

OBJECT DETECTION

CODE READER

COLOUR DETECTION



FA 45 Vision Sensor

A fast and economic answer
to inspection applications without
experience in image processing



FA 45 branch applications include:

- Automotive and supply industry
- Special-purpose machine construction
- Machine and plant engineering
- Food and beverage industry
- Logistics and packaging industry
- Pharmaceutical industry
- Metal processing industry
- Electrical and electronics industry

General fields of application:

- Factory automation
- Logistics automation
- Quality assurance

Application ranges of the FA 45:

- Object detection (up to 32 characteristics)
- Code reading (DataMatrix, barcode)
- Colour detection (up to 32 colours)

“Industrial image processing systems? Surely there must be a simpler, reliable and economic alternative.”

Factory automation follows the principle of improving those processes where human capacities reach their natural limits. The FA 45 industrial vision range is no different. They have evolved to compliment and amplify the perceptive capability and speed of detection in industrial environments.

Now a new generation of so-called vision sensors is replacing and expanding the customary functions of complex image processing systems - particularly in application areas which involve the detection of production differences, quality and colour deviations, tracking of components and assembly groups as well as the improvement of production process procedures in general.

With the FA 45 vision sensor, SensoPart presents the first intelligent automation solution which combines many years experience in standard sensor technology with modern – and above all powerful – image processing technology. For the first time, industrial users can solve demanding applications without knowledge of image processing technology, using only familiar sensor technology. The advantages are as varied as they are simple:

- » “Plug and Play“ without experience in image processing
- » Miniaturisation of dimensions with integrated intelligence
- » Reliability in the harshest ambient conditions
- » And all that at an unbeatable price...

» “Plug and Play“ – even without experience in image processing

Complex functions do not mean complicated use. Every technician can work intuitively with the FA 45 vision sensor. Once unpacked, the FA 45 is positioned and connected via Ethernet and M12 sensor connectors in no time at all. Parameter settings are carried out directly via teach-in using a temporarily connected PC and application software included in the standard delivery. Set-up can be repeated and adjusted to new features any number of times.

» Miniaturisation of dimensions with integrated intelligence

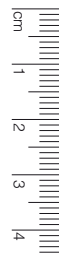
The FA 45 vision sensor is almost square in shape with its 45x45x65 mm dimensions, which is extremely practical. It requires little space, even though it includes everything – from lighting and camera, adjustable lens and evaluation electronics through to data and process interface. And where others require external support, this sensor handles all the data: the evaluation electronics supply reliable results at a clock speed of up to 600 parts per minute.

» Reliability in the harshest ambient conditions

When we say “heavy-duty“, we mean heavy-duty. Regardless of vibrations, an ambient temperature of 50° C or 80% air humidity, the vision sensor is optimally prepared for harsh industrial use.

» And all that at an unbeatable price...

The FA 45 is not just a low-cost alternative to complex image processing systems, it also guarantees a fast provable return on investment down to the Euro and cent, due to full use of previously economically-unexploitable optimisation potential.





General applications:

- Presence check
- Completeness check
- Part differentiation
- Position check / detection
- Rejection check
- Sorting

Precise application examples:

- Complete assembly of components
- Differentiation and sorting of small parts
- Detection of damage
- Presence of weld seams, components or registration marks
- Detection of correct component position on printed circuit boards or in assembly groups

At last an alternative which differentiates not only the good from the bad but also the right from the wrong.

Parameters for sample comparison are easily set-up on the PC interface in five steps:

These are the contents of the interface:

Step 1:

Live display – luminosity and focus are adjusted here

Step 2:

Adjust sample and operating zones

Step 3:

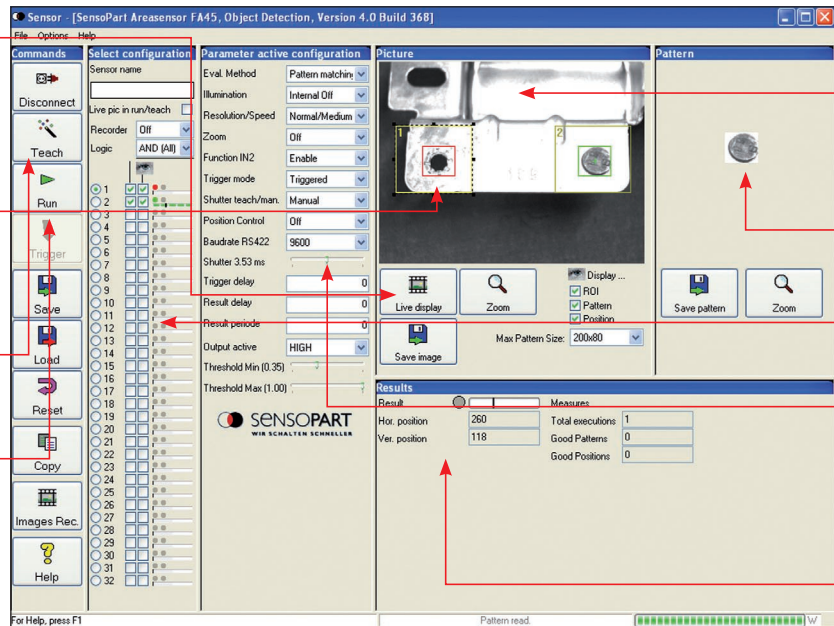
Teach-in sample

Step 4:

Test, improve parameters if necessary

Step 5:

Plug and play...



Real picture of "viewed" object with frame for operating and teach-in zone

Taught sample

Selection of up to 32 inspection tasks

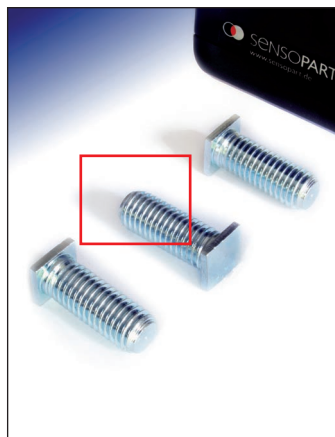
Parameters of selected inspection task, e.g. sample comparison, contrast

Overall results

One-off set-up of "Object detection" vision sensor through intuitive use of the supplied software. After parameterisation, the vision sensor functions independently in the production plant without a PC. The signal output on the back of the vision sensor controls e.g. rejection of faulty parts during production.



"Is the glue dot present?" Early detection through presence check – here with an example of seals for the beverage packaging industry – long before final quality inspection.



Position and positional tolerance measurement using geometrical features. The FA45 processor "learns" the contours and their direction from a picture and responds reliably to deviations.



Present or not present? Shrink-wrapped too deep – or not deep enough? Contour-based object detection with the FA 45 enables almost unlimited applications.

General applications:



Reading ECC 200 Codes



Reading barcodes

Concrete application examples:

- Product identification
- Product labelling
- Automated product tracking
- Quality assurance
- Reliable reading and processing of different types of codes

Special features:

The FA 45 vision sensor reads codes in all directions on different materials (metal, plastic, paper and glass) printed and directly marked (punched or laser-etched).



Punched, laser-etched, printed? It's no problem – the FA 45 vision sensor can read it.

Parameters for code reading are easily set-up on the PC interface in four steps:

These are the contents of the interface:

Step 1:

Live display – luminosity and focus are adjusted here

Step 2:

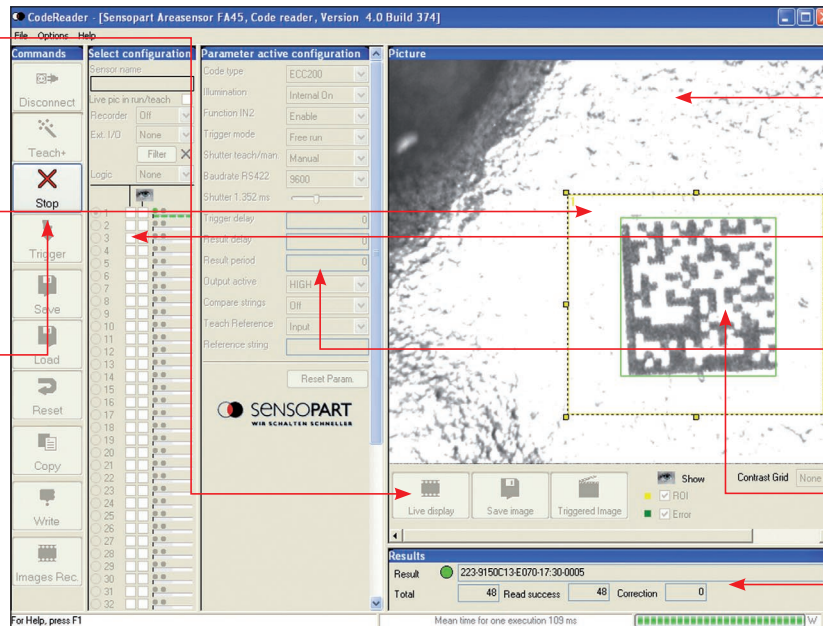
Adjust operating ranges

Step 3:

Test, improve parameters if necessary

Step 4:

Plug and play...



Real picture of "viewed" object / code with frame for operating range

Selection of up to 32 inspection tasks

Parameters of selected inspection task, e.g. DataMatrix or barcode

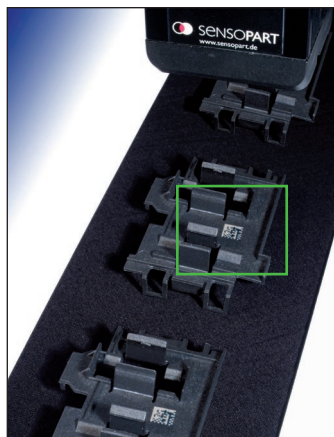
Code that has been read

Overall results code contents

One-off set-up of "Code reader" vision sensor through intuitive use of the supplied software. After parameterisation, the vision sensor functions independently in the production plant without a PC. The signal output on the back of the vision sensor controls e.g. rejection of faulty parts during production.



Not all DataMatrix codes or barcodes are as easy to read as on this item. The FA 45 is tailor-made for dirty, partially-damaged codes which are difficult to read.



Many applications involve directly marked ECC codes. The FA 45 reads the codes reliably regardless of the base material and printing method.



In contrast to printed labels, ECC 200 codes which are laser-etched on glass, are particularly difficult to read due to poor contrast: The FA 45 offers safe and reliable results here.



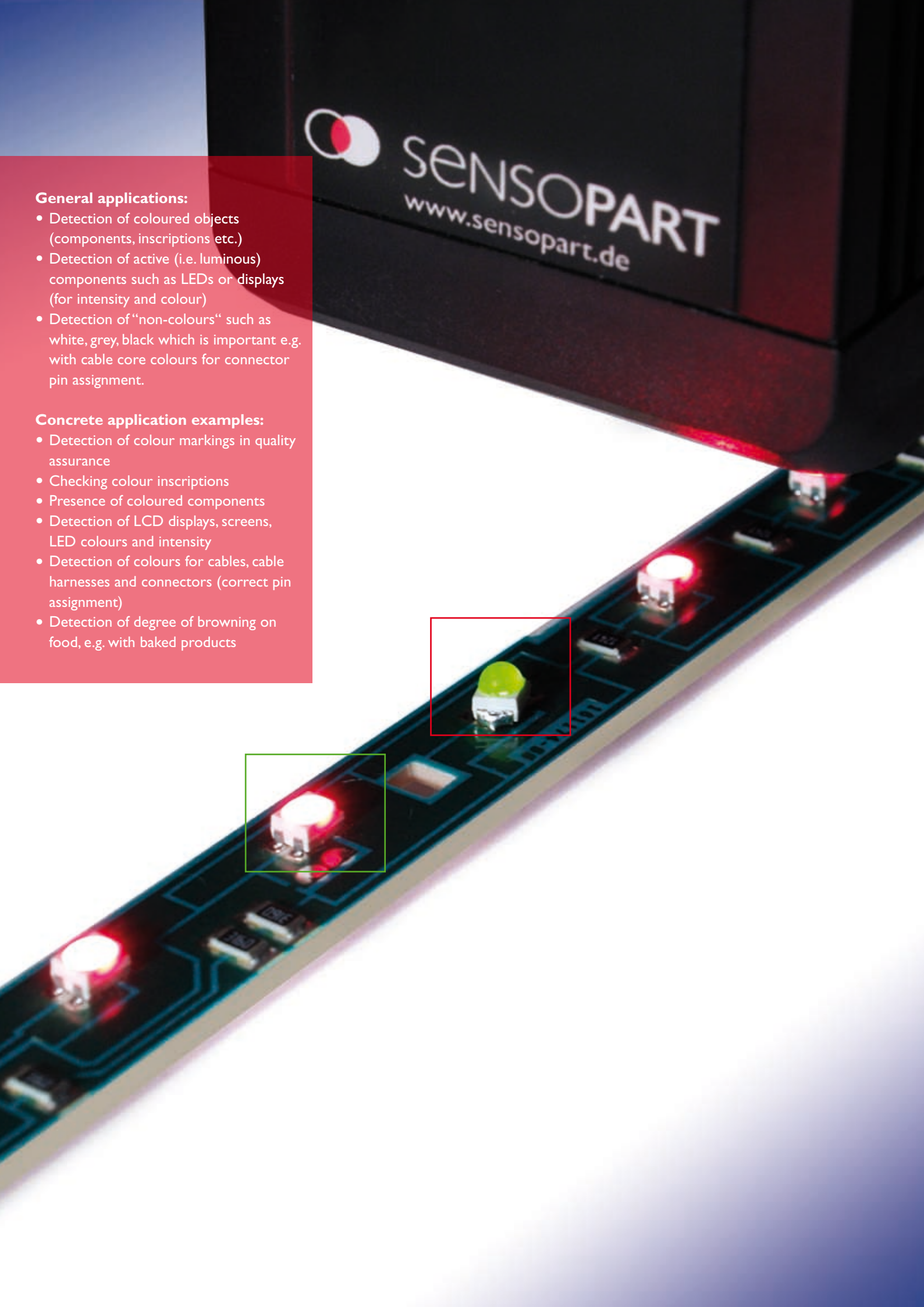
SENSOPART
www.sensopart.de

General applications:

- Detection of coloured objects (components, inscriptions etc.)
- Detection of active (i.e. luminous) components such as LEDs or displays (for intensity and colour)
- Detection of “non-colours” such as white, grey, black which is important e.g. with cable core colours for connector pin assignment.

Concrete application examples:

- Detection of colour markings in quality assurance
- Checking colour inscriptions
- Presence of coloured components
- Detection of LCD displays, screens, LED colours and intensity
- Detection of colours for cables, cable harnesses and connectors (correct pin assignment)
- Detection of degree of browning on food, e.g. with baked products



How brown is brown bread, how many green cables are hanging on a harness?

Parameters for colour detection are easily set-up on the PC interface in five steps:

These are the contents of the interface:

Step 1:

Live display – luminosity and focus are adjusted here

Step 2:

Adjust operating ranges

Step 3:

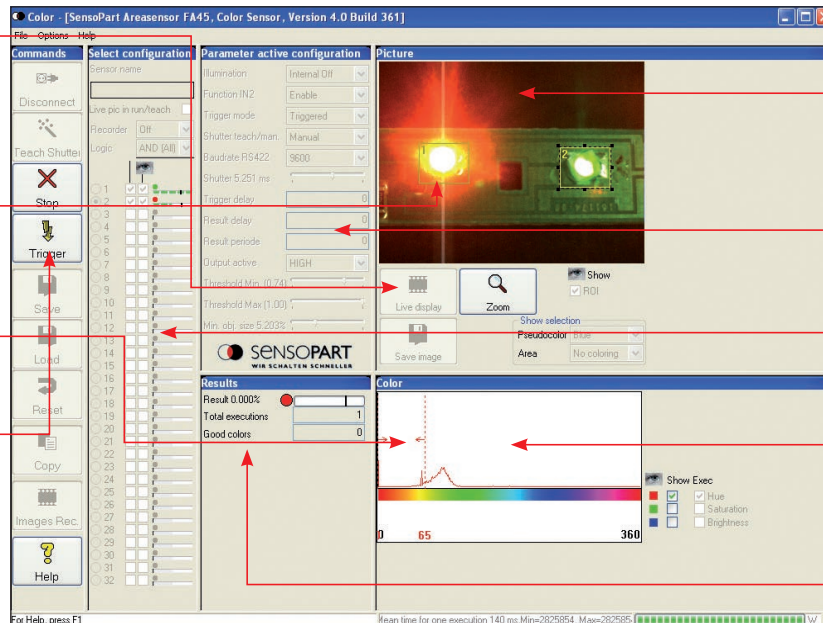
Set required colour

Step 4:

Test, improve parameters if necessary

Step 5:

Plug and play...



Real picture of "viewed" object with frame for operating range

Parameters of selected inspection task

Selection of up to 32 inspection tasks

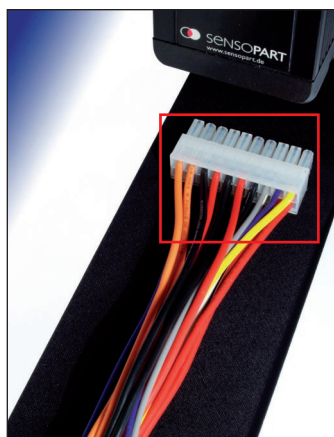
Required colour selected in histogram

Overall result

One-off set-up of "Colour detection" vision sensor through intuitive use of the supplied software. After parameterisation, the vision sensor functions independently in the production plant without a PC. The signal output on the back of the vision sensor controls e.g. rejection of faulty parts during production.



Presence check using colour detection: Is the O ring seal present? Does the O ring seal fit perfectly? The questions and applications can be diverse – the answer is simple and reliable: FA 45.



Is the right cable in the allocated place on the connector? The FA 45 identifies, sorts and inspects up to 32 taught colours.



Simple colour markings are an established and reliable distinguishing feature in many industrial processes, such as here in quality assurance. A simple application for the FA 45 vision sensor.

Technical data FA 45 Vision Sensor

Electrical data

Typ. cycle time Object Detection	50 ... 100 ms (1 pattern matching)
Typ. cycle time Code Reader	100 ms (1 evaluation)
Typ. cycle time Colour Detection	50 ... 100 ms (1 evaluation)
Operating voltage	24 VDC +/- 10 % (absolute max. values 18-30V)
Residual ripple within Ub	< 5 V ss
Current consumption (without I/O)	max. 200 mA
INI/IN2 inputs	High 10 ... 24 V (+10 %), Low 0 ... 3V
Trigger input	Rising edge, 10V ... Ub
Outputs OUT 1 to 4	PNP (N.O., pull up MOSFET)
Output current (per output)	200 mA (max. 9.6 W)
Short circuit protection (all outputs)	Yes
Reverse battery protection	Yes
Interfaces	Ethernet (LAN), RS 422/RS 485
Protection class	2 (50V)
Power-on delay	Approx. 6 s after power-on

Optical data

Number of pixels, sensor technology	640 (H) x 480 (V), CCD (b/w or colour)	
Integrated measurement lighting	Red/white light or infrared LEDs	
Integrated lens, focal distance	6	12 mm (adjustable focal point)
Min. measurement distance in mm	20	20
Min. field of view X * Y in mm	18 x 14	8 x 6
Range of depth of focus	Approx. +/- 5% of measurement distance	

Mechanical data

Length x width x height	64 x 45 x 45 mm
Weight	Approx. 170 g
Ambient operating temperature	-0 °C to 50 °C (80 % air humidity, non-condensating)
Storage temperature	-20 °C to 50 °C (80 % air humidity, non-condensating)
Protection standard	IP 65/67
Connections	Connector M12 8-pin, Ethernet M12 8-pin, process M12 5-pin
Casing	Aluminium, plastic
Vibration/shock	EN 60947-5-2



List of models to determine the FA 45 Vision Sensor suited to your application

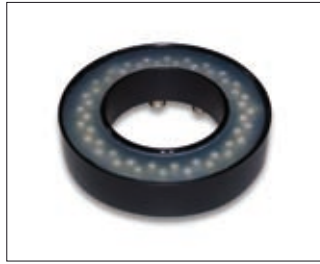
Application	Model designation	Part no.	Image chip	Lighting	Lens	Interfaces	Configuration
Object detection	FA45-300-WCC-OBO6HS4	522-91052	CCD-Mono	White light	f=6 mm	RS 422/Ethernet	32
Object detection	FA45-300-WCC-OBO12HS4	522-91053	CCD-Mono	White light	f=12 mm	RS 422/Ethernet	32
Object detection	FA45-300-RCC-OBO6HS4	522-91055	CCD-Mono	Red light	f=6 mm	RS 422/Ethernet	32
Object detection	FA45-300-RCC-OBO12HS4	522-91056	CCD-Mono	Red light	f=12 mm	RS 422/Ethernet	32
Object detection	FA45-300-CC-OBOCSHS4	522-91054	CCD-Mono	Not integrated	C-CS mount	RS 422/Ethernet	32
Object detection	FA45-301-WCC-OBO6LS3	522-91058	CCD-Mono	White light	f=6 mm	Ethernet	1
Object detection	FA45-301-WCC-OBO12LS3	522-91059	CCD-Mono	White light	f=12 mm	Ethernet	1
Object detection	FA45-301-CC-OBOCSLS3	522-91060	CCD-Mono	Not integrated	C-CS mount	Ethernet	1
Code reader	FA45-300-WCC-CRO6HS4	522-91064	CCD-Mono	White light	f=6 mm	RS 422/Ethernet	32
Code reader	FA45-300-WCC-CRO12HS4	522-91065	CCD-Mono	White light	f=12 mm	RS 422/Ethernet	32
Code reader	FA45-300-RCC-CRO6HS4	522-91067	CCD-Mono	Red light	f=6 mm	RS 422/Ethernet	32
Code reader	FA45-300-RCC-CRO12HS4	522-91068	CCD-Mono	Red light	f=12 mm	RS 422/Ethernet	32
Code reader	FA45-300-CC-CROCSHS4	522-91066	CCD-Mono	Not integrated	C-CS mount	RS 422/Ethernet	32
Colour detection	FA45-300-WCCC-COO6HS4	522-91034	CCD-Colour	White light	f=6 mm	RS 422/Ethernet	32
Colour detection	FA45-300-WCCC-COO12HS4	522-91035	CCD-Colour	White light	f=12 mm	RS 422/Ethernet	32
Colour detection	FA45-300-CCC-COOCSSHS4	522-91036	CCD-Colour	Not integrated	C-CS mount	RS 422/Ethernet	32

Accessories FA 45 Vision Sensor

External lighting



Surface lights for all FA 45 models. A series of several surface lights can be activated to enable flexible and economic lighting of a row of components. Also suitable for use as dark field light.



Ring-shaped front light for all FA 45 models with an excellent cost/performance ratio. Provides uniform lighting of objects.



Surface light / backlight for all FA 45 models. Background lighting for better contrast display of the external profile of components.



Ring light for all FA 45 models for front lighting. Highlights edges on strongly contoured components as a dark field light.

Miscellaneous



Cable and connection cable (power and I/O), Ethernet cable, RS422 cable and lighting cable for all FA 45 models with M12 standard connectors, drag-chain compatible.



Stand for flexible installation and alignment of the FA 45 vision sensor; swivels in every direction, quick and easy to clamp.

C mount lenses



C mount lenses for all FA 45 models with different focal widths for flexible component display in different reproduction scales. These are heavy-duty industrial lenses, an IP 65 outer casing is available.

Switch modules and interface modules



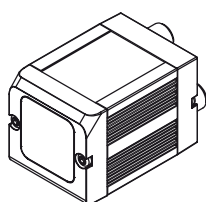
Switch module and interface module for all FA 45 sensors for I/O extension with up to eight additional inputs and up to 32 additional outputs. Connection to vision sensor via RS422.



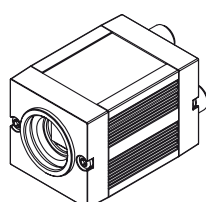
Demonstration and text box for all FA 45 models. Enables test mode with simulation of inputs (trigger or similar) and display of outputs as well as power supply of vision sensor. All I/Os are through-wired, so parallel operation with control system possible.



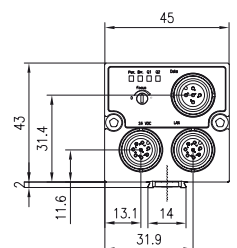
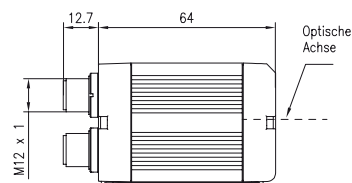
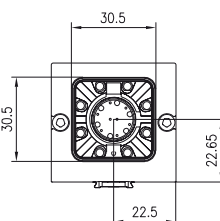
Profibus adapter for all FA45 models for connection of the sensor to a Profibus. Connection via RS422.



FA 45



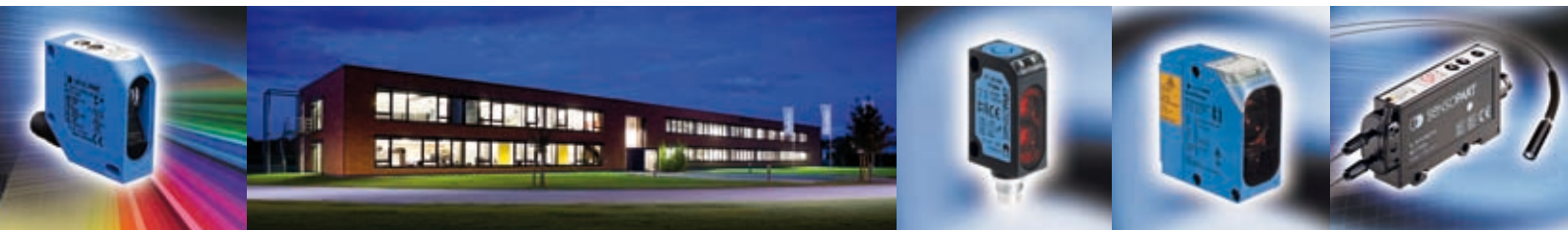
FA 45 C-Mount



From our product range

- | | | | |
|--------------------------|---------------------|---------------------------|------------------------|
| » Anti-collision sensors | » Distance sensors | » Line cameras | » SmartPlug |
| » Capacitive sensors | » Fibre optics | » Miniature sensors | » Slot sensors |
| » Colour sensors | » Inductive sensors | » Optical windows | » Through-beam sensors |
| » Contrast sensors | » Laser sensors | » Proximity switches | » Ultrasonic sensors |
| | | » Retroreflective sensors | » Vision sensors |

Our concept: Speed combined with innovation, quality and customer awareness



Since the day we were founded, our investments in research and development have been way above average for this branch, and have laid the foundation for customer satisfaction and continuous growth. Today SensoPart is one of the leading suppliers of industrial sensors – including **distance sensors, vision sensors, laser sensors and colour sensors.** Recognition by independent experts is prominent evidence of our work. Indeed SensoPart has received numerous distinctions and prizes over the past years. We have been rewarded for the clear goal behind of our innovations – achieving customer satisfaction with convincing performance data and clever ideas.

- » Dr Rudolph Eberle Prize for Innovation 2001
- » Baden Württemberg Sponsorship award for Young Companies 2002
- » German Sensor Application Prize 2003
- » German Sensor Application Prize 2004
- » Dr Rudolph Eberle Prize for Innovation 2006



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