

# VISOR® vision sensors and the Eyesight vision systems

Image processing made simple!

## VISOR® Object Sensor from Page 62

### V10-OB-S1-W12

- Standard version configurable for 8 inspection tasks, up to 32 evaluations can be used for each inspection task  
>> Page 70

### V20-OB-A2-W12

- Advanced version configurable for 255 inspection tasks as required, with 255 evaluations per inspection task as desired
- Megapixel resolution  
>> Page 64



## VISOR® Color from Page 80

### V10C-CO-S2-W12

- Standard version for colour detection with up to 8 inspection tasks and up to 32 evaluations  
>> Page 88

### V20C-CO-A2-W12

- Advanced version for colour detection and object detection with up to 255 inspection tasks and up to 255 evaluations  
>> Page 82



## VISOR® Solar Sensor from Page 98

### V10-SO-S1-W6

- Standard version for detecting position and breakouts of wafers and cells
- Easy operation without previous knowledge of image processing  
>> Page 104

### V10-SO-A1-W6

- Advanced version for the comprehensive measurement of wafers and cells
- With busbar detection  
>> Page 106



## Eyesight Vision Systems from Page 112

### V20-EYE-A2-C

- Megapixel resolution (1280 x 1024 pixels) for higher precision  
>> Page 116

### V10-EYE-A1-C

- Complete image-processing package with robust and flexible hardware
- Standard resolution (736 x 480 pixels)  
>> Page 122



SensoPart covers the entire range of industrial image processing with its portfolio of vision solutions – from VISOR® plug & play solutions for standard applications to the freely configurable Eyesight vision system for particularly complex automation tasks.

### Camera + Software = Vision!

A powerful smart camera in compact tightly sealed sensor housings with uniform dovetail mounting forms the basis of our VISOR® vision sensor and Eyesight vision systems. Among other features, it has integrated signal processing, LED illumination (white, red, infrared, UV), data interfaces and digital I/Os, integrated optics or C-mount, as well as user-friendly configuration software.

Most of the inspection tasks that are required in practice can be solved with one of our VISOR® vision sensors that are ready for use in just a few steps. With up to 50 evaluations per second, our VISOR® vision sensors are also the right choice for rapid processes.

And for particularly complex cases we offer the Eyesight, a flexible vision system with which you can also implement your most sophisticated automation requirements.



#### C-mount variants:

- C-mount for many variants; can be combined with C-mount protective casings
- VISOR® V20 variants with megapixel resolution for high precision

## VISOR® Code Reader

from Page 152

### V20-CR-P2-R12

- Professional version with optical character reading (OCR)
  - Megapixel resolution
- >> Page 132

### V10-CR-A1-R12

- Advanced version for detection of 1D/2D codes and objects
  - Reads several different code types in a single reading pass
- >> Page 146



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 made in Germany



**Object detection and classification:**  
The VISOR® object sensor monitors the sorting of parts and regulates ejection.



**Detection of coloured objects:**  
The VISOR® Color sensor detects not only colours and colour intensities, but also "non-colours", i.e. white, black and grey.



**Positioning and inspecting solar cells:**  
The VISOR® Solar sensor detects the position and orientation of wafers and cells, as well as any damage.



**Code reading:**  
The VISOR® Code Reader detects all common printed and directly marked data matrix and bar codes.

**Ready, steady, go!**

VISOR® vision sensors – complexities made easy



**Unpack, adjust and off you go** – vision sensors have never before been so powerful and so easily and intuitively operated. The VISOR® is ready for operation in only ten minutes with just a few mouse clicks. Thanks to VISOR® technology from Sensopart, there is now also a simple and effective solution for the most difficult automation tasks. Whether objects with complex shapes, colour detection, data matrix codes, self-illuminating display elements, or edge breakouts on solar cells, our application-specific vision sensors reliably detect all relevant object features.

It's all there.



Figure 1:1



C-mount variants for long operating distances

# VISOR® object sensor

## System description

The VISOR® object sensor from SensoPart not only impresses with its excellent performance data, but also with its sophisticated operating concept: even the definition of complex inspection tasks is achieved rapidly and without complication thanks to its comfortable and easily understood user interface – even without detailed image-processing knowledge. You define and test your inspection tasks (“job”) and desired evaluations (“detectors”) in a few intuitive setup steps.

The effect of every setting is immediately visible in the image. Comprehensive logic functions allow the direct assignment of more complex inspection results to one of six digital result outputs (or even to 32 switching outputs via the I/O expansion module available as an accessory). Time-based control of signal output is also possible via the integrated encoder function. The integrated image recorder, with which you can carry out fault analyses and simulations, is also very helpful.

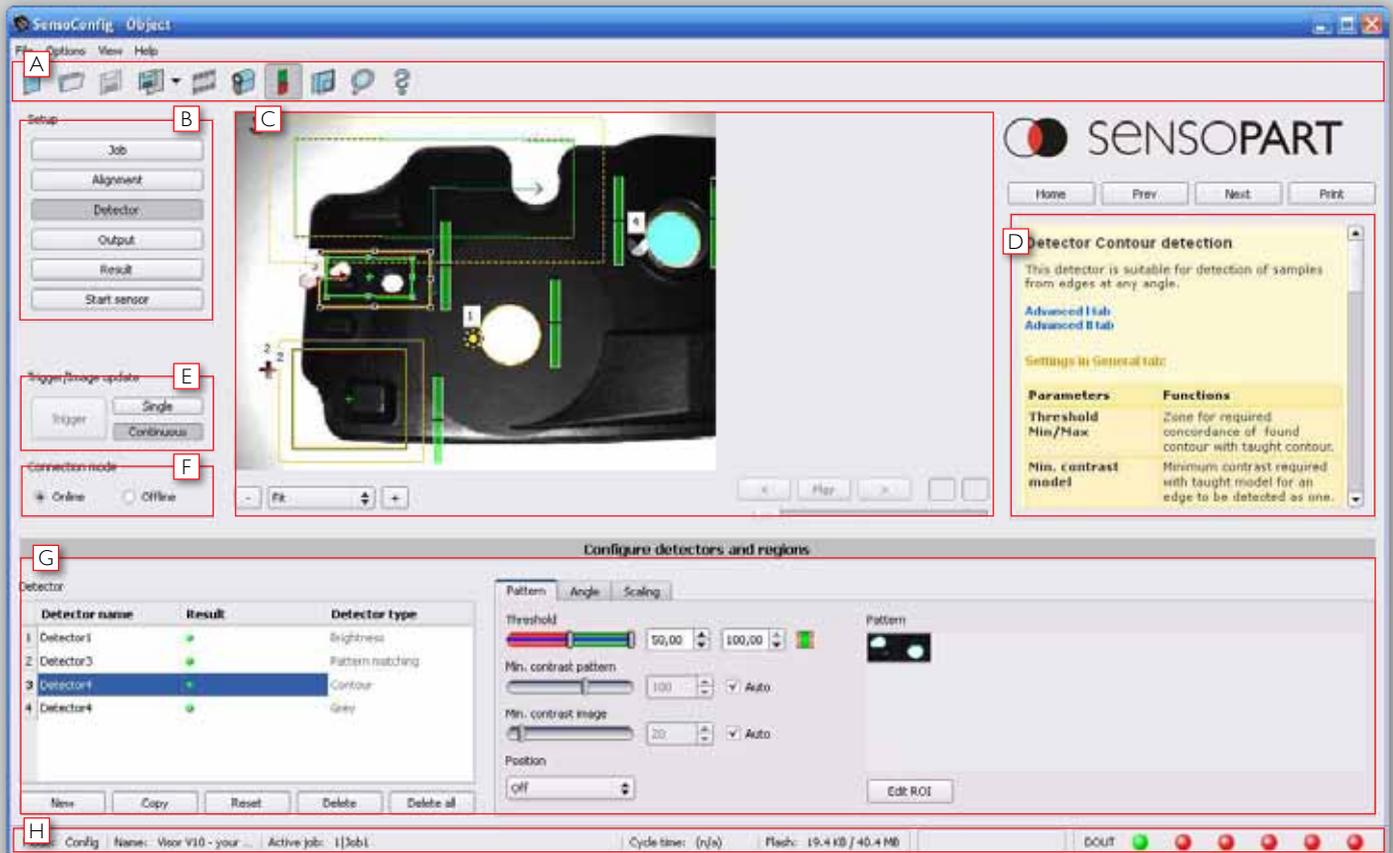
**Everything in view with the Viewer:** after completing configuration, the vision sensor works in your production plant autonomously, i.e. without a PC connection. Of course, data can be called up at any time during running operation: our own Viewer software with heriarchical user rights (reliably preventing unintentional changes to the configuration) is available for this. Professional image processing can be so simple and comfortable!

### Step-by-step to your goal

1. **Job:** select an inspection task or create a new one.
2. **Position tracking:** define a position detector (optional).
3. **Detectors:** define the desired evaluations.
4. **Output:** assign the inspection results to the switching outputs.
5. **Results:** test your configuration.
6. **Start the sensor:** run your job on the sensor.

### Product variants: the VISOR® object sensor

Features/sensors	Standard	Advanced
<b>Functions</b>		
Resolution V10 in pixels	736 x 480	736 x 480
Resolution V20 in pixels	–	1280 x 1024
Image rate per second V10   V20	50   –	50   40
Number of jobs   detectors	8   32	max. 255   max. 255
Position tracking	Contour only	✓
Contour (X-, Y-translation, rotation)	✓	✓
Pattern comparison (X-, Y-translation)	✓	✓
BLOB	–	✓
Calliper	–	✓
Grey threshold	✓	✓
Contrast	✓	✓
Brightness	✓	✓
Freeform Tool	Contour only	✓
<b>Interfaces</b>		
Inputs   outputs	2   4	2   4
Freely definable switching outputs/ inputs, PNP or NPN	2	4
Encoder input	–	✓
I/O expansion	–	✓
RS232   RS422	–   –	✓   ✓
Ethernet/data transmission	✓	✓
EtherNet/IP	✓	✓
PROFINET	✓	✓
<b>Lens</b>		
V10 integrated, 6 mm   12 mm   25 mm	✓   ✓   –	✓   ✓   ✓
V20 integrated, 12 mm	–	✓
C-mount	–	✓
<b>Operation/visualisation</b>		
Viewer software with user guidance	✓	✓
Hierarchical user rights	✓	✓



**Overview of the user interface**

- A **Menu bar:** rapid access to the most important functions
- B **Setup navigation:** dependable user guidance through the configuration process
- C **Image window:** live picture of the object with graphic display of inspection area and results
- D **Context help:** precise information on every work step
- E **Trigger function:** triggered operation or free-running, single picture or serial switching
- F **Online/offline operation:** operating with sensor connected or simulation with stored pictures
- G **Configuration window:** input of parameters for every navigation step
- H **Status line:** current information on active job and on state of outputs

# VISOR® Color

## System description

The vision colour sensors of the VISOR® Color series offer comprehensive functions for detecting coloured objects. Instead of the usual monochrome imaging chip they are equipped with a colour chip with a resolution of up to 1.3 megapixels (V20).

The comprehensive selection of detectors for object detection corresponds to the functional range of VISOR® object sensors. In addition to the detectors for sample comparison, contour, contrast, grey level, brightness and position tracking (selectable via sample comparison, contour or edge scanning), the VISOR® Color is also equipped with three detectors for colour detection. Three colour spaces (RGB, HSV, Lab) and several colour channels are available.

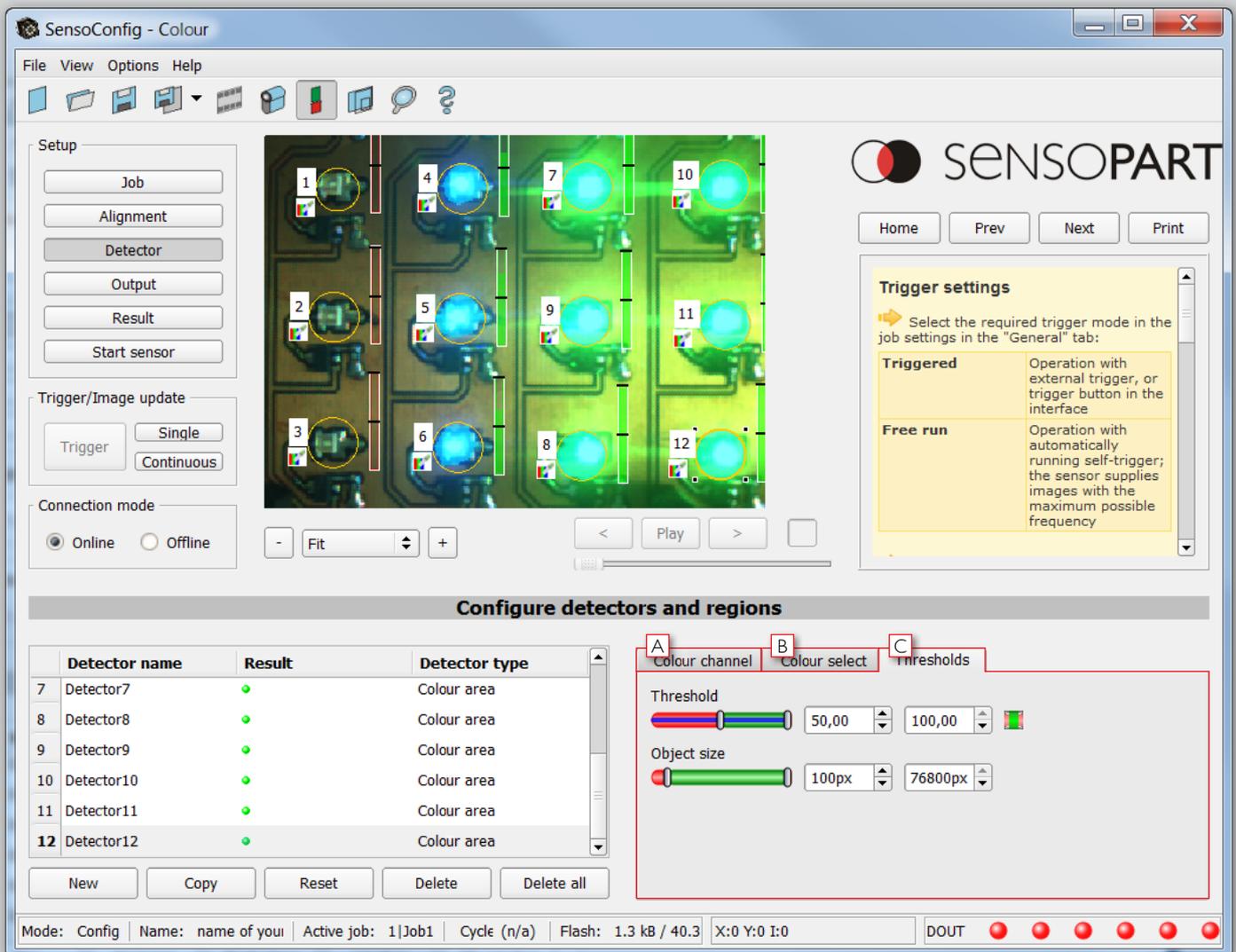
With the new colour detectors, the VISOR® Color is capable of differentiating between the finest of colour nuances. Any desired number of colours, colour gradients or colour patterns can be stored in the sensor memory and called up on demand. Moreover, objects with similar colours can be searched for.

### Uniform operation for all VISOR® sensors

Setup of the VISOR® Color takes place via the proven intuitive user interface of the VISOR® series, with which even complex inspection tasks can be configured without detailed knowledge of image processing. Inspection tasks (jobs), position tracking (alignment) and the desired evaluations (detector) can be configured and tested in a few intuitively understandable setup steps. The effect of every setting is immediately visible in the image. Comprehensive logic functions allow the direct assignment of complex inspection results to one of six digital results outputs. With the help of the I/O expansion, available as an accessory, it is even possible to trigger up to 32 supplementary switching outputs.

## Product variants: VISOR® Color

Features/sensors	Standard	Advanced
<b>Functions</b>		
Resolution, V10	736 x 480 Color	736 x 480 Color
Resolution, V20	–	1280 x 1024 Color
Image rate per second V10   V20	40   –	40   20
Number of jobs   detectors	8   32	max. 255   max. 255
Position tracking	Contour only	✓
Contour (X-, Y-translation, rotation)	✓	✓
Sample comparison (X-, Y-translation)	–	✓
BLOB	–	✓
Calliper	–	✓
Grey level	–	✓
Contrast	✓	✓
Brightness	–	✓
Colour value	–	✓
Colour area	✓	✓
Colour list	–	✓
Free-form tool	–	✓
<b>Interfaces</b>		
Inputs   outputs	2   4	2   4
Freely definable switching inputs / outputs, PNP or NPN	2	4
Encoder input	–	✓
Interface for IO box	–	✓
RS232   RS422	–   –	✓
Ethernet / Data transfer	✓	✓   ✓
EtherNet / IP	✓	✓
PROFINET	✓	✓
<b>Lens</b>		
V10 integrated, 6 mm   12 mm   25 mm	✓   ✓   –	✓   ✓   ✓
V20 integrated, 12 mm	–	✓
C-mount	–	✓
<b>Operation / visualization</b>		
Viewer software with user guidance	✓	✓
Graded user rights	✓	✓



### Overview of the user interface

- A Colour channel:** selection of the colour space and the colour channels in which the detector is to operate.
- B Colour selection:** setting of the colour to be searched for.  
A good/bad result is generated depending on the proportion of the area.
- C Thresholds:** setting of the threshold for the good/bad signal.

# VISOR® Solar sensor

## System description

### The tailor-made solution for wafer handling.

The VISOR® Solar sensor can be configured for image processing with a few clicks and without previous knowledge. The user defines the inspection criteria and selects the relevant information, e.g. wafer position and orientation, wafer dimensions, breakout depth, position and orientation of the busbar, or wafer quality.

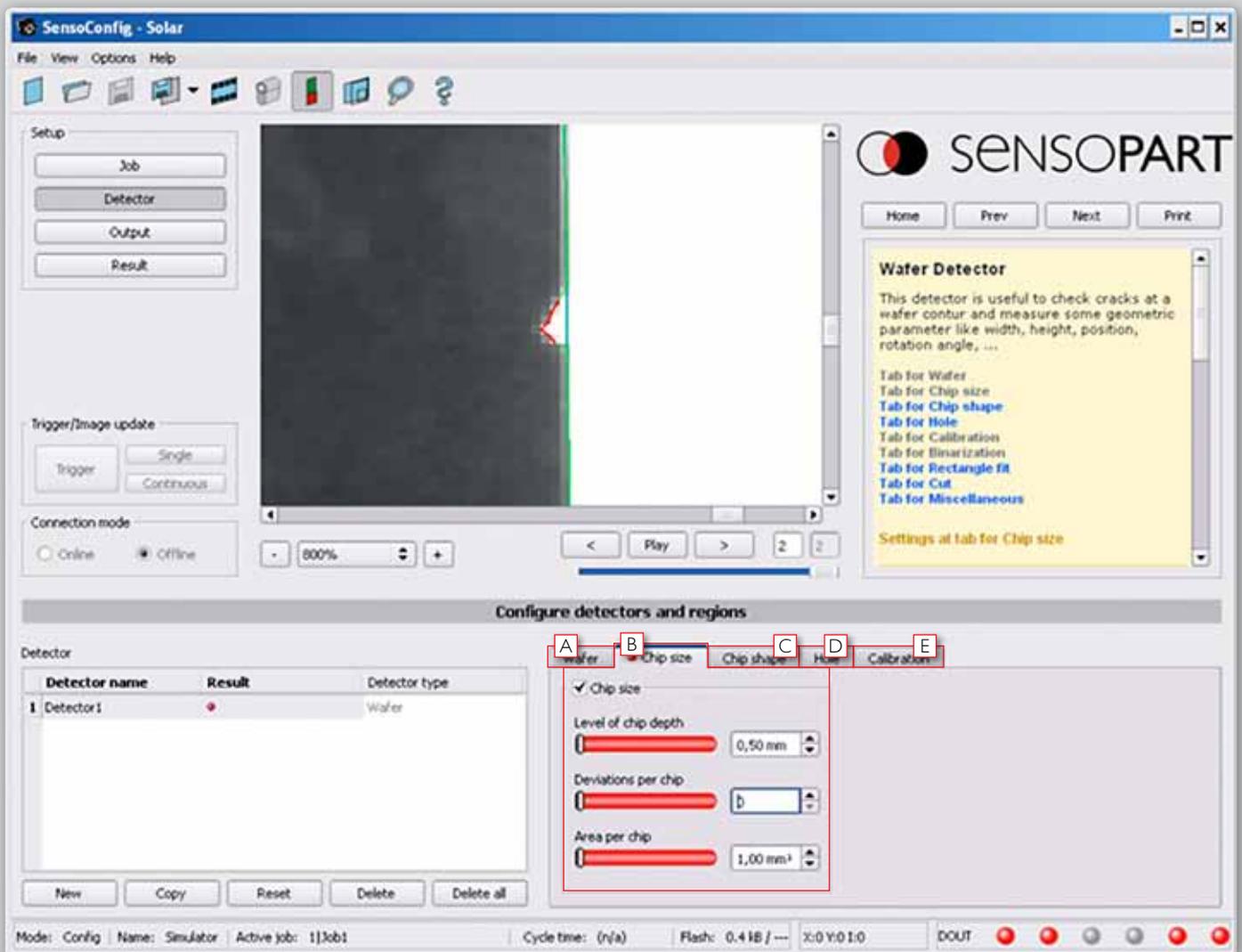
**Plug & play:** using the VISOR® Solar sensor is much easier than a classic image-processing solution. Because the functions relevant for wafer and cell inspections, e.g. the detection of wafer geometry and any defects, are already pre-configured so that the sensor is ready for operation after just a few mouse clicks. This is quick, doesn't cost much and functions wonderfully. Sunny times await you!

### HIGHLIGHTS OF THE VISOR® SOLAR SENSOR

- Simple integration
- Precise position detection
- Finds breakouts from depth
- Detection of holes
- Conveyor systems can be cut out
- Short cycle times from 60 ms
- Reliable operation, even in daylight
- No backlight necessary
- Little space required: operating distance from 360 mm

### Product variants: the VISOR® Solar sensor

Features/sensors	Standard	Advanced
<b>Functions</b>		
Resolution in pixels,V10	736 x 480	736 x 480
Resolution in pixels,V20	–	1280 x 1024
Image rate per second	50	50
Number of jobs   detectors	8   32	255   255
Position tracking	–	✓
Pattern comparison (X-,Y-translation)	–	✓
Grey threshold	✓	✓
Contrast	✓	✓
Brightness	✓	✓
Wafer position and breakouts	✓	✓
Busbar position and number	–	✓
Calliper	–	✓
<b>Interfaces</b>		
Inputs   outputs	2   4	2   4
Freely definable switching outputs/ inputs, PNP or NPN	2	4
Encoder input	–	✓
I/O expansion	–	✓
RS232   RS422	–   –	✓   ✓
Ethernet/data transmission	✓	✓
EtherNet/IP	✓	✓
PROFINET	✓	✓
<b>Lens</b>		
Integrated 6 mm   12 mm	✓   –	✓   ✓
C-mount	–	✓
<b>Operation/visualisation</b>		
Viewer software with user guidance	✓	✓
Hierarchical user rights	✓	✓



Overview of the user interface

- A **Wafer:** select wafer size.
- B **Breakout dimensions:** define good / bad criteria according to the size of the breakout.
- C **Breakout shape:** detection of differentiate shaped breakouts.
- D **Holes:** reject wafers with holes.
- E **Calibration:** the camera is calibrated with one click.

# Eyesight vision systems

## System description

Most image-processing applications can be rapidly and easily solved with pre-configured VISOR® vision sensors. However, their range of functions is not always sufficient for particularly demanding or specific tasks – but here, too, SensoPart has the right solution: the freely programmable Eyesight vision systems offer comprehensive configuration possibilities so that you can also implement very complex automation applications with the smart camera. Whereby complex is not synonymous with complicated: the graphic programming by means of drag & drop makes it easy for you to “construct” your own applications.

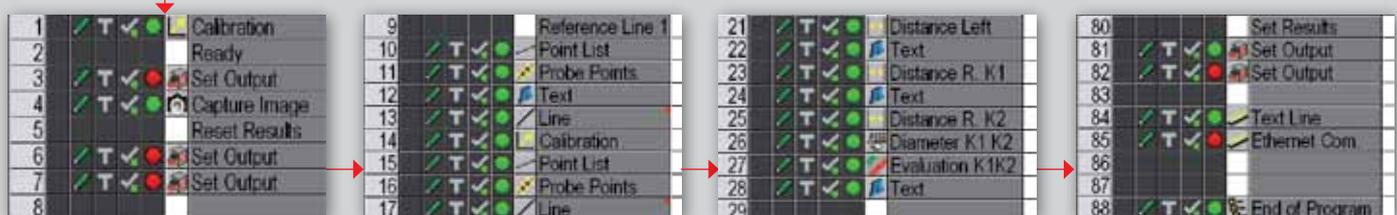
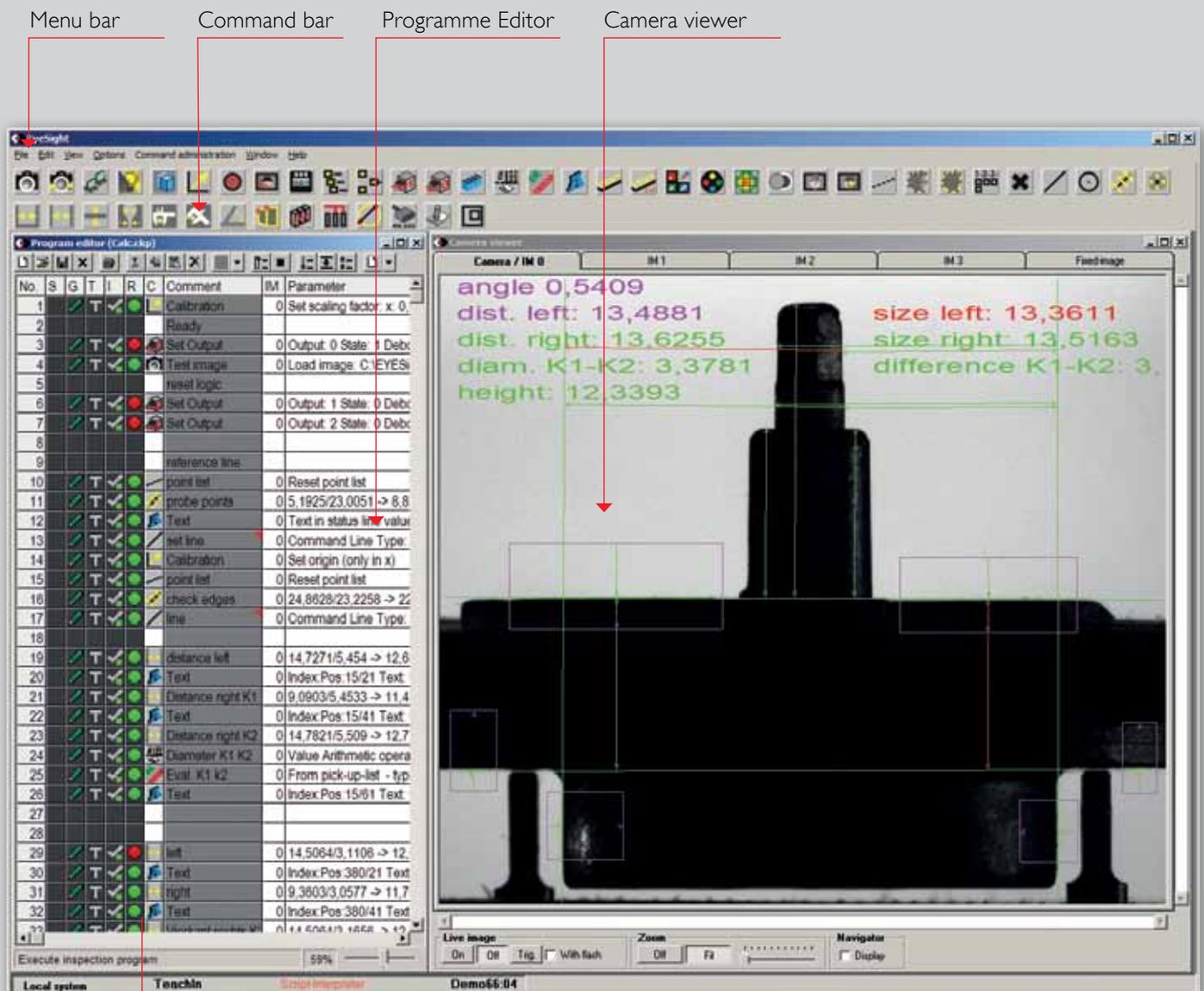
### EYESIGHT HIGHLIGHTS

- Complete image-processing package with robust and flexible smart camera
- Programming via drag & drop of function blocks
- Complex iterative linkage of individual inspections
- Image and result visualisation in inspection mode
- Interpreter for programming your own functions
- Image processing can be simulated on the PC without the camera
- Freely programmable data protocol for Ethernet and serial interface

## Product variants: the Eyesight vision systems

Features/sensors	V20 Advanced	V10 Advanced	V20C Advanced	V10C Advanced
<b>Functions</b>				
Resolution in pixels	1280 x1024, monochrome	736 x 480, monochrome	1280 x1024, color	736 x 480, color
Image rate per second	40	50	20	40
Number of inspection programmes	No limitation (max. 40 Mb)			
Function blocks	See overview of commands >> Page 60			
<b>Interfaces</b>	2   4	2   4	2   4	2   4
Inputs   outputs	4	4	4	4
Freely definable switching outputs/inputs	✓	✓	✓	✓
I/O expansion	✓   ✓	✓   ✓	✓   ✓	✓   ✓
RS422   RS232	✓	✓	✓	✓
Ethernet/data transmission				
<b>Lens</b>	-   ✓	✓   ✓	-   ✓	✓   ✓
Integrated 6 mm   12 mm	✓	✓	✓	✓
C-mount				
<b>Operation/visualisation</b>	✓	✓	✓	✓
Viewer software eye view				

## Overview of the user interface



### Step-by-step to your goal

#### Step 1

##### Image capture

- Calibration
- Reset outputs
- Enter triggered image

#### Step 2

##### Referencing

- Object position determination
- Define object reference lines
- Graphic provision of position

#### Step 3

##### Inspection of parts

- Measure distances/diameter
- Calculate difference values
- Define target/actual values
- Graphic provision of measurement values

#### Step 4

##### Output of results

- Set outputs according to results logic
- Transmit data to the master computer via Ethernet
- End programme

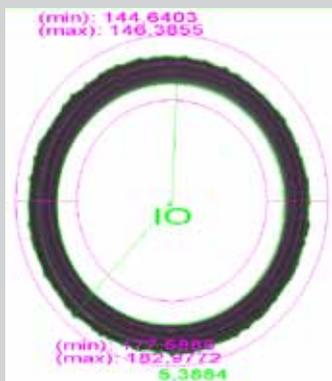
# Eyesight vision systems

## System description

### Overview of commands: Eyesight vision systems

<b>Image/camera</b> Image capture Camera settings	<b>Inputs/outputs</b> Text Data transfer; serial Data transfer; LAN (text line)	<b>Measurement</b> Measure gap width Calliper (hor./vert.) Calliper (free) Calculate angle Determine warpage point	<b>Pattern/contour comparison</b> Correlation <b>Scanning</b> Scan points Circular scanner Edge counter (straight) Find edges (projected) Search ring for counting
<b>Colours *</b> Select colour channel Colour inspection Colour filter	<b>Visualisation</b> Image transfer	<b>Programme control</b> Stop watch Control of sequence and loop options Run subprogramme Access variable Evaluation	<b>Access to libraries</b> Script Interpreter
<b>Pre-processing</b> Calibration and position tracking Correct brightness Remove background Filter functions	<b>Measurement</b> Image information Area test List of points Determine points Determine lines Calculate circle Calculate distance Line distance Calculate cross-section	<b>Sample/contour comparison</b> Count objects Inspect contour Track contour	

\* with colour version



#### Circle calculator:

Round objects or segments of circles can be measured with this tool for easy detection of deformations. An example of this would be checking for underfilling or overfilling during the plastic process.



#### Angle calculation:

Components can be tested for dimensional accuracy with the measurement tool. Angles on components, for example, can be determined and evaluated with the angle tool. The thread is also checked for completeness and the dimensions are checked with the help of the distance tool.



#### Distance calculation:

Any distances in the component can be measured and evaluated with the distance tool. In addition, radii, angles, and drilled holes can also be checked in an inspection programme.

# Accessories for VISOR® vision sensors and the Eyesight vision systems

## System description

Good lighting is all-important for image-processing applications – because the best evaluation system cannot compensate for anything that has already been lost during image capture. This is why all our vision systems have powerful integrated illumination that is more than bright enough for most applications. Supplementary illumination may be helpful, however, in critical lighting situations, e.g. with strong ambient light incidence, or highly reflective or strongly contoured objects. Sensopart offers a comprehensive selection of surface, ring and diffuse lighting with which all applications can be properly illuminated.

**Integrated lens or C-mount?** In most cases you will also have no problem with the integrated lens of your vision sensor. If necessary for the application, however, with very long measurement distances for example, a C-mount version with a separate lens is available.

The Sensopart range also covers all eventualities with other accessories, from mounting brackets, through interface cables, to I/O expansion. Because we want to be sure that you are missing nothing!

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### A few basics regarding good illumination



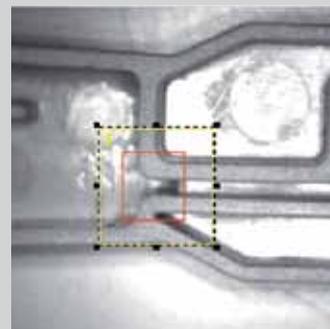
#### White, red or infrared light?

White light can be used everywhere because it includes the whole spectrum of light, so it achieves good contrast with objects of differing surface properties and colours. Red or infrared light is recommended, on the other hand, for the targeted highlighting or suppression of coloured object features or for eliminating ambient light effects.



#### Surface or ring lighting?

Every structure has its specific virtues. Surface lighting, for example, is often used for backlit applications in which the target object is lit from behind – so that the external contours are strongly highlighted. Very symmetrical incidental illumination can be implemented with ring lighting, and diffuse illumination is recommended for, among other things, strongly reflective surfaces.

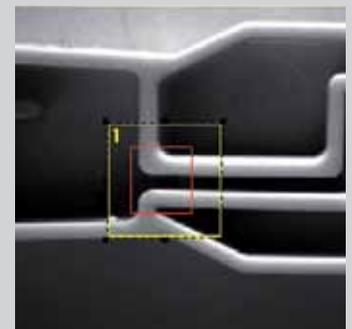


#### With a bright field

Edges and background are difficult to differentiate.

#### Light or dark field?

Targeted features can be amplified, and interfering effects suppressed, by using the right illumination. Light or reflective features are well differentiated when an object is illuminated from the direction of the sensor (light field); if the light is directed towards the sensor at a slight angle (dark field), the structures of the target object are more strongly differentiated.



#### With a dark field

Edges are clearly highlighted using dark field illumination.