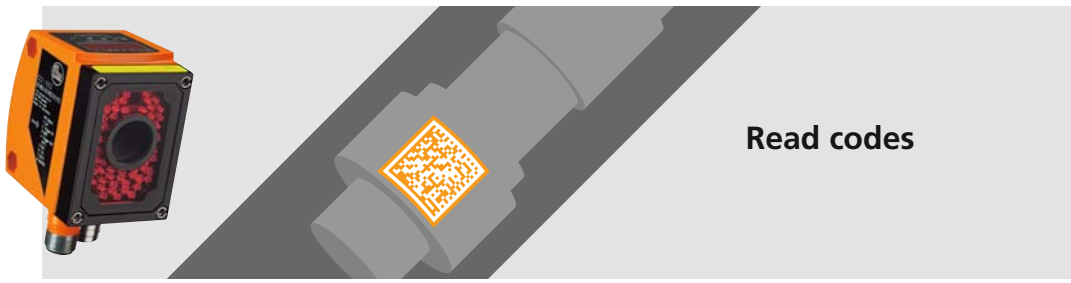
Compare contours

Object inspection type O2V



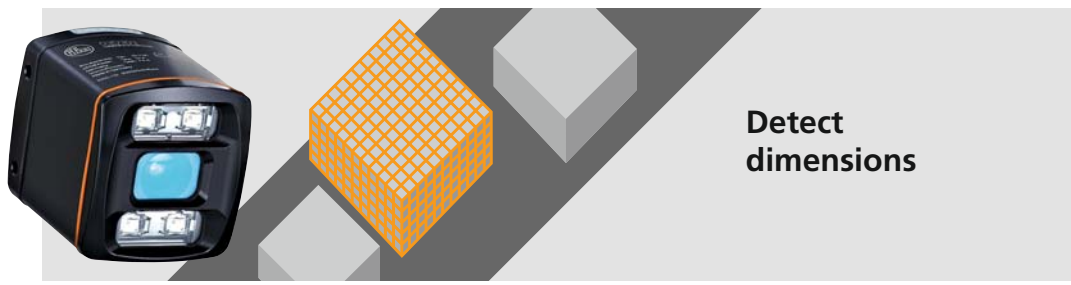
Count pixels

Identification type O2I



Read codes

3D object recognition type O3D



Detect dimensions

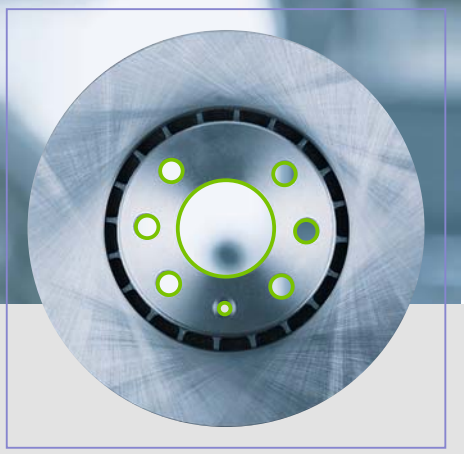
Type overview operating distance / field of view size

	no colour contrast to the background	objects smaller than 1 cm²	variable shape	moving objects, variable orientation and position	moving 1D and 2D codes, variable orientation and position	
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.		✓		✓		*6 - 7*
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.		✓	✓	✓		*8 - 9*
For 1D and 2D codes as well as text. For monitoring processes in industrial automation. Use in product tracking, control and identification.		✓			✓	*10 - 11*
For the three-dimensional detection of objects and scenes using the time of flight measurement. For the assessment of level, distance and volumes. Use e.g. in conveying and packaging technologies.	✓		✓	✓		*12 - 13*
						14 - 15

Object recognition type O2D
All geometries in focus

The electronic eye

The application possibilities of the contour sensor efector dualis range from presence, position and orientation monitoring via sorting and counting tasks to quality control.



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 saved 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.

Position

Horizontal and vertical coordinates of the freely selectable reference point

Orientation in degrees

Number

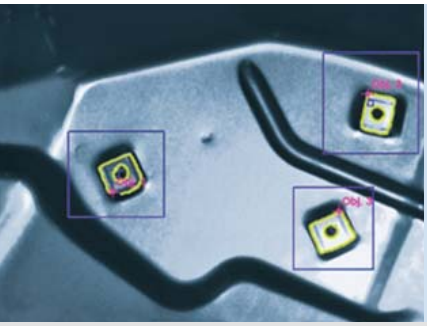
Objects

Models

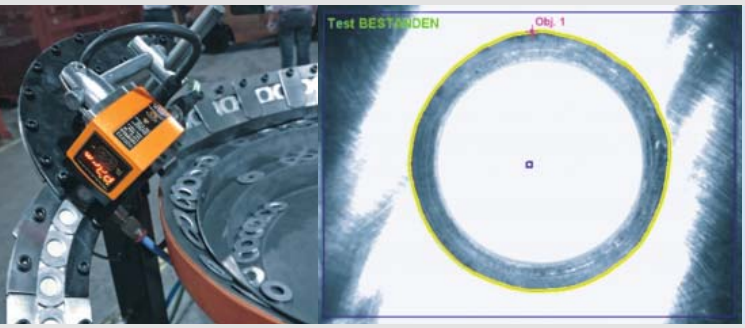
Sorting

Tolerance range

Good / bad



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.

ifm provides the user with a wide selection of LED external lighting.

Further information at
www.ifm.com/gb/object-recognition

Object inspection O2V
Checking variable features of objects and scenes

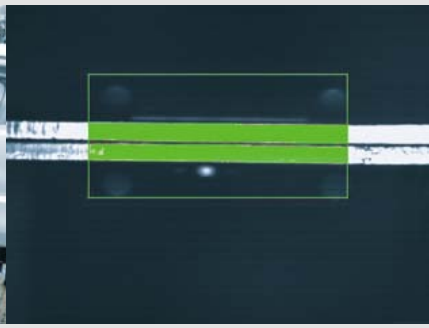
Whereas common vision sensors check parts on the basis of defined contours (like the contour sensor O2D) the new O2V pixel counter compares on the basis of variable features.

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.



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

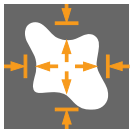
Instead of a defined contour the user determines relative features used by the sensor to assess an object or a scene. Within freely selectable tolerances the sensor determines features such as area, size, roundness or compactness of an object.

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.

Size



Outer and inner width and height

Outer and inner radius

Area in number of pixels

Position

Horizontal and vertical coordinates of the object's centre of gravity

Orientation in degrees

Shape

Roundness, squareness, compactness

Contrast

Homogeneity, minimum, mean and maximum grey-scale value

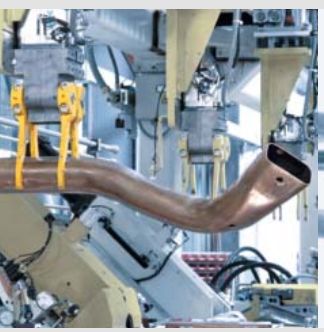
Number

Objects

Holes in the object

**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

Identification type O2I

Reliable identification of 1D and 2D codes as well as text

Powerful identification

Independent of orientation and number of codes the multicode reader automatically decodes 1D and 2D codes.

The new version also solves OCR tasks, e.g. for product identification by type designations or serial numbers.
All information such as expiry

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

Intelligence in the sensor:
Programmable outputs, verifier system reduces data transmission.

Flexible connection:
RS-232, Ethernet TCP/IP and Ethetnet/IP interface.

Quick in the process:
Object speeds of up to 7 m/s.

Compact integration:
Illumination, optics, evaluation and interfaces in an industrially compatible housing.

Easy handling:
The system is configured and ready for use within a few minutes – with PC software or directly on the sensor.

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

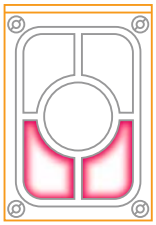
date or production date can now be read directly. Further functions include the output of the code position via the process interface, adjustable total quality parameters, individual illumination settings for each configuration in a group, integrated fault memory and access protection with password.

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.

Optimum illumination

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



QR code

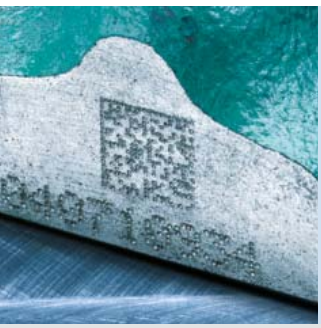
PDF code

DMC code

Bar code

OCR

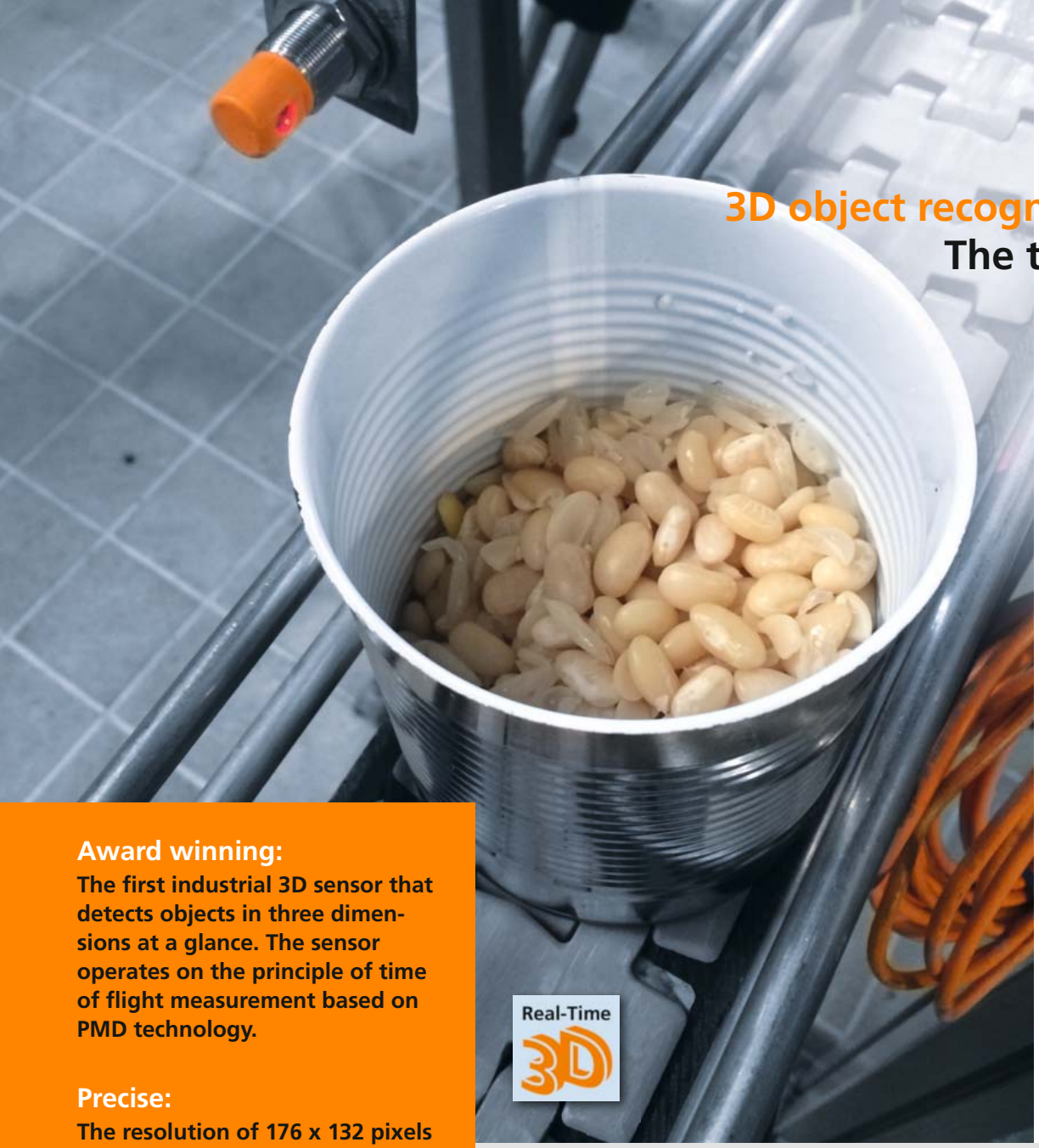
7103775829 42



The ifm multicode reader reads many 2D and 1D codes as well as text. The standardised 2D code can be applied in different ways: printed on paper, engraved by laser or dot-peened onto a metal surface.

One of many examples: Based on the Data Matrix code, the multicode reader identifies hygienically packed cotton swabs on a conveyor belt dynamically.

Further information at
www.ifm.com/gb/multicodereader



3D object recognition type O3D
The third dimension at a glance

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.

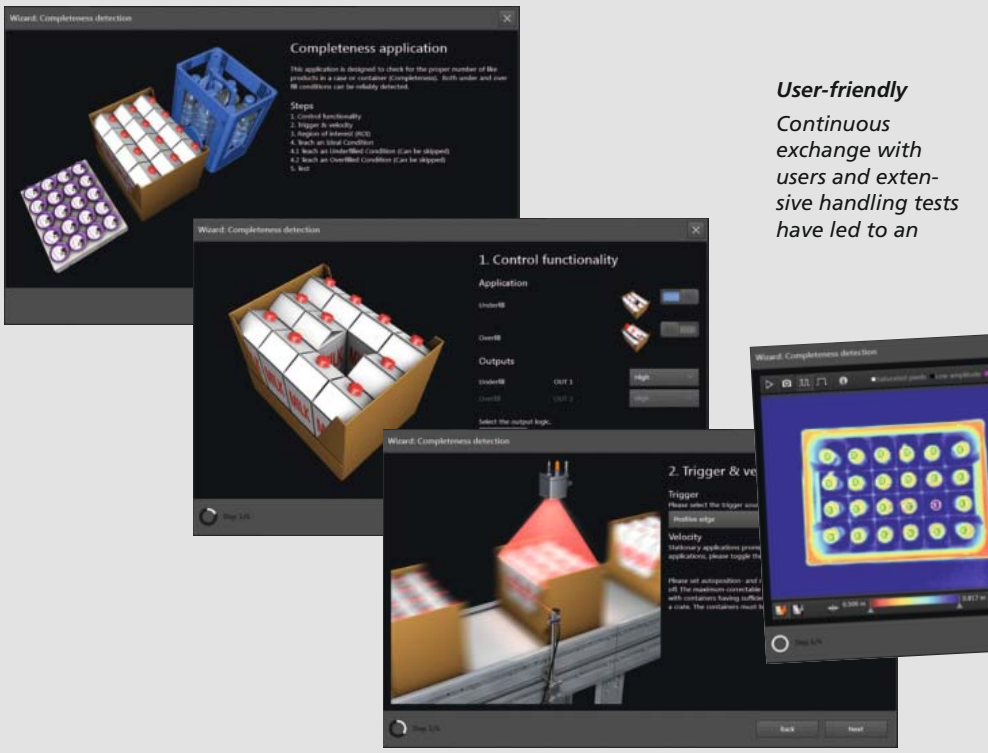
Precise:
The resolution of 176 x 132 pixels results in 23,232 distance values per measurement for the detailed assessment of the application.

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 5 m irrespective of the object colour, robust against extraneous light.

Level measurement:
The sensor is suitable for continuous level measurements of non-transparent solids and bulk materials in tanks, silos, hoppers or in heaps. Monitoring conveyors for level or belt usage is also possible. In the measuring range the sensor determines the level via the defined background and transmits the analogue level value or has the function of a point level switch.



User-friendly
Continuous exchange with users and extensive handling tests have led to an

3D object recognition for conveying and packaging technologies

Monitoring completeness:

Consumer goods and industrial products are often delivered in homogeneous packaging. If a pallet with only one incomplete handling unit reaches the customer, they often return the whole pallet.

This causes a lot of additional cost, in particular in case of perishable goods. On the basis of colour the sensor checks the handling units for underfill and overfill. As opposed to conventional solutions, there is flexibility in changing the type or size of the handling unit.

Object dimensioning:

Size determination for volume calculations or sorting applications. Warehouse, post room, logistics distribution centre or transport system: optimisation of the storage area is needed everywhere.

The sensor has the function of a simple threshold switch or transmits object size, orientation and position to the warehouse management or ERP system. In addition, quality parameters help detect damaged or deformed object.

Level

Completeness

Object dimensioning

Full crate inspection
The sensor checks handling units for completeness, e.g. workpiece carriers, bottle crates, outer packaging, blister packs or pallets.
Automatic position and orientation adjustment guarantees a stable function even with a variable object position.

extremely simple usability and ease of integration of the sensor – from ordering to replacement.

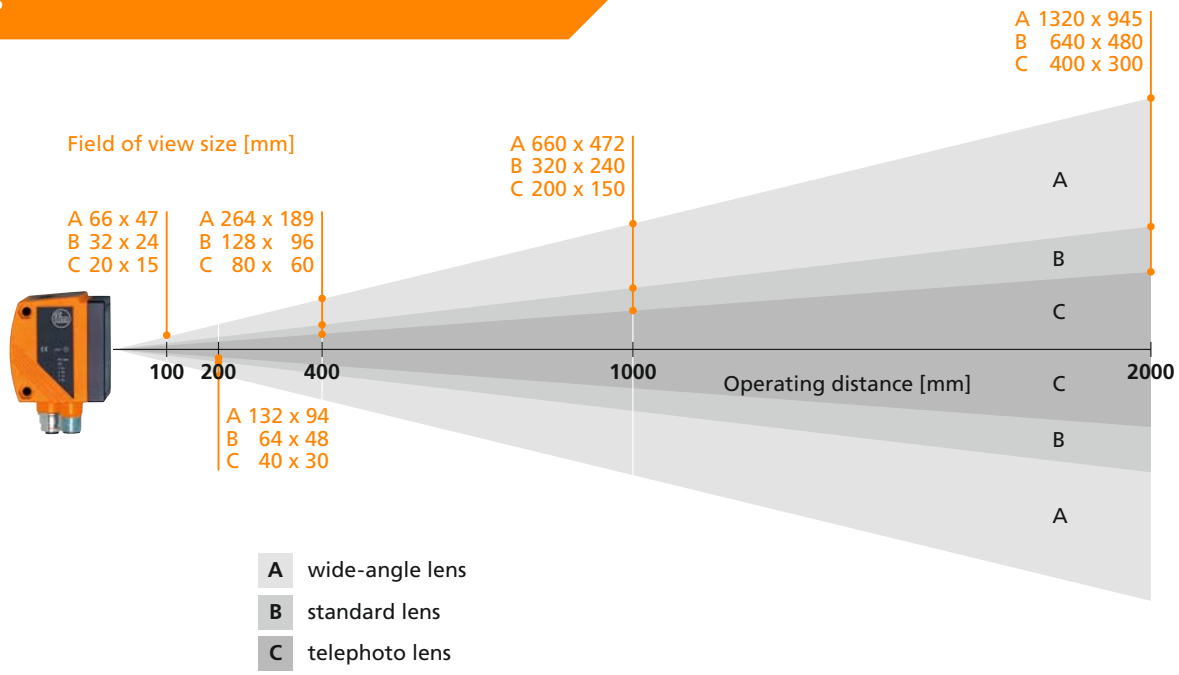
Package dimensioning
Today countless courier services charge not only according to the actual weight of an object to be sent but also according to the object's bulkiness, i.e. according to strap length or dimensional weight. If the dimensional weight or the strap length exceeds the actual weight, the shipping or freight costs are calculated on this basis.

A wiring wizard helps with the first set-up.

Further information at
www.ifm.com/gb/o3d

Type overview operating distance / field of view size

Vision sensors

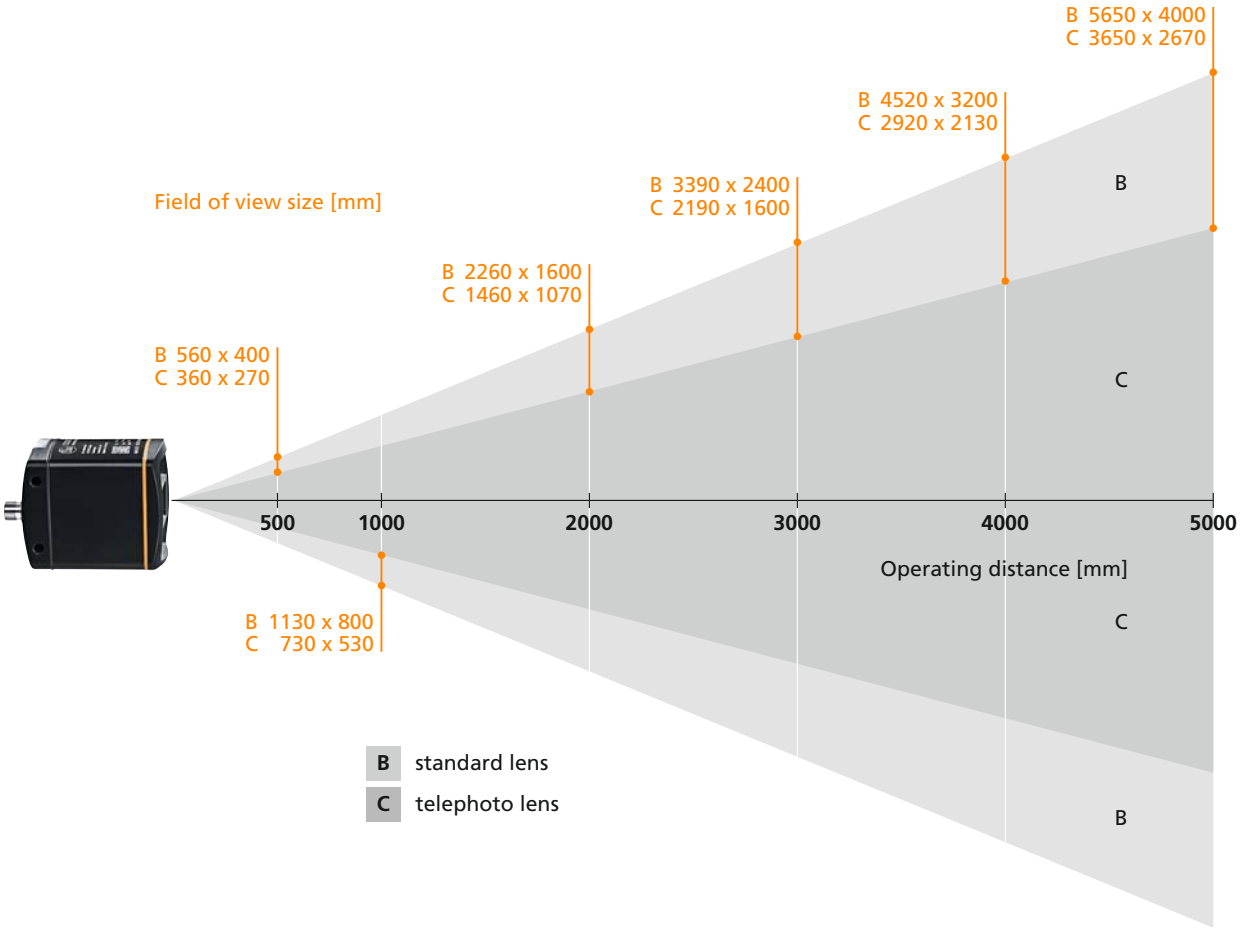


A wide-angle lens
B standard lens
C telephoto lens

Vision sensor type	Description	Angle of aperture horizontal x vertical [°]	Order no.
Object recognition type O2D	Infrared, wide-angle lens (A)	36 x 27	**O2D222**
	Infrared, standard lens (B)	18 x 14	**O2D220**
	Infrared, telephoto lens (C)	12 x 9	**O2D224**
Object inspection type O2V	White, wide-angle lens (A)	36 x 27	**O2V102**
	White, standard lens (B)	18 x 14	**O2V100**
	White, telephoto lens (C)	12 x 9	**O2V104**
	Infrared, wide-angle lens (A)	36 x 27	**O2V122**
	Infrared, standard lens (B)	18 x 14	**O2V120**
	Infrared, telephoto lens (C)	12 x 9	**O2V124**
Identification Typ O2I	Red light, wide-angle lens (A)	36 x 27	**O2I302**
	Red light, standard lens (B)	18 x 14	**O2I300**
	Red light, telephoto lens (C)	12 x 9	**O2I304**
	Infrared, wide-angle lens (A)	36 x 27	**O2I303**
	Infrared, standard lens (B)	18 x 14	**O2I301**
	Infrared, telephoto lens (C)	12 x 9	**O2I305**

Accessories vision sensors

Description	Order no.
Protective glass lens	**E21168**
Protective plastic lens for the food industry	**E21166**
Plastic diffuser	**E21165**
Daylight filter (for infrared types)	**E21172**



Vision sensor type	Description	Angle of aperture horizontal x vertical [°]	Order no.
3D object recognition type O3D	Infrared, telephoto lens (C)	40 x 30	**O3D300**
	Infrared, standard lens (B)	60 x 45	**O3D302**
	Infrared, telephoto lens (C), stainless steel	40 x 30	**O3D310**
	Infrared, standard lens (B), stainless steel	60 x 45	**O3D312**

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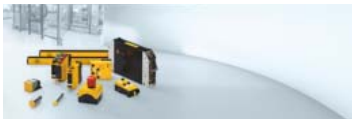
Sensors for motion control

Industrial imaging



Safety technology

Process sensors

Industrial communication

IO-Link

Identification systems

Condition monitoring systems

Systems for mobile machines

Connection technology

Software

Power supplies

Accessories

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