CAMERA SENSORS
OPTI-CHECK OC53

Undreamt of freedoms

IPF ELECTRONIC

High-End *in High-Tech.*

CAMERA SENSORS OC53
A FOCUS ON YOUR APPLICATION

In many cases, the scope of applications for camera sensors is still being underestimated. Do you think otherwise? If so, maybe you should take a closer look at the new **OC53** series of camera sensors from ipf electronic.

Are you looking for a camera sensor that can do nothing more and nothing less than your specific application requires? You will certainly find your 'specialist' cameras in our range. This is because the **OC53** series consists of a range of variable camera sensors in five different embodiments with focal distances of 10mm (working distance: from 50mm to ...) to 16mm (working distance: from 70mm to 300mm). As a result of their wide range of graduated inspection features, these devices offer a range of functions which are especially orientated towards one thing – your specific needs.
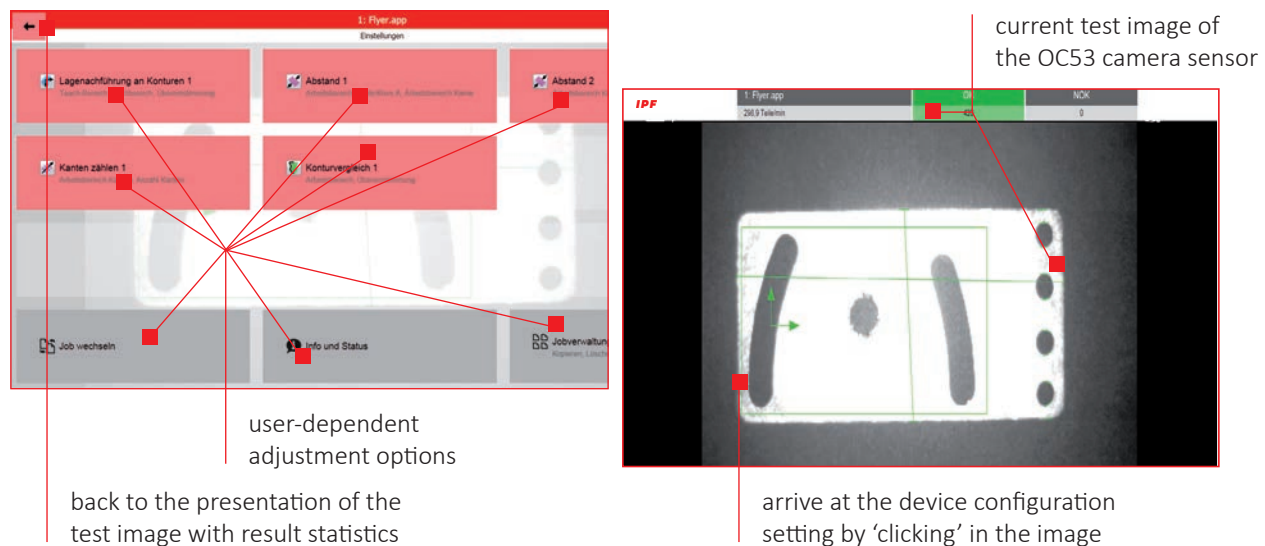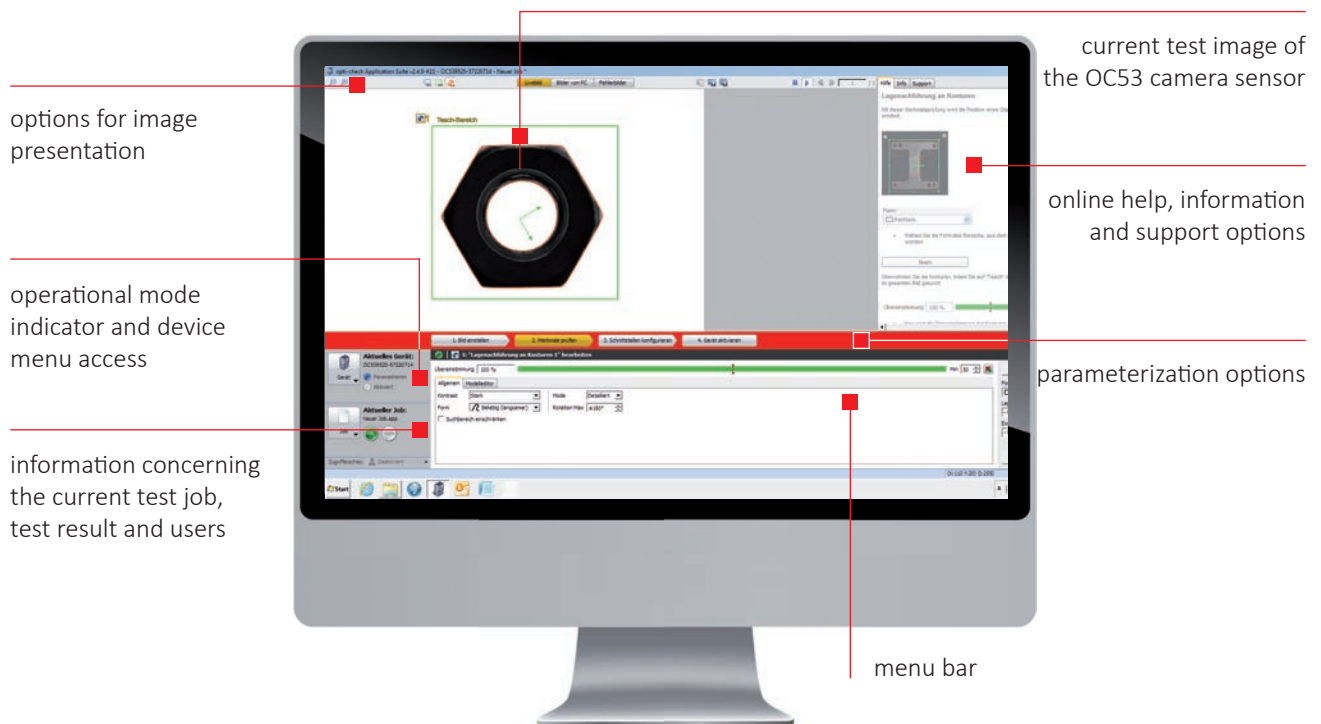
Do you have a complex application for which you want to employ a solution which is both flexible and comprehensive? If so, we recommend that you take a look at our 'multitalent' from the **OC53** series. With a C-mount connection and an integrated flash controller, with this device, you have a whole range of freedoms when selecting lenses and controlling external illumination via the sensor without any problems.

But this is not all: All camera sensors in the **OC53** series offer certain interesting features with plenty of practical advantages. Curious to find out more? You will find out more on the next couple of pages!
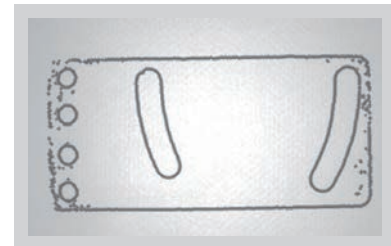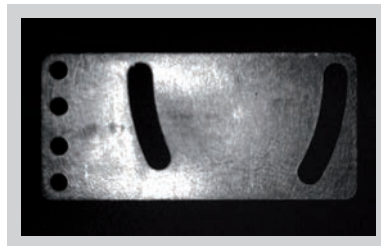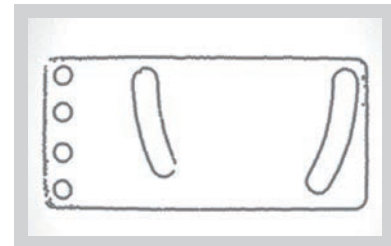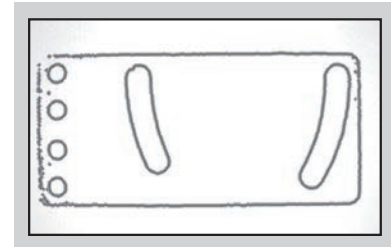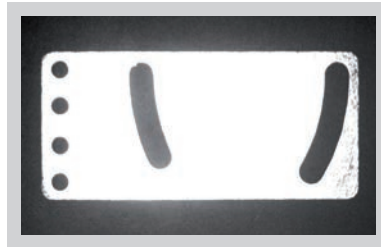
SOFTWARE – WEB INTERFACE
WEB INTERFACE – CAMERA SENSORS OC53

As is generally known, the 'intelligence' of a camera sensor lies in its software. And in the OC53, the software is complex, but not complicated. In only a few steps, the clear parameterization interface guides the user to a readily configured camera sensor which, in most cases, is ready to use within a few minutes. If required, specific access rights can be awarded to the operator on site during the production process. This operator does not even need the software in order to be able to access the sensor. This is possible by means of a suitable web interface for each standard browser which is available when the IP address of the respective sensor is entered into the browser line.

options for image presentation

operational mode indicator and device menu access

information concerning the current test job, test result and users

current test image of the OC53 camera sensor

online help, information and support options

parameterization options

menu bar

current test image of the OC53 camera sensor

user-dependent adjustment options

back to the presentation of the test image with result statistics

arrive at the device configuration setting by 'clicking' in the image

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FROM PIXEL TO CONTOUR

- contour-based, instead of pixel-based recognition – as far as possible, independent of the influence of external light
- combining is a good idea: wide range functionality for the examination of components regardless of position, with the option of combining several tracking operations, however independently from one another
- free selection of lenses by devices with a C-mount thread
- integrated flash controller in the case of sensors with a C-mount thread (external illumination is supplied with electricity, the controller ensures a flash pulse for multiplying the brightness of the illumination
- higher image resolution, if required: sensors with a C-mount thread offer resolutions of up to 2 megapixels, e.g. in order to recognize the smallest of details on a large surface
- the unit is quickly put into service as a result of a uniform user interface for all devices: a ready-configured camera sensor in only four steps
- less work involved in recognizing text: sensors with an OCR function (text recognition) do not require any previous learning of text
- user friendly interface: simply configure your sensor via any standard web browser by entering the IP address of the device
- powerful processing of data through the evaluation of images alongside the recording of images

MULTIFACETED

„ALL IN ONE"

A compact camera sensor with integrated illumination, lens, image recorder and image processing

„ONE FOR ALL"

A camera sensor with a C-mount objective thread for maximum flexibility and an integrated flash controller for controlling the illumination

I robust industrial design in a metal housing (protection system IP67)

I multifaceted options for part location (on contours, on edges, on a circle or a line of text)

I a wide, device-specific range of tools for examining product features

I multifaceted combination options: 19 different tools for carrying out up to 32 feature checks per examination task – and all this with up to 255 test programs which can be stored on the sensor

I multifaceted examinations of features with a single sensor:

- examinations of geometric aspects (distance, circle, angle, counting of edges or the position of a point)

- comparisons (counting contour points, comparing contours, brightness, contrast, area size, counting areas, pattern comparison)

- identification (bar codes, matrix codes, texts, letters, numbers)

I reliable simulation: using product simulators for each device, all of the feature checks in a test program can be tested, evaluated and optimized

I rapid program optimization: using the integrated test function, it is possible to carry out a sort in only a few minutes, e.g. the shots collected in a test run can be sorted into good and bad parts in order to evaluate the reliability of the test program that has been created

PART LOCATION...

ON CONTOURS

Establish the position and pivot position of a part on the basis of its contours. All subsequent feature checks can be aligned towards the found object position.

ON EDGES

Establish the position and pivot position of a part on the basis of an edge or two edges at right angles to one another. All subsequent feature checks can be aligned towards the found object position.
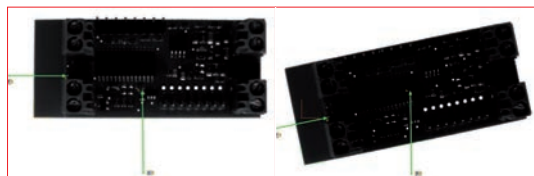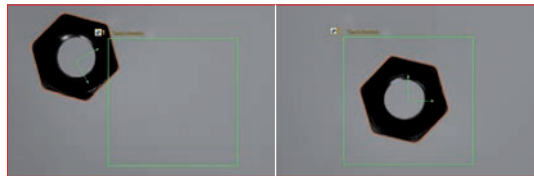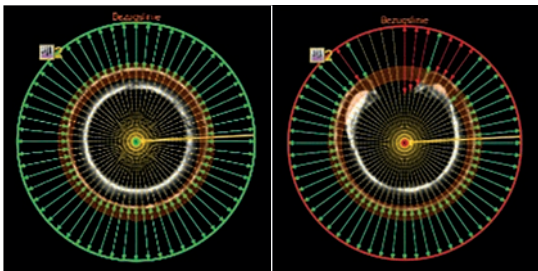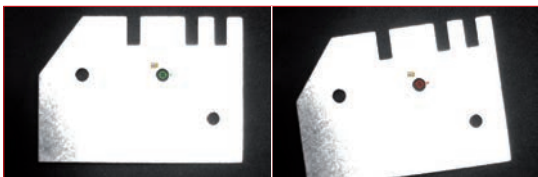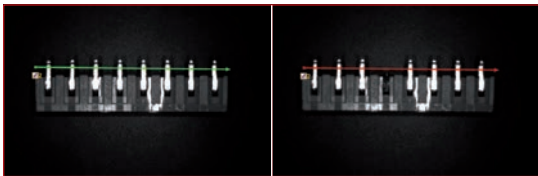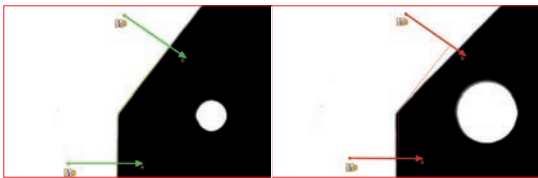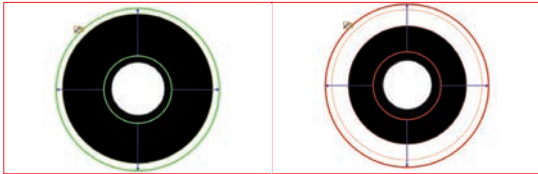
ON CIRCLES

Establish the position and pivot position of circular parts. All subsequent feature checks can be aligned towards the found object position.

ON TEXT LINES

Establish the position and pivot position of text within the working range, even if, at the same time, the text changes. All subsequent feature checks can be aligned towards the found object position.

FEATURE CHECKS & CHARACTERISTICS
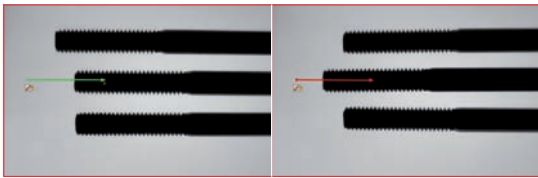
GEOMETRY

DISTANCE

Determine the distance between two edges, to a reference point, between an edge and a circle or between two circles.

CIRCLE

Determine the diameter, position and circularity compared to a reference circle.

ANGLE

Determine the angle between two edges or to a reference point.

COUNT EDGES

Determine the number of edges along a search beam.

POINT POSITION

Determine the absolute position / pivot position of a point in an image or relative to a reference point (pick and place).

EDGE CONTOUR

Compare the distance between edges along a search beam.

FEATURE COMPARISON*

COUNT THE CONTOUR POINTS*

Determine the number of contour points within a working area.

COMPARISON OF CONTOUR*

Compare the contour of a learned part with the contour of the current test piece.

COLOR DETERMINATION

Inspect the color in the operating range for deviations from a saved reference color.

BRIGHTNESS

Determine the medium brightness in a working area.

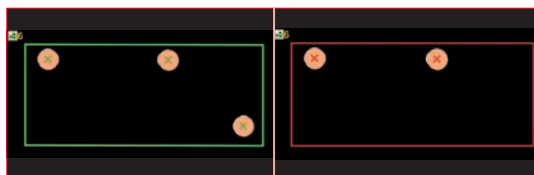
CONTRAST

Calculate the contrast in a working area.

AREA SIZE

Determine the area of light and dark regions in an image. Establish the total area or the largest connected area.

COUNT AREAS*

Count connected light and dark regions that are visible in the detailed section of the image.

FEATURE CHECKS & CHARACTERISTICS

* also available in color

PATTERN COMPARISON*

Check the presence of a taught pattern in the working area.

COLOR ARRANGEMENT

Comprehensive tools not only to determine the color, but also to determine the arrangement in the working area.

MONOCHROME VS. COLOR FEATURE CHECKS

See table.
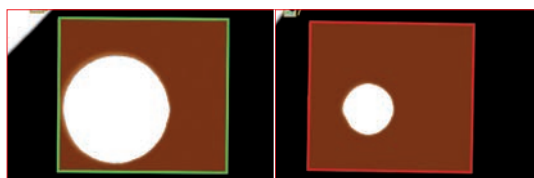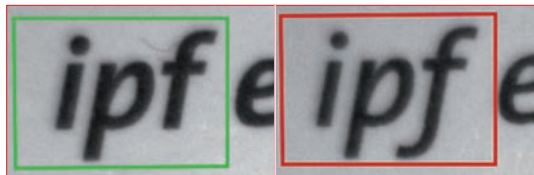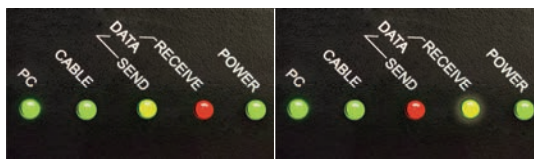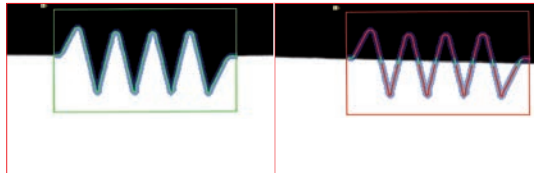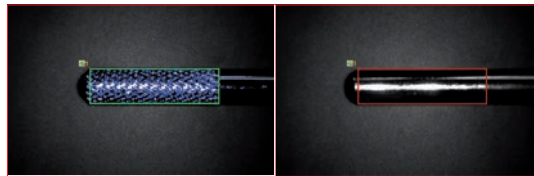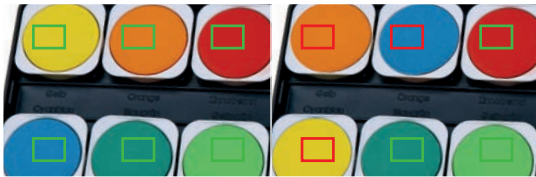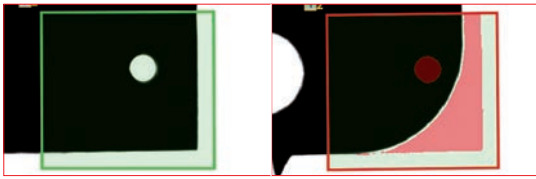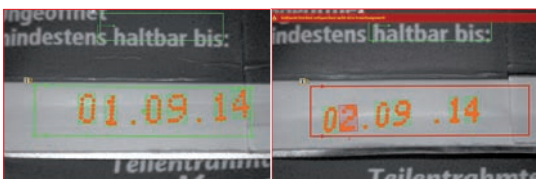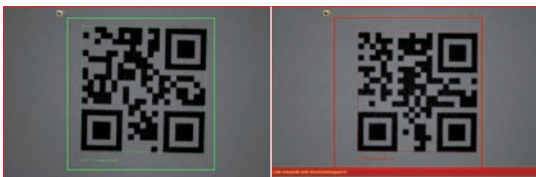
Mono-chrome	Color	Feature check color	Analogy / Difference
		count contour points	4 counting directions
		contour comparison	light / dark => colors
		color determination	instead of „brightness"
		area size	light / dark → ≤ 8 colors
		count areas	light / dark → ≤ 8 colors
X Neu		color arrangement	specific color tool (≤ 24 colors)
		pattern comparison	gray value → color difference

IDENTIFICATION

BARCODE

Read barcodes and determine their quality in accordance with ISO/IEC 15416. The results can be displayed via the process interface. There is the option of carrying out a comparison of target values.

MATRIX CODE

Read any rotated matrix codes (ECC 200, GS1, QR, PDF417) and determine their quality in accordance with ISO/IEC 15415 or AIM DPM-1-2006. The results can be displayed via the process interface. There is the option of carrying out a comparison of target values.
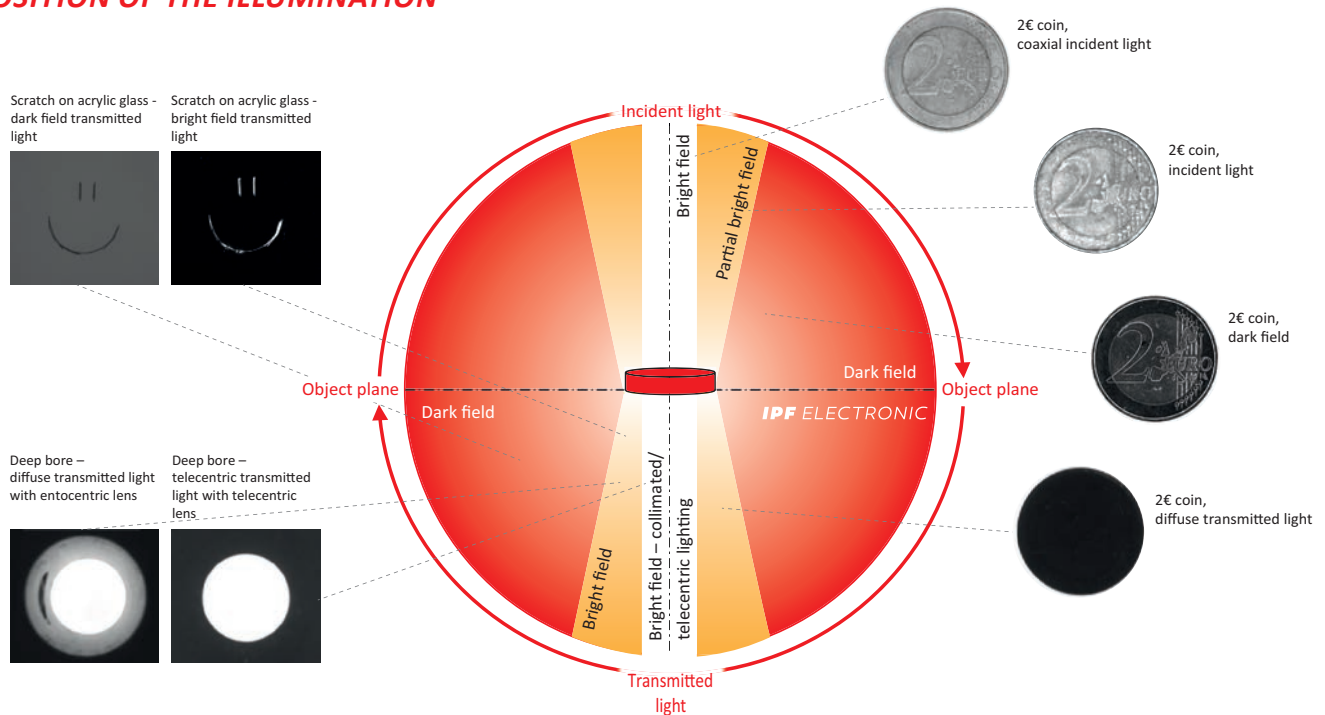

TEXT

Read date information, numbers and letters. In the case of texts, the print quality can be checked. Characters that are read can be displayed via the process interface. There is the option of carrying out a comparison of target values.

* also available in color

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A QUESTION OF LIGHT
POSITION OF THE ILLUMINATION

Scratch on acrylic glass - dark field transmitted light

Scratch on acrylic glass - bright field transmitted light

Deep bore – diffuse transmitted light with entocentric lens

Deep bore – telecentric transmitted light with telecentric lens

Incident light

Bright field

Partial bright field

Dark field

Object plane

Object plane

Dark field

Dark field

Bright field – collimated/telecentric lighting

Bright field

IPF ELECTRONIC

Transmitted light

2€ coin, coaxial incident light

2€ coin, incident light

2€ coin, dark field

2€ coin, diffuse transmitted light

USE OF COLORED ILLUMINATION

Even with monochrome imaging of the camera sensor, specific colors (e.g. blue, green or red) can be accentuated or suppressed with the use of colored illumination. The contrast generated by the colored illumination can therefore make it easier to differentiate between relevant features. That is why this type of illumination is sometimes crucial for the success of an application solution.

If, for example, blue light hits a multicolored surface or multicolored objects, this light is only reflected by the blue sections of the material surface. The more blue sections the object to be detected has, the more light is reflected, making the surface areas appear brighter. For this reason, red surfaces look extremely dark when blue light is used.

Illumination:

| white	blue	green	red
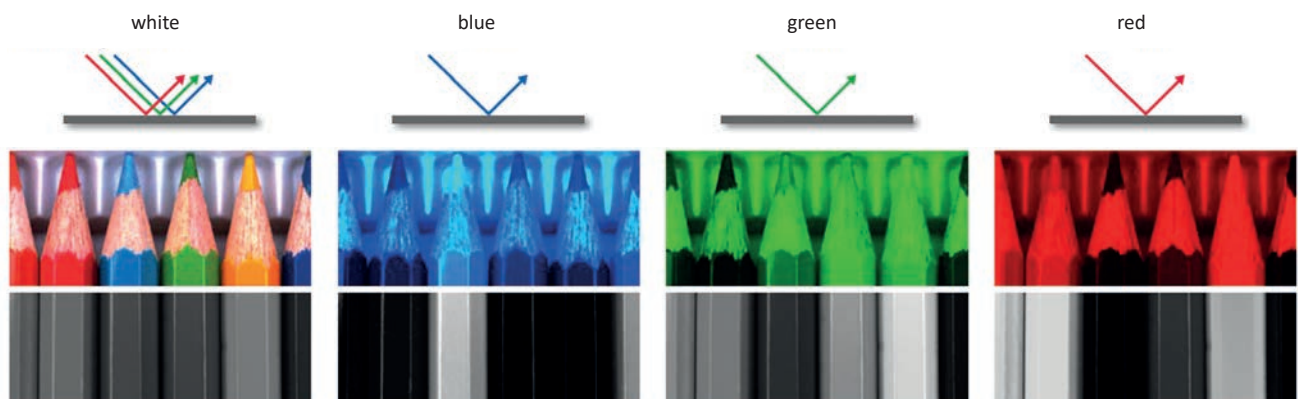
INDIVIDUAL REQUIREMENTS
WHETHER SHORT OR LONG – CORRECTLY IDENTIFIED

A classic application for sensors in the metal industry: The aim is to identify the correct length of metric screws with a standard thread. In connection with this, the screws are transported in suspension on a rail and the parts which are not OK, i.e. screws that are too short or too long, are eliminated after the check. With an OC53, this task can be handled quickly and reliably.

At the same time, the camera sensor shows its strengths, even when it comes to flexibility. If, for example, the product type changes and as a result, screws have to be evaluated with a different length, this conversion is possible without a lot of work. Simply select the program that is prepared for the current product type and activate it in the camera sensor – and you're done.

At the same time, other product features (such as the thread length) can, in a manner of speaking, be checked in 'one go', i.e. with one photo shot. In any event, for each program, up to 32 product features can be queried without an OC53, i.e. the hardware, having to be adjusted to it.
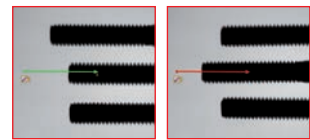
USING THE EDGE TO CHECK THE CAP
## CAMERA SENSOR INSPECTS VARICOLORED BOTTLE CAPS

In a filling station, up to 21,000 bottles are filled per hour, whereby the products are changed throughout the day. When the products are changed, the bottle type and bottle caps change as well. These objects have different colors and the level of gloss also varies. The bottle caps are to be inspected for 100% correct fit with an **OC53**.
Illumination adjusted to the application solves the problem of unique identification of the bottle caps which vary in color and level of gloss.

For bottle cap monitoring, the „edge contour" feature check is selected in the configuration software available for the **OC53**. The object contour is scanned with several search beams here and the calculated contour distance is compared with defined conditions per search beam. The outer bottle cap contour is checked perpendicularly from above in a circular scanning range which is situated over the outer cap contour. Position detection and tracking using the cap contour ensures that the bottles are located in the center of the detection range of the **OC53** during transport.

The edge monitoring feature check ensures that a cap is completely affixed to the bottle. If a contour distance is recorded by all search beams, an additional inspection is performed with a predefined differential value (difference from the comparison of the distances of the longest and shortest search beams). The difference value therefore marks the tolerance range for the permitted ovality of a cap. If it is too large, the cap is not correctly positioned and the bottle is NOK. A separate inspection task per cap version has been created and saved using the software to check all bottle caps despite their differences in color.
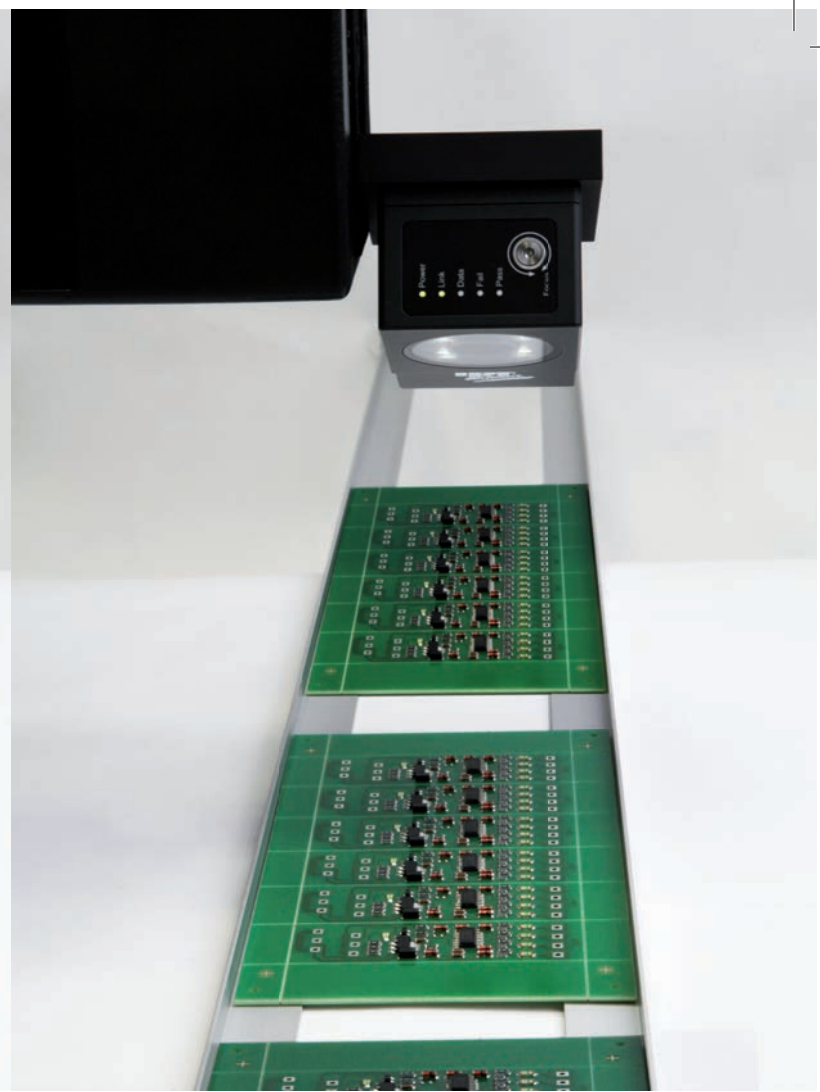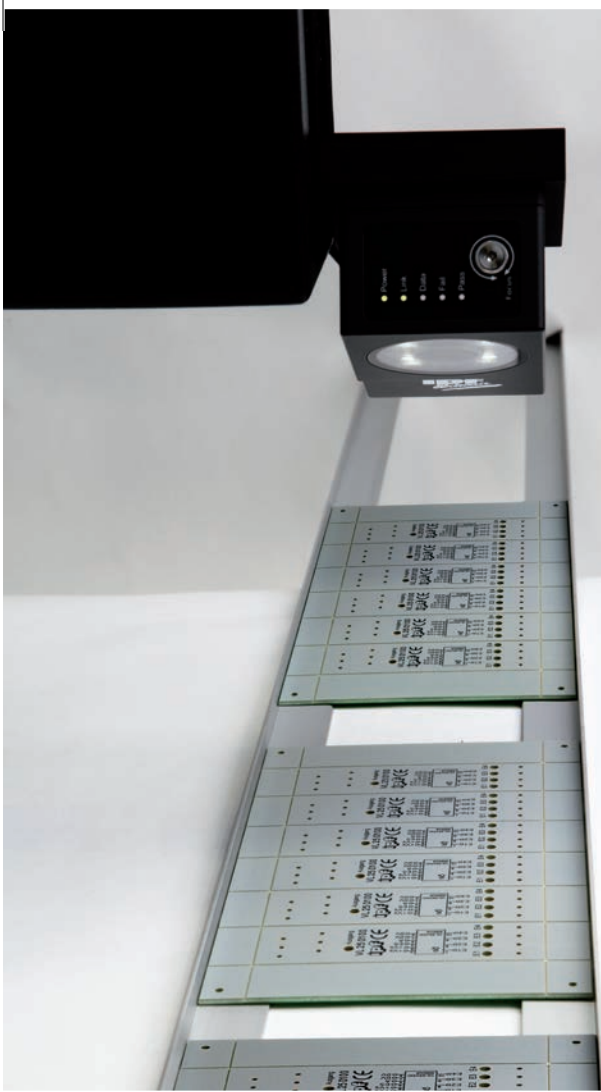
ALWAYS ECONOMICAL
DESPITE EVER GREATER DEMANDS

The electronics industry has extremely high demands when it comes to the manufacturing quality of its suppliers. In this application, several imprinted circuit boards are located on a larger printed circuit board (panel). In this case, an **OC53** is not only able to reliably check the quality of the print but upon request, it is also able to simultaneously check the labeling of each circuit board, e.g. for an incorrect or correct article number. For this comparison, the user only has to teach in the reference.

By the way, the recognition of text (text, date or a combination of numbers) takes place any time without intensive teaching.

In a second case, the task was to check the reverse side of circuit boards 'in panels' in order to ensure that electronic components were complete. Regardless of whether, in the worst scenario, a circuit board is not fitted at all, or alternatively, it is only a component that is missing from the circuit board, an **OC53** can securely spot the problem without complex parameterization. Accordingly, with the versatility of the **OC53**, it is possible to realize the production of electronic components in a way which is always able to meet high, and in addition, increasing demands.
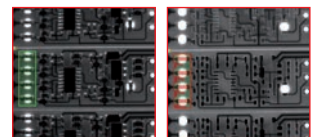
CONVINCING PRACTICAL EXAMPLES
GET A PERSPECTIVE, EVEN UNDER TOUGH CONDITIONS

The task here was to check the fill level of PET bottles. For conventional sensors, this is not an easy task for a variety of reasons: Structures on the material surface, drips or wet refraction anomalies inside the bottle, welds in the material, and many other things besides. Furthermore, when checking fill levels, a very limited distance is often necessary between the detection range and the conventional sensor – with the potential hazard of collisions in the transport system. These are all problems and challenges which can be comfortably forgotten with the **OC53**.

In the desired area of the bottle, the fill level is simply taught in. The verification program is activated and the camera sensor can start its work. Where necessary, it takes on other checking tasks in an application of this type, e.g. to see whether there is a top on the bottle and/or in addition, to check whether it is sitting correctly. The large range of tools and their application-orientated combination make this possible, and much more besides.

EFFICIENT ADVICE ON ALL MATTERS
PERSONAL SERVICE AND RAPID SOLUTIONS FOR YOUR PROBLEMS

Every call is important! When you contact our technical hotline, you contact experienced employees who will answer your questions competently and conscientiously. Our goal is to provide you with comprehensive and individual advice around the clock. Our expert team of in-house trained personnel is here to support you.

In almost all industrial applications, problems are becoming ever more complex and varied. Solutions to these problems often require external expertise. You will find this expertise together with a high level of specialist and problem-solving competence at ipf electronic. We are happy to discuss tasks which may seem small with you. For us, this is a matter of course.

ipf electronic is a renowned supplier of industrial sensor technology and a reliable partner. No customer query is ignored and no on-site customer appointment is missed. Our extremely broad range of products will convince you.

Diversity, expertise, consultation and flexibility:
This is ipf electronic's recipe for success.

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