

## VISOR<sup>®</sup> Product Overview

VISOR<sup>®</sup> vision sensors and systems for factory automation



## Calibration of vision sensors

Metric world and robot coordinates at a mouse click.



### Increased efficiency when setting up vision sensors:

Vision sensor intelligence has risen continuously over recent years and can be trusted with more and more complex tasks. The calibration function offered by the VISOR® series is a prime example: it saves considerable time when setting up pick and place applications, as there is no need for programming in the robot control system or PLC. This represents a significant boost in efficiency both for users and integrators.

# Contents

SensoPart: innovative, flexible, practical	Page 4
Compact image processing systems in a sensor	Page 6
Overview of vision sensors & systems	Page 12
VISOR <sup>®</sup> detectors, tools and interfaces	Page 16
Sectors and applications	Page 20
VISOR <sup>®</sup> versions and system descriptions	Page 28
Technical data	Page 52
Accessories	Page 54

# Vision with foresight

At SensoPart we already anticipate the future of automation



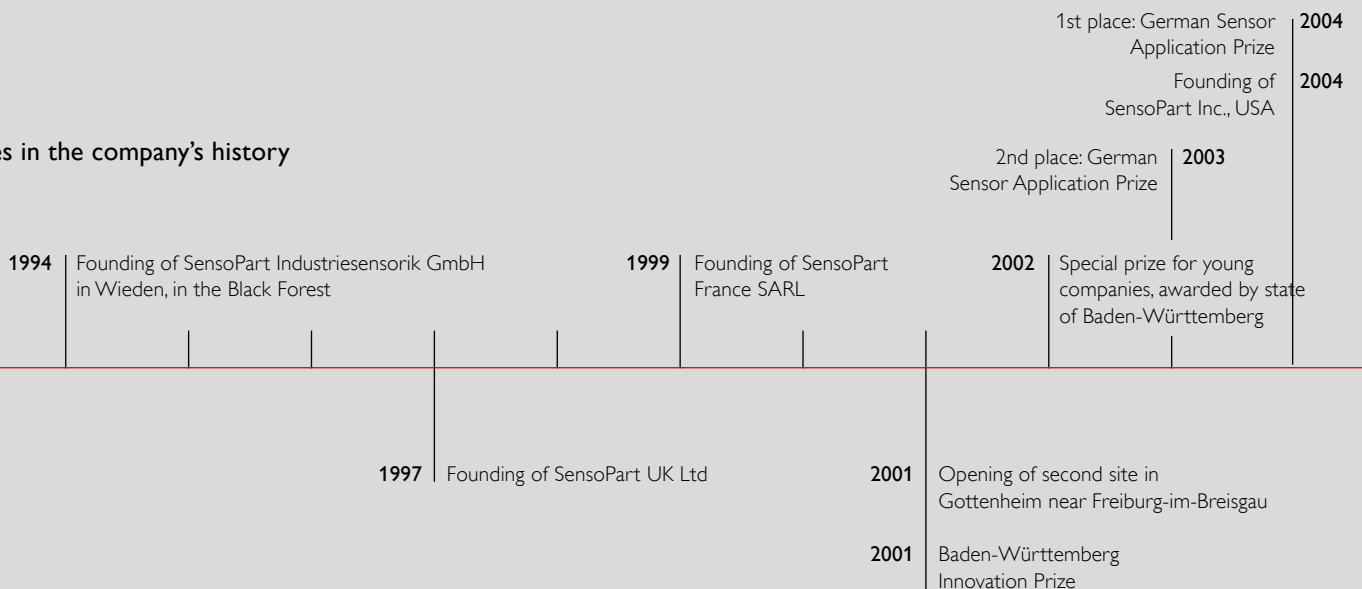
“Our standard is not what is possible today, but the vision of what will be achievable in future” – this has been our credo since the founding of SensoPart in 1994. Our aim is to remain one step ahead and be able to offer our customers the most innovative products on the market.

When we have identified a path as correct we follow it consistently. As a **family-run company** we can act independently and as we see fit – a major prerequisite for the extremely successful

development that SensoPart has achieved since its start.

Successful products, now considered indispensable for modern factory automation, have been created from the many future-oriented ideas of earlier days. But we do not simply rest on our laurels – because we still have many ideas for the future. Here the future concepts of **Industry 4.0** are playing an important role for us. Some of them have already been implemented with our products.

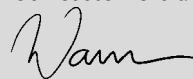
## Milestones in the company's history



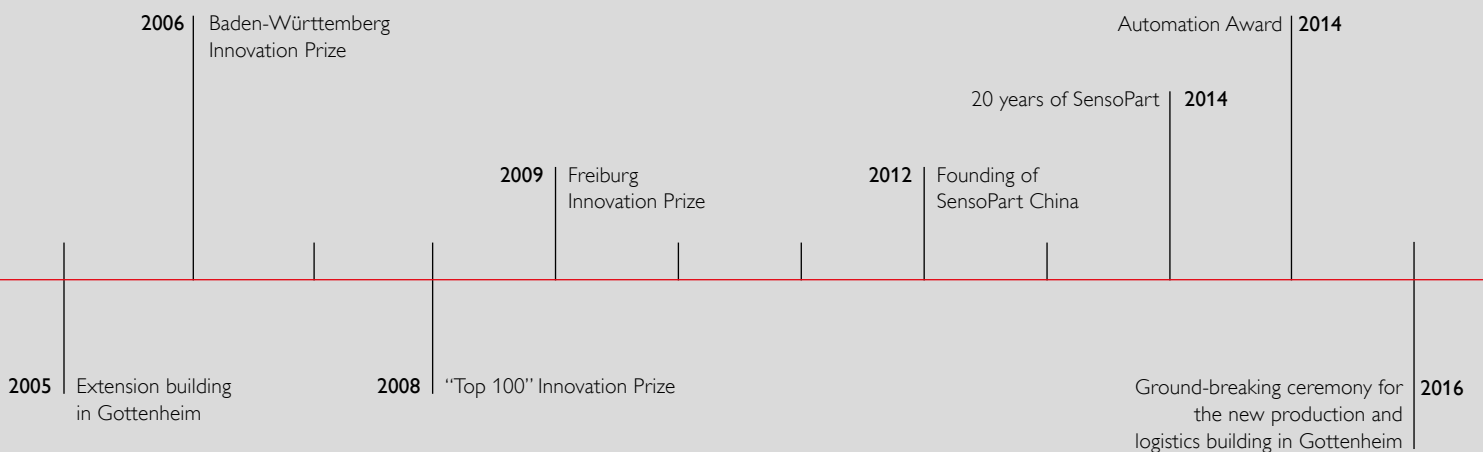


**“Dependability, responsibility and trust”**

SensoPart is a family-run German company and this also influences our attitude towards work: we believe that dependability is important, we take responsibility for our activities, and we value close and trusting relations within the company as well as with our customers and business partners.



**Dr. Theodor Wanner,  
Founder and Managing Director of SensoPart**



# Thoroughly equipped

Sophisticated design and extensive features

5 x ready-to-use VISOR® sensors:

- VISOR® Allround
- VISOR® Object
- VISOR® Code Reader (OCR)
- VISOR® Color
- VISOR® Solar

- User-friendly configuration software (also available offline)
- External panel PC for visualisation

- High-resolution monochrome or color imaging chip (736x480, 1280x1024 pixels)



- High-performance, integrated LED lighting (white, red, infrared, UV)
- Can be combined with external lighting

- Integrated lens (6, 12, 25 mm)
- Optional C/CS-mount version



- Integrated processing unit with high-performance signal processor
- Robust and vibration-resistant metal housing, IP 65 / IP 67
- Compact dimensions: 65 x 45 x 45 mm

Data, M12, 5-pin

- RS422/RS232
- Profibus via adapter
- I/O-extension box (8/32 I/Os)

- Status LEDs
- Focus adjustment

Power supply and I/O, M12, 12-pin

- Power supply
- I/Os
- Encoder
- External lighting

Configuration and data output, Ethernet, M12, 4-pin

- Ethernet
- EtherNet/IP
- PROFINET
- FTP/SMB archiving
- SensoWeb

- Simple and flexible installation using dovetail mount
- Extensive range of mounting accessories and holders

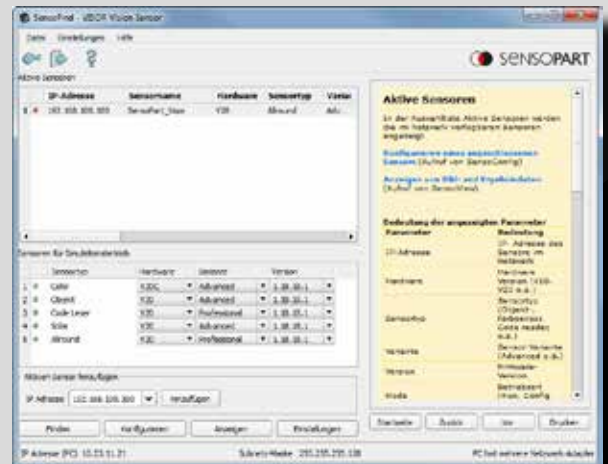
**Unpack, set up** – it's ready to run! Vision sensors have never been as easy and intuitive to use despite unprecedented levels of performance. The VISOR® is ready in just a few mouse clicks. Thanks to VISOR® technology from SensoPart, there is now a simple and effective solution for even the most challenging vision tasks. Whether these involve complex object shapes, color detection, data matrix codes, fluorescent display elements or edge chipping on solar cells – our application-specific vision sensors reliably detect all relevant object characteristics.

# Setup requires just a few simple steps

Complex tasks made easy - with VISOR® software packages

## SensoFind

Lists all the VISOR® vision sensors available in the network. Configuration or Viewer mode can be accessed directly from here and offline simulation can also be started.



## SensoConfig

VISOR® configuration software. Complex inspection tasks can be easily set up in a step by step process. The effect of each setting is immediately visible on the screen. Comprehensive logic functions enable the direct assignment of complex inspection results to one of six digital result outputs. The integrated image recorder, which enables error analysis and simulations, is also very useful.

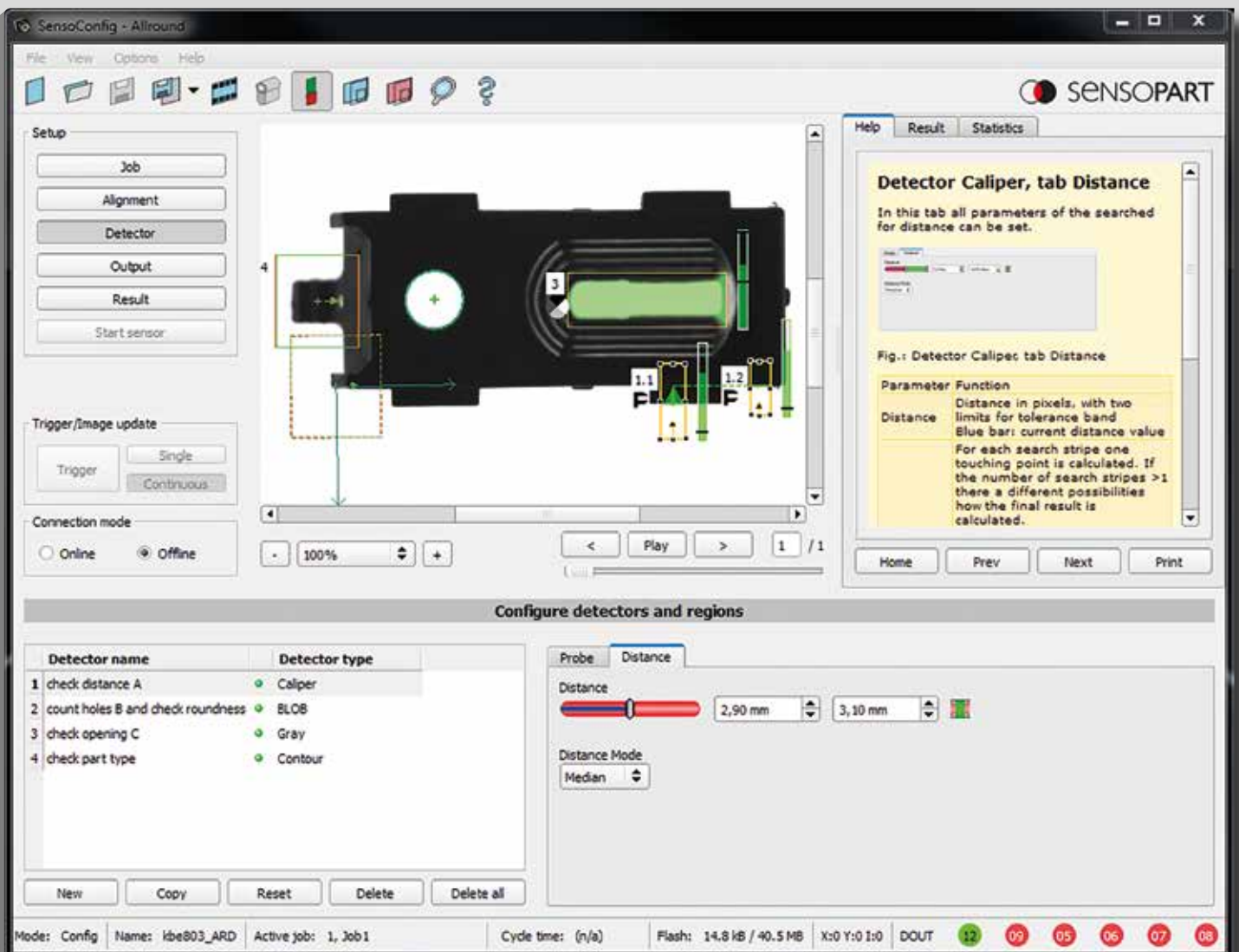


## SensoView & SensoWeb

Once configuration has been completed, the vision sensor operates as a free-standing unit - i.e. without a PC connection. Data can of course be called up at any time while the sensor is running; a unique viewer software 'SensoView' with restricted user rights is available for this purpose – inadvertent changes to configuration settings are thus reliably avoided. 'SensoWeb' enables easy connection to system visualisation by web browser. Professional image processing is that simple!







## Step by step guide

1. Set up job and image
2. Set up image tracking and detectors
3. Result output/communication

# A convincing portfolio

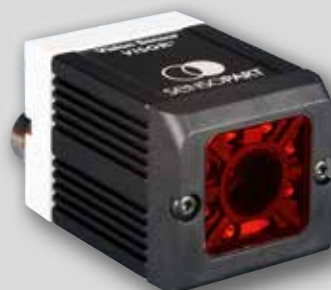
An impressive range of outstanding sensors

## Advantages of VISOR® vision sensors

- Universal interface for all VISOR® devices, which means universal PLC modules
- Versions with increased depth of field, so no need for autofocus
- PROFINET with update rate of 4 ms, incl. image transmission
- Easily configurable image processing tools and preprocessing filters for reliable evaluation
- Image resolution can be scaled in software for high-speed analysis
- Standardised electrical and mechanical design
- ONE VISOR® software for ALL versions – this minimises the need for training



VISOR® white



VISOR® red



VISOR® infrared



VISOR® C-mount

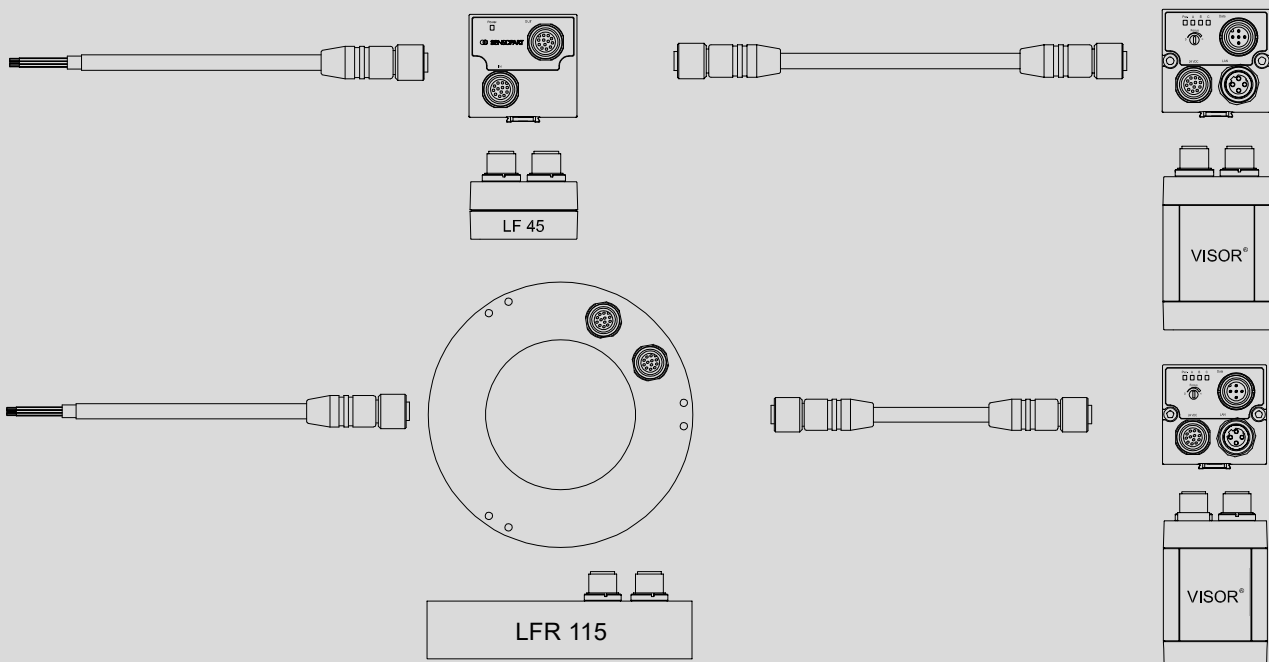
# Easily extendible

Innovative and user-friendly accessory and mounting concept



The MG 3A mounting bracket can be combined with mechanical accessories and external lighting.

External lighting can be controlled via VISOR®.



External lighting (panel light LF 45, ring light LFR 115) can be connected directly between the vision sensor and power supply.

# VISOR® vision sensors and the Eyesight vision systems

Image processing can be so easy

## VISOR® Allround



### Object detection and identification in one device

- All evaluations ("Detectors") of object sensor and code reader combined in one device
- Highly accurate evaluation via 1.3 megapixel chip
- Color and Monochrome versions available

## VISOR® Object sensor



### Reliable detection and classification of objects

- Precise determination of X/Y position, orientation and tracking
- High evaluation accuracy through 1.3 megapixel chip
- Comprehensive logic functions for the digital switching outputs
- Flexible definition of output data (header; trailer; net data)

## VISOR® Color



### Improved object detection through supplementary color information

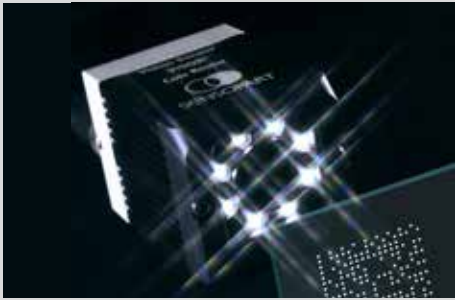
- Powerful color detection, even with small color nuances or self-lighting components
- Powerful part-finding and tracking
- High evaluation accuracy through 1.3 megapixel color chip
- Up to 6 digital switching outputs each separately configurable

## Camera + software = vision!

With its portfolio of vision solutions, SensoPart covers the entire range of industrial image processing, from VISOR® Plug & Play solutions for standard applications to the freely configurable Eyesight vision system for particularly complex automation tasks.

Our VISOR® vision sensors and Eyesight vision systems are based on a powerful smart camera in compact, tightly sealed sensor housings with uniform dovetail mounting. Among other things, they offer integrated signal processing, LED illumination (white, red, infrared, UV), data interfaces and digital I/Os, integrated optics or C-mount, and user-friendly configuration software.

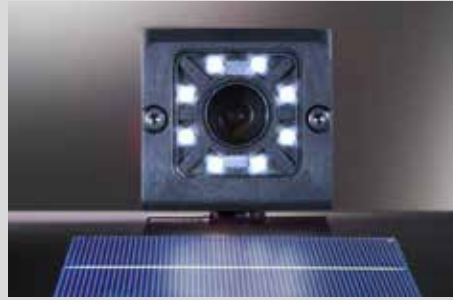
## VISOR® Code Reader



### Reading of bar codes and data matrix codes, as well as detection of optical characters (OCR)

- Reliably reads bar codes as well as printed and directly marked data matrix codes, also several codes simultaneously and 1D/2D codes in combination
- Supplementary object detection for features outside the code
- Evaluation of quality parameters according to ISO/IEC 15415 and AIM DPM 2006
- Flexible definition of output data (header, trailer, net data)
- String comparison with signalling via the digital switching output

## VISOR® Solar sensor



### Positioning and inspection of solar cells

- Simple integration
- Precise position detection to  $\pm 50 \mu\text{m}$
- Outbreaks can be detected up to a depth of 0.50 mm
- Detection of differing outbreaks
- Detection of holes
- Transport systems can be suppressed

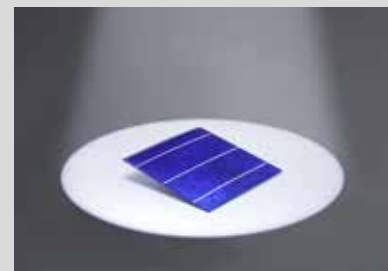
## Eyesight vision system



### Complete image processing package with robust smart camera

- Programming of function blocks via drag & drop
- Complex iterative linkage of individual inspections
- Visualisation of images and results in test mode
- Interpreter for programming one's own functions
- Image processing can be simulated on a PC without a camera

# Product overview – vision sensors and systems










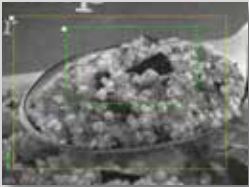










Features/sensors	VISOR® Allround			VISOR® Object Sensor	
	V10/V20 Advanced	V10C/V20C Advanced	V20 Professional	V10 Standard	V10/V20 Advanced
<b>Highlights</b>	Object detection and identification			Object detection and classification	
	–	Color area	–		
	–	Color list	–		
	–	Color value	–		
	Data code	Data code	Data codes		
	Bar code	Bar code	Bar codes		
	Optical character recognition (OCR)	Optical character recognition (OCR)	Optical character recognition (OCR)		
	–	–	Multishot		
<b>Functions</b>					
Resolution in pixels V10	736 x 480 Mono	736 x 480 Color	–	736 x 480 Mono	736 x 480 Mono
Resolution in pixels V20	1280 x 1024 Mono	1280 x 1024 Color	1280 x 1024 Mono	–	1280 x 1024 Mono
Image rate per second V10   V20	50   40	40   20	–   40	50   –	50   40
Number of jobs   detectors	max. 255   max. 255	max. 255   max. 255	max. 255	8   32	max. 255   max. 255
Position tracking	✓	✓	✓	✓	✓
Calibration	✓	✓	✓	–	✓
Contour matching (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	2   4	2   4	2   4
Freely definable switching outputs/inputs, PNP or NPN	4	4	4	2	4
Encoder input	✓	✓	✓	–	✓
I/O expansion	✓	✓	✓	–	✓
RS 422   RS 232	✓   ✓	✓   ✓	✓	–   –	✓   ✓
Ethernet	✓   ✓	✓   ✓	✓	✓	✓
EtherNet/IP	✓   ✓	✓   ✓	✓	✓	✓
PROFINET	✓   ✓	✓   ✓	✓	✓	✓
SensoWeb	✓	✓	✓	✓	✓
<b>Lens</b>					
V10 integrated, 6mm   12mm   25mm	✓   ✓   ✓	✓   ✓   ✓	–	✓   ✓   –	✓   ✓   ✓
V20 integrated, 12mm	✓	✓	✓	–	✓
C-mount	✓	✓	✓	–	✓



VISOR® Color		VISOR® Code Reader			VISOR® Solar Sensor	
V10C Standard	V10C/V20C Advanced	V10 /V20 Standard	V10/V20 Advanced	V20 Professional (OCR)	V10 Standard	V10/V20 Advanced
Improved object detection through additional color information		Code reading			Positioning and inspecting solar cells	
Color area	Color area				Wafer position and breakouts	Wafer position and breakouts
–	Color list				–	Busbar position and number
–	Color value	Data code	Data code	Data code		
		Bar code	Bar code	Bar code		
		–	–	Optical character recognition (OCR)		
736 x 480 Color	736 x 480 Color	736 x 480 Mono	736 x 480 Mono	–	736 x 480 Mono	736 x 480 Mono
–	1280 x 1024 Color	1280 x 1024 Mono	1280 x 1024 Mono/Color	1280 x 1024 Mono/Color	–	1280 x 1024 Mono
40   –	40   20	50   40	50   40	–   40	50   –	50   40
8   32	max. 255   max. 255	8   2	max. 255   max. 255	max. 255   max. 255	8   32	max. 255   max. 255
✓	✓	–	✓	✓	–	✓
–	✓	–	–	–	–	–
✓	✓	–	–	–	–	–
–	✓	–	✓	✓	–	✓
–	✓	–	–	–	–	✓
–	✓	–	–	–	–	✓
–	✓	–	✓	✓	✓	✓
✓	✓	–	✓	✓	✓	✓
–	✓	–	✓	✓	✓	✓
–	✓	–	✓	✓	–	✓
2   4	2   4	2   4	2   4	2   4	2   4	2   4
2	4	2	4	4	2	4
–	✓	–	✓	✓	–	✓
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–   –	✓   ✓	✓   ✓	✓   ✓	✓   ✓	–   –	✓   ✓
✓	✓	✓	✓	✓	✓	✓
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✓	✓	✓	✓	✓	✓	✓
✓   ✓   –	✓   ✓   ✓	✓   ✓   ✓	✓   ✓   ✓	–	✓   –   –	✓   ✓   –
–	✓	✓	✓	✓	–	✓
–	✓	–	✓	✓	–	✓

# VISOR® vision sensor

## Detectors and application examples
















Identification			
 <b>Barcode</b>	Reading and quality assessment of most barcode types, such as EAN, UPC, RSS, 2/5 Interleaved, 2/5 Industrial, Code 32, Code 39, Code 93, Code 128, GS1, Pharmacode, Codabar.		-
 <b>Data code</b>	Reading and quality assessment of 2D codes, such as ECC200, QR code, ECC200 (GS1), QR code (GS1), PDF 417. High-performance decoder algorithm for directly marked, low-contrast and damaged codes.		-
 <b>OCR</b>	Optical character reading of printed, laser-etched or dot-peened characters. High reading rate with difficult characters or fluctuating marking quality through use of neural networks. Easy to use. Fast segmentation mode for high reading rates.		-
Object detection		✓ ok	✗ not ok
 <b>Pattern matching</b>	Object search based on pattern matching: once a pattern has been taught, consecutive images are then scanned for the same pattern. The degree of similarity can be defined by switching thresholds. Free form function for teaching random shapes.		
 <b>Contour</b>	Object search based on contour comparison: once a contour has been taught, images are then scanned for the same contour. The degree of similarity can be defined by switching thresholds. Free form function for teaching random shapes. Orientation and scaling variations are configurable.		
 <b>Contrast</b>	Contrast analysis in search zone. Definition of result output via switching threshold.		
 <b>Brightness</b>	Brightness analysis in search zone. Definition of result output via switching threshold.		






Object detection (continued)		✓ ok	✗ not ok
 <b>Grey threshold</b>	Analysis of grey threshold in search zone. Definition of result output via switching threshold.		
 <b>Calliper</b>	Measurement of the distance between edges. Diverse detection options. Measurement of minimum, maximum or averaged distance values Innovative visualisation of detected edges. Definition of measurement sensitivity by dividing the measurement field into search beams.		
 <b>BLOB</b>	Counting and evaluation of objects Analysis and sorting of objects based on user-defined criteria (area, height, width, circumference, position face up/face down and more).		
Color detection		✓ ok	✗ not ok
 <b>Color value</b>	Output of color values via interfaces, setting options for color space: RGB, HVS, LAB.		-
 <b>Color list</b>	Color evaluation via list: find a color from a list of taught colors, evaluation of colors according to color deviation (delta e) in the color spaces RGB, HSV and LAB.		
 <b>Color area</b>	Color evaluation via area: evaluation of interrelated color area according to size and color: Innovative configuration via histogram for color spaces RGB, HSV and LAB.		

# VISOR® Vision-Sensor

## Detectors and application examples

Object detection for solar cells		✓ ok	✗ not ok
 <b>Wafer</b>	<p>Detection and inspection of solar cells. High-precision detection of position of solar cells. Checking solar cells for chipping. Analysis of chipping based shape and surface area. Detection of holes. Correction of camera's optical distortion.</p>		
 <b>Busbar</b>	<p>Detection and inspection of busbars. Finding and analysing busbars. Identifying centre of busbars. Suitable for continuous and individual busbars.</p>		
Position tracking			
 <b>Edge detection</b>	<p>High-performance edge finder for position tracking. Combination of different search strategies possible. Innovative visualisation of edges found. Definition of measurement sensitivity by dividing the measurement field into search beams.</p>		
 <b>Pattern matching</b>	<p>Object search based on pattern matching: once a pattern has been taught, consecutive images are then scanned for the same pattern. The degree of similarity can be defined by switching thresholds. Free form function for teaching random shapes.</p>		
 <b>Contour</b>	<p>Object search based on contour comparison: once a contour has been taught, images are scanned for the same contour. The degree of similarity can be defined by switching thresholds. Free form function for teaching random shapes. Orientation and scaling variations are configurable.</p>		

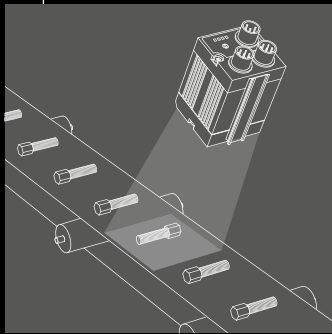
Interfaces	
 <b>SensoWeb</b>	Visualisation of images and results. Easy connection to system visualisation by web browser.
 <b>PROFINET</b>	Industrial Ethernet in compliance with PROFINET standard through integrated Ethernet interface. VISOR control options via PROFINET.
 <b>EtherNet/IP</b>	Industrial Ethernet in compliance with EtherNet/IP standard through integrated Ethernet interface. VISOR® control options via EtherNet/IP.
<b>Ethernet TCP/IP</b>	Ethernet interface with user-configurable protocol. VISOR® control options via serial commands.
<b>Serial interface</b>	Serial interface RS232 / RS422 with user-configurable protocol. VISOR® control options via serial commands. Reversible RS232 / RS422.
Calibration	
<b>Calibration</b>	Output of results in metric units or inches and world coordinates. Calibration using calibration plate, scaling or point pair list.
Functions & preprocessing filters	
<b>Free form tool</b>	Innovative free form tool to create random teaching areas for pattern matching and contour and random search areas for contrast, grey threshold, brightness and BLOB.
<b>Filters</b>	Large number of preprocessing filters to improve the picture before actual image processing.

# Sectors and applications

The best solution for you

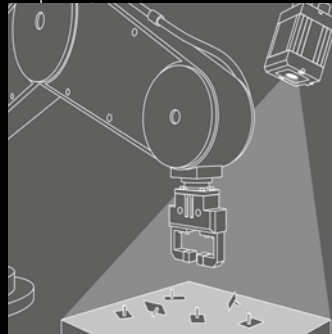
## Object detection

- *Correct feed positions*
- *Inspection of completeness and presence*
- *Counting of parts*
- *Inspecting assembly processes*
- *Part detection and differentiation*



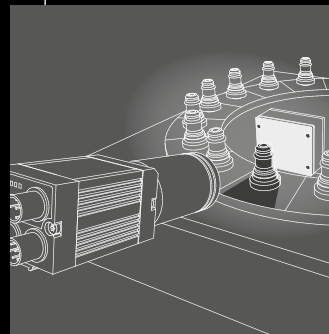
## Pick & Place

- *Simple conversion of pixels into robot coordinates*
  - *Correction for image distortions*
- *Full automation of calibration process*
- *Exact part position in robot coordinates*



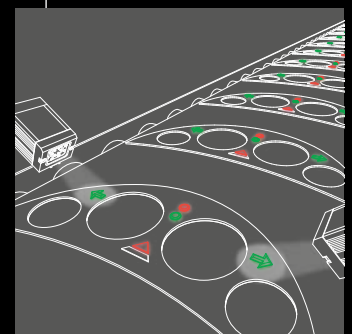
## Measurement

- *Measurement of components*
- *Distance measurement in the  $\mu\text{m}$  range*
- *Monitoring sag & dancer rolls*
- *Technologies: triangulation, time-of-flight, ultrasonic, 2D camera*



## Color, contrast & luminescence

- *Detection and differentiation of colored parts*
- *Detection of color marks*
- *Inspection of self-lighting components such as LEDs or displays*
- *Printed mark detection*



There is nobody in sight, everything is moving as if by magic: transport belts rattle; robot arms whirl; workpieces are individualised, picked up and set down again, further transported on belts, put together to create assemblies. Sensors from SensoPart ensure that all these processes run smoothly and without human intervention – we offer the appropriate sensor type for every task in the process.

In the area of optoelectronics alone there is an enormous and comprehensive variety of sensors: whether through-beam photoelectric sensors, proximity sensors with background suppression, color sensors, code readers, fibre-optic sensors, fork sensors, sub-miniature sensors, glass photoelectric sensors or ultraviolet sensors, with laser light or LED, in cuboid or cylindrical housings – every housing and every technology has its specific strengths and areas of application.

Our switching sensors cover numerous standard industrial applications such as monitoring presence and completeness, distance and position determination, color and mark detection, as well as customer-specific requirements in a great variety of sectors. Our vision sensors and systems detect complex objects or fluorescent colors, decipher data matrix codes, and detect crooked bottle tops or the broken edges of solar cells.

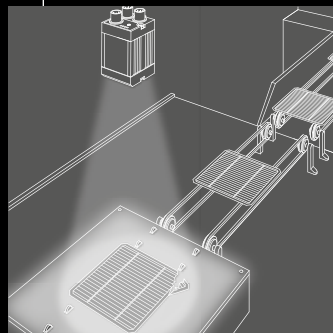
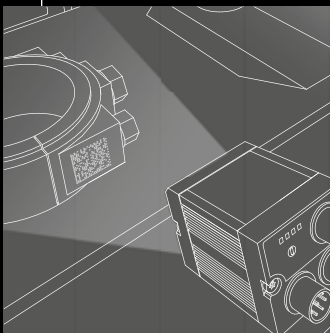
On the following pages we present a small selection of what our sensors can do for you. Contact us if your application is not included: we are certain that we will find the right solution for your process, too!

### Identification

- Product labelling
- Product identification
- Automated product tracking
- Product picking
- Quality assurance, determination of quality parameters

### Applications for the solar sector

- Position and edge damage inspection
- Wafer dimensions
- Code reading on solar cells
- Checking projections on wafer boxes



### *From practical experience, for practical use.*

*As versatile and varied as our sensors are, they have this in common: they are all extremely reliable. During the development of our products we aim for the maximum that is feasibly possible and innovative, solid solutions that can cope with the demands of daily practice.*



Versatile vision experts – VISOR® vision sensors.



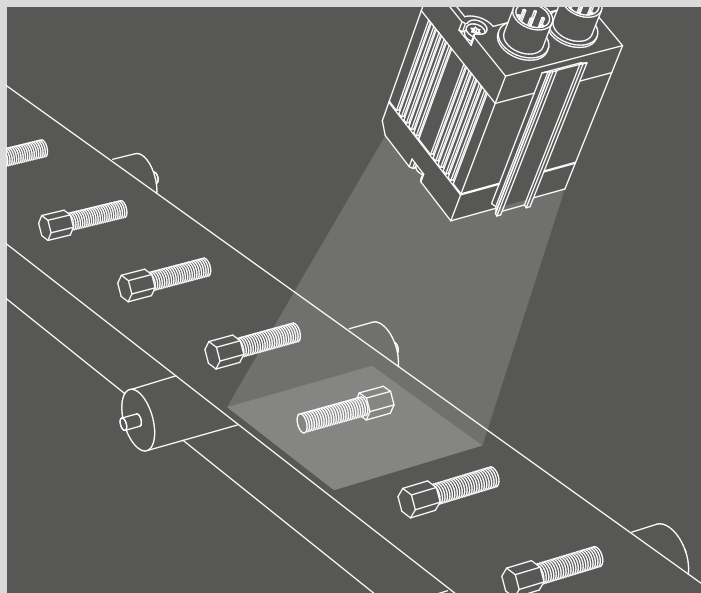
VISOR® Vision sensors with integrated lens and integrated lighting

# Object detection

Checking presence, inspecting completeness, counting and sorting

Is the object present? How is it lying on the belt? Is a detail missing or is it wrongly mounted?

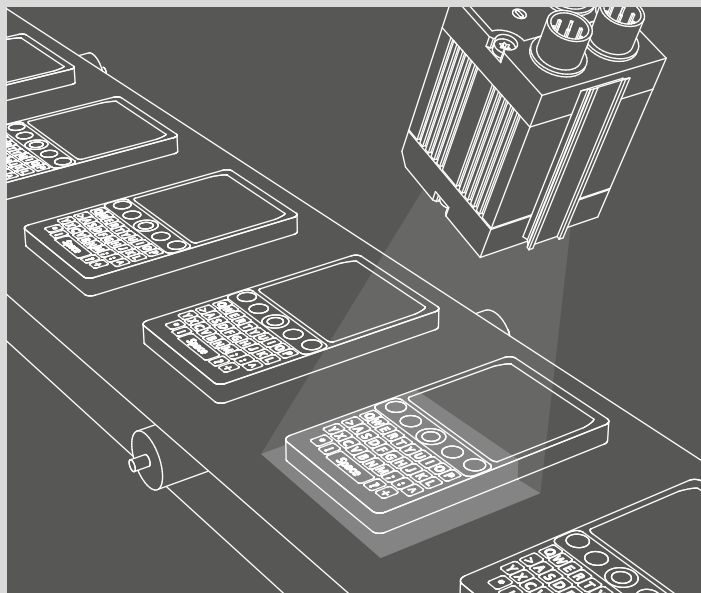
The VISOR® object sensor is ideal for many demanding applications e.g. monitoring positions and positioning components, inspecting plastic parts or Pick & Place and robotic applications. Objects that sometimes appear in unexpected positions and have complex shapes and details – classic switching sensors would be completely overwhelmed by such detection tasks. Not the VISOR® object sensor from SensoPart.



## Feeding of small parts in correct alignment

On the basis of a pattern comparison, a **VISOR® object sensor** detects whether the parts have been supplied in the correct orientation.

- Highly precise determination of orientation (X-/Y-position and orientation)
- Comprehensive configuration software with user guidance and context help
- Viewer software with hierarchical user rights
- Image recorder for simulation of the application without a sensor



## Inspecting completeness of a mobile phone keyboard

A **VISOR® object sensor** inspects whether all the keys are present on a mobile phone and mounted in the correct positions.

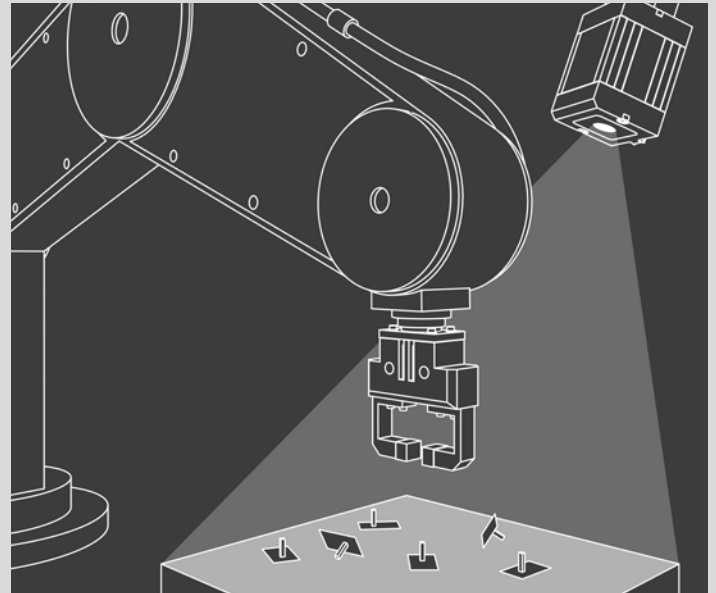
- Powerful part finding and tracking (five detectors plus position tracking)
- Simultaneous inspection of several object features
- Comprehensive logic functions
- 6 configurable result outputs
- Comprehensive, multi-lingual configuration software with user guidance and context help

## Full automation of calibration process

In order to pick up a component, a robot needs to know the part's exact position, particularly in relation to the robot's own coordinate system. Instead of programming the conversion of sensor coordinates into robot coordinates in the control system, which can be a time-consuming process, this can now be done in the VISOR® configuration software in just a few mouse clicks. This represents a significant boost in efficiency when setting up pick & place applications!

### Pick & Place without programming

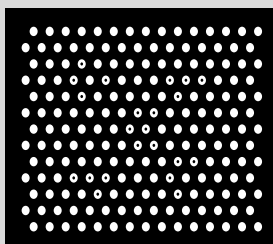
- Simple conversion of pixels into robot coordinates
- Correction for image distortions
- Full automation of calibration process
- Exact part position in robot coordinates



# Measurement

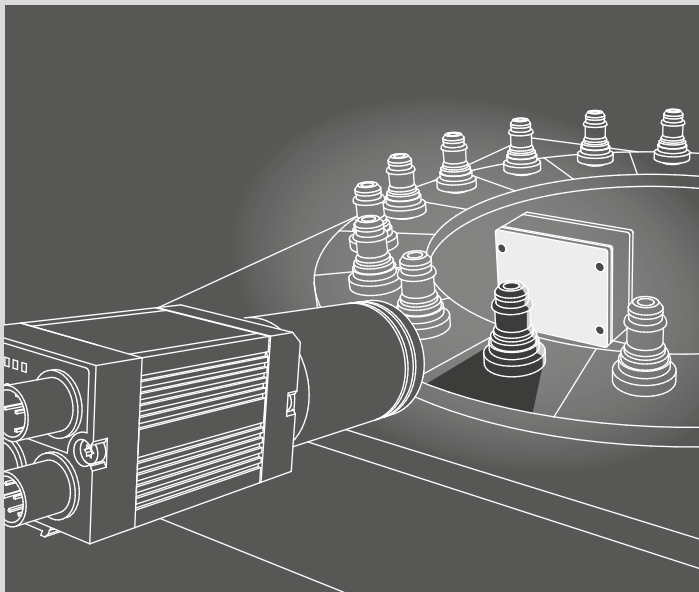
Measuring parts, monitoring sag, measuring thickness and distance

Our VISOR® vision sensor is available for detailed inspections of dimensional accuracy. It can be calibrated at a mouse click thanks to the **VISOR® calibration plate**, and any image errors or distortions are automatically corrected. For more complex tasks, use the Eye-sight vision system with a function library of over 100 functions.



## VISOR® calibration plate

Automatic correction of image errors and distortions for a precise positioning, measurement and checking.



## Measurement of turned parts on a rotary table

Turned parts can be inspected for dimensional accuracy with the **VISOR® vision sensor**.

- Compact hardware, optionally available with C-Mount lens and protective tube
- Appropriate illumination (surface light) for high process reliability
- Powerful part-finding and tracking
- Calliper function for the reliable measurement of distances
- Calibration in millimeters with distortion correction at a mouse click using the VISOR® calibration plate



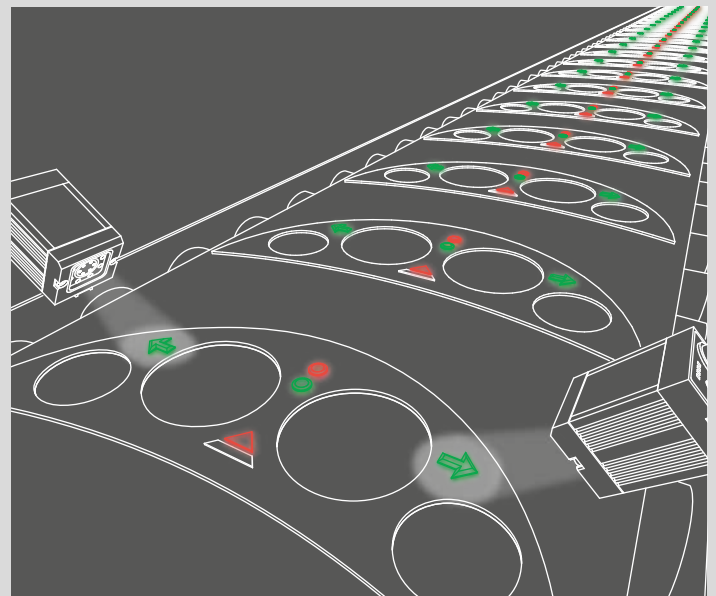
Checking presence of colored objects, printed mark detection, inspecting LEDs

The attachment of color marks that are then evaluated with a color or contrast sensor is a proven method for identifying objects in industrial production. Even objects with differing shapes and surface properties can be very reliably detected in this way.

## Inspecting LEDs in car production

A **VISOR® Color** inspects the correct color of LEDs installed in dashboards.

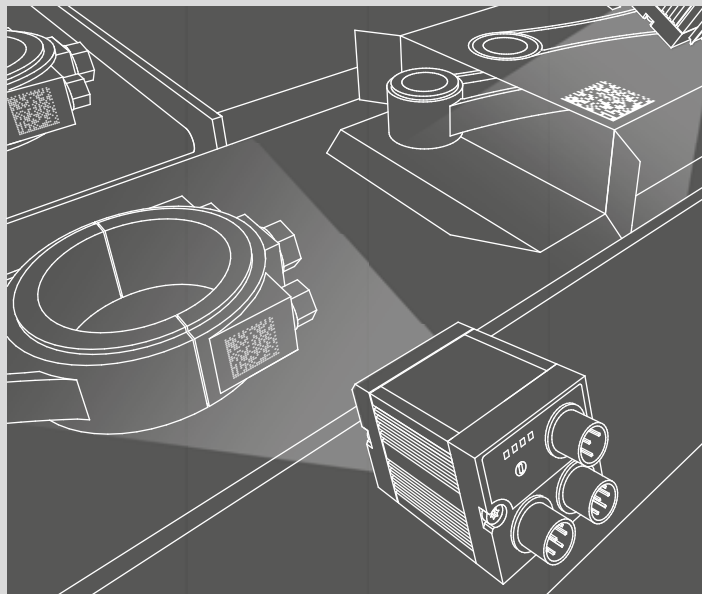
- Application-specific pre-configured vision sensor
- Detection of active (i.e. self-lighting) colors as well as “non-colors” (white, grey, black)
- High detection accuracy, even with very slight color nuances
- Simple alignment with user-friendly configuration software
- Image recorder for offline simulation without sensor



# Identification

## Reading of bar codes and data matrix codes, OCR, tracking of components

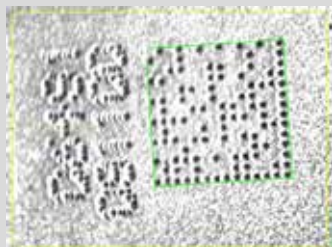
The unbroken tracking of parts and products plays an increasingly important role in industrial processes. This is why parts are provided with one- or two-dimensional codes that are either attached using labels or directly placed on the part by means of dot peening or laser (direct marking). Our code readers in the VISOR® series read bar codes and data matrix codes of numerous types. Even extremely small printing or marked codes on difficult substrates (wrinkled, reflective, rough) can be reliably detected using a variety of optical and illumination variants.



### Evaluation of printed and directly marked codes

A VISOR® Code Reader checks both the dot-peened data matrix code on a die-cast part and the code printed on the corresponding packaging.

- For all conventional 2D data matrix codes and 1D bar codes
- Optimum cost-effectiveness due to the combination of code reading and object detection in a single device
- High operational reliability thanks to reliable detection of even poorly legible codes
- Flexible and simple integration in PC and PLC environments
- Very high flexibility, e.g. reading of several similar or differing codes types in a single read process
- Reading of optical characters with OCR



#### Dot-peened code on rough substrate

This is made readable by means of powerful algorithms. The dot-peened imprint in optical characters can be checked for presence using object detection.



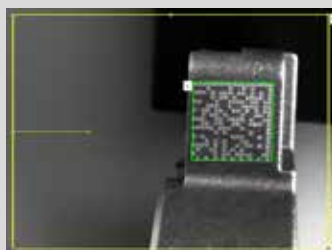
#### Code with low contrast

This is made readable by the high tolerance to weakly contrasting codes.



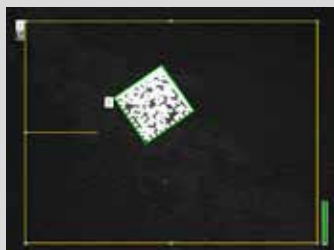
#### Reading optical characters

Dotted fonts can also be read with OCR.



#### Code with small "quiet zone"

Even codes with a small quiet zone or damaged finder pattern can be read.



#### Code reading on solar cells

Even extremely small codes, such as those on silicon solar cells, or highly reflective codes, e.g. on thin-layer solar cells, can be read.

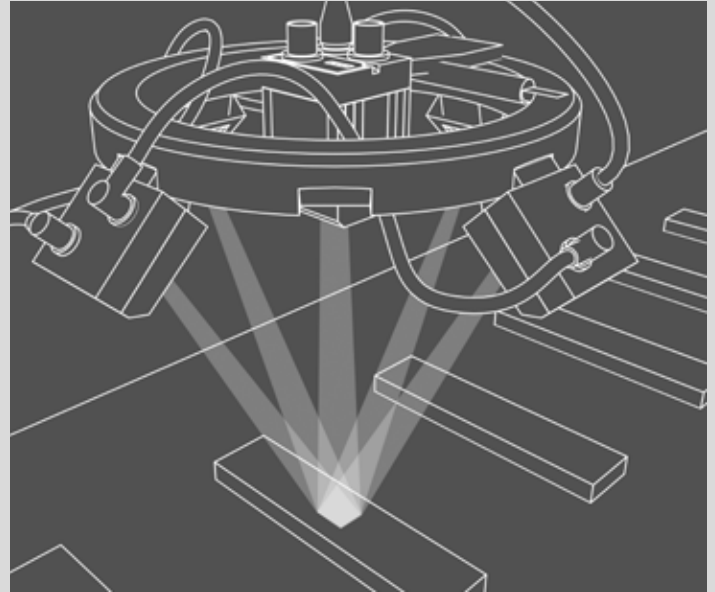


#### Printed codes on pharmaceutical packaging

It is possible to search for both ECC200 or bar codes (e.g. EAN 13) simultaneously. In addition to code reading, the presence of optical characters can be inspected using object detection.

### Multishot: Recognition of indentations and bumps on even surfaces

With the **multishot function**, four images are captured in sequence, each illuminated from another direction. By combining the four images in one single image, a pseudo height image can be created. This method is particularly suitable for the detection of indentations and bumps on even surfaces, e.g. stamped fonts, codes or surface defects.



## Applications in the solar sector

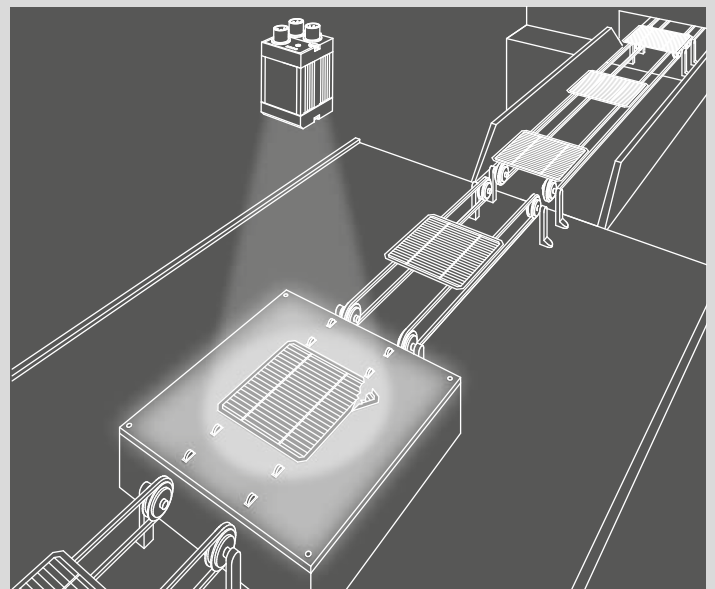
Positioning, detecting edge breaks, front-edge detection and checking for projections, double layers detection

SensoPart has developed customised automation solutions for the photovoltaic industry. These include, for example, monitoring the positions and broken edges of solar wafers and cells in handling areas, as well as the unbroken tracking of crystalline and thin-layer solar cells via directly marked data matrix codes. In addition to switching sensors, application-specific solar sensors from the VISOR® series are used for these applications.

### Monitoring the positions and broken edges of solar wafers

**VISOR® Solar sensors** check the correct position of the wafer and detect any broken edges during various phases of solar cell production.


- Precise detection of position and orientation of wafers and cells
- Breakage detection regardless of type of wafer or cell
- Edges monitored with sub-pixel accuracy
- Simple integration in just a few steps
- No background illumination necessary
- Measurement of wafers
- Position and orientation of busbars

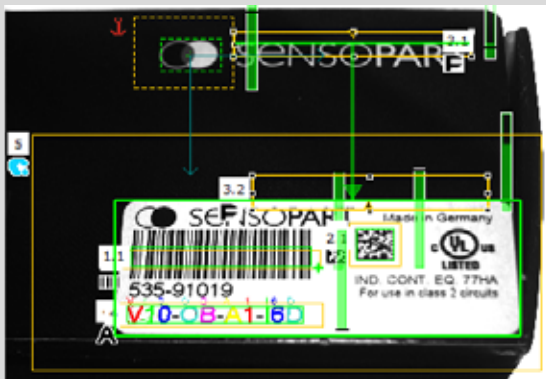


# VISOR® Allround

Advanced allround vision sensor for complex inspection tasks.



 made in Germany



**VISOR® Allround – Object detection in color plus identification united in one device.**  
The VISOR® Allround is the latest member in the VISOR family and a real multi-talent among vision sensors. In the new allround version, the device combines the functions of the object sensor (i.a. calibration, pattern matching, contour, calliper, BLOB) with the powerful tools of the code reader (bar code, datamatrix and optical character recognition).

## HIGHLIGHTS OF VISOR® ALLROUND

- All evaluations (“Detectors”) of object sensor and code reader combined in one device
- Highly accurate evaluation via 1.3 megapixel chip
- Real-world engineering units and robot coordinates at a mouse click
- Precise determination of X/Y position, orientation and tracking
- Can be used for all common 2D-Codes (ECC 200-Data-matrix) and common 1D-bar codes
- User-friendly configuration and viewer software with graded user rights and online help



**The one with a BLOB:**  
With the new BLOB detector (Binary Large Object), the VISOR® detects even small differences between objects, counts parts or detects whether a part is face up or face down.

**VISOR® Allround – Object detection in color plus identification combined in one device.**

The VISOR® Allround is the latest member in the VISOR® family and a real multi-talent among vision sensors. In the new allround version, the device combines the functions of the object sensor (i.a. calibration, pattern matching, contour, calliper, BLOB) with the powerful tools of the code reader (bar code, datamatrix and optical character recognition). When feeding parts in correct alignment or positioning components, additional data matrix codes for example can now also be read. With a resolution of up to 1.3 megapixel even the smallest details are reliably detected and evaluated.

In addition to the monochrome version, the VISOR® Allround is also available as a color version with up to 1.3 megapixel. Thus additional “Detectors” are available for color evaluation. Even the subtlest nuances in shade can be reliably detected. The relevant object colors, for example, can be taught-in quite simply by push of a button or - thanks to the intuitive color histogram - set graphically for each channel in the color space. The authorised color tolerances can be defined by the user.

VISOR® Allround – Product Overview				
	Firmware Option	Resolution	Focal Length	Integrated illumination
V20-ALL-A2-xxx	Advanced	1280 × 1024 pixels	12 mm	White, red or infrared LEDs
V20-ALL-A2-xxx	Advanced	1280 × 1024 pixels	C-mount	None
V20-ALL-P2-xxx	Professional	1280 × 1024 pixels	12 mm	White, red or infrared LEDs
V20-ALL-P2-xxx	Professional	1280 × 1024 pixels	C-mount	None
V20C-ALL-A2-xxx	Advanced	1280 × 1024 pixels	12 mm	White LEDs
V20C-ALL-A2-xxx	Advanced	1280 × 1024 pixels	C-mount	None
V10-ALL-A2-xxx	Advanced	736 × 480 pixels	6 mm	White, red or infrared LEDs
V10-ALL-A2-xxx	Advanced	736 × 480 pixels	12 mm	White, red or infrared LEDs
V10-ALL-A2-xxx	Advanced	736 × 480 pixels	25 mm	White, red or infrared LEDs
V10-ALL-A2-xxx	Advanced	736 × 480 pixels	C-mount	None
V10C-ALL-A2-xxx	Advanced	736 × 480 pixels	6 mm	White LEDs
V10C-ALL-A2-xxx	Advanced	736 × 480 pixels	12 mm	White LEDs
V10C-ALL-A2-xxx	Advanced	736 × 480 pixels	25 mm	White LEDs
V10C-ALL-A2-xxx	Advanced	736 × 480 pixels	C-mount	None

# VISOR® Allround

## System description

### VISOR® Allround – Object detection in color plus identification combined in one device

The VISOR® Allround is the latest member in the VISOR family and a real multi-talent among vision sensors. In the new allround version, the device unites the functions of the object sensor

(i.a. calibration, pattern matching, contour, calliper, BLOB) with the powerful tools of the code reader (bar code, data-matrix and optical character recognition). When feeding parts in correct alignment or positioning components, additional datamatrix codes for example can now also be read. With a resolution of up to 1.3 mega-pixel even the smallest details are reliably detected and evaluated.

In addition to the monochrome version, the VISOR® Allround is also available as a color version with up to 1.3 megapixel. Thus additional "Detectors" are available for color evaluation. Even the subtlest nuances in shade can be reliably detected. The relevant object colors, for example, can be taught-in quite simply by push of a button or - thanks to the intuitive color histogram - set graphically for each channel in the color space. The authorised color tolerances can be defined by the user.

Special image filters for image pre-processing can be used, e.g. to highlight edges or to suppress distracting details.

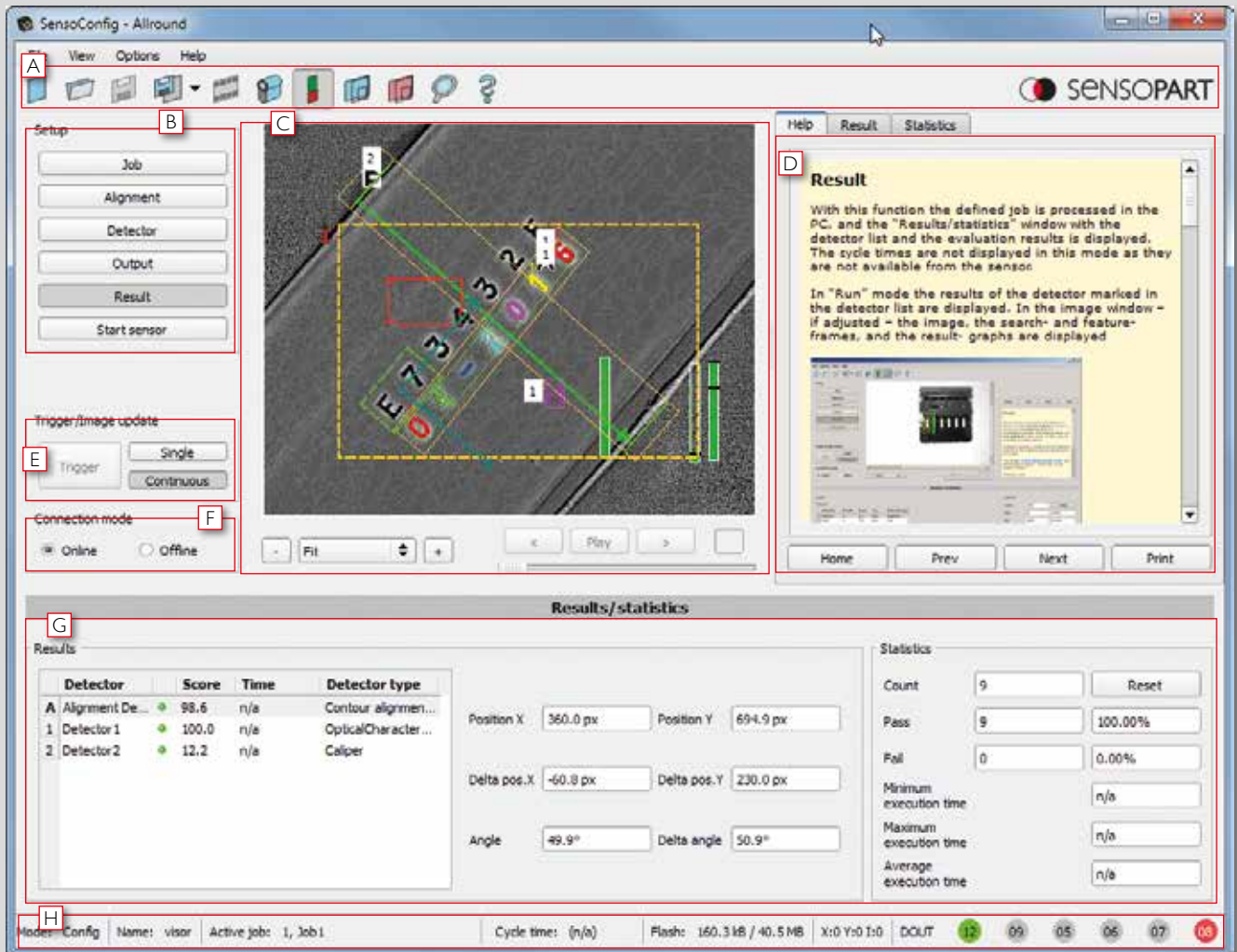
### Communication interfaces

In addition to EtherNet/IP and TCP/IP, the VISOR® vision sensors also support the fieldbus standard Profinet IO and thus "understand" the most common communication standards' of Industrial Ethernet. Thanks to freely available PLC function blocks for Siemens S7, Codesys and Allen Bradley, the VISOR® can also be easily and flexibly connected to PLC environments.

The new VISOR® Allround is thus one of the most powerful vision sensors in the market.

### Product variants: the VISOR® Allround

Features/sensors	V10/V20 Advanced	V10C/V20C Advanced	V20 Professional
<b>Functions</b>			
Resolution V10 in pixels	736 x 480 Mono	736 x 480 Color	–
Resolution V20 in pixels	1280 x 1024 Mono	1280 x 1024 Color	1280 x 1024 Mono
Image rate per second V10   V20	50   40	40   20	–   40
Number of jobs   detectors	max. 255   max. 255	max. 255   max. 255	max. 255
Multishot	–	–	✓
Position tracking	✓	✓	✓
Calibration	✓	✓	✓
Contour (X-,Y-translation, rotation)	✓	✓	✓
Pattern comparison (X-,Y-translation)	✓	✓	✓
BLOB	✓	✓	✓
Calliper	✓	✓	✓
Grey threshold	✓	✓	✓
Contrast	✓	✓	✓
Brightness	✓	✓	✓
Color area	–	✓	–
Color list	–	✓	–
Color value	–	✓	–
Data code	✓	✓	✓
Bar code	✓	✓	✓
Optical character recognition (OCR)	✓	✓	✓
Freeform Tool	✓	✓	✓
<b>Interfaces</b>			
Inputs   outputs	2   4	2   4	2   4
Freely definable switching outputs/ inputs, PNP or NPN	4	4	4
Encoder input	✓	✓	✓
I/O expansion	✓	✓	✓
RS232   RS422	✓   ✓	✓   ✓	✓
Ethernet/data transmission	✓   ✓	✓   ✓	✓
EtherNet/IP	✓   ✓	✓   ✓	✓
PROFINET	✓   ✓	✓   ✓	✓
SensoWeb	✓	✓	✓
<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 Result window:** Overview of all results.
- H Status line:** current information on active job and on state of outputs.

# VISOR® object sensor for part detection

Detects the right part in the wrong place and vice versa



 made in Germany



**The one with a BLOB:** With the new BLOB detector (Binary Large Object), the VISOR® detects even small differences between objects, counts parts or detects whether a part is face up or face down.



#### **Calibration function:**

With the VISOR®, positions and distances in the sensor image can now be easily converted into relative world coordinates or absolute robot coordinates. Distortions resulting from diagonal view angles and other image errors are simultaneously corrected. Thus robot applications can be easily solved.

## HIGHLIGHTS OF VISOR® OBJECT SENSOR

- User-friendly configuration and viewer software with hierarchical user rights and online help
- Real-world engineering units and robot coordinates at a mouse click
- Precise position determination: x/y-position and orientation
- Comprehensive logic functions for the digital switching outputs
- Flexible definition of output data (header, trailer, net data)
- Support of EtherNet/IP and PROFINET
- Comprehensive possibilities for archiving pictures and data



Objects that sometimes appear in unexpected positions and have complex shapes and details – classic switching sensors would be completely overwhelmed by such detection tasks. Not the VISOR® object sensor from SensoPart: it always maintains its overview, detecting defective parts, parts in the wrong position, wrong orientation, wrong sequence or a combination of them all – in an instant. The comprehensive calibration functions range from a simple scaling factor via the correction of image and lens distortions at a mouse click through to a point pair list for robot applications.

With its highly precise position and orientation detection, our VISOR® object sensor is one of the best in its class.

### Seven detectors plus position detection

A total of seven detectors are available for inspection tasks and evaluations: pattern comparison, contour detection, calliper, BLOB, brightness, grey threshold and contrast detection. Position tracking offers reliable detection of those features that are not always present in the original taught-in position.

All evaluations take place relative to the current part position and orientation, without them having to be defined for every possible position of an individual feature. This powerful tool allows you to solve even demanding applications confidently!

VISOR® Object Sensors – Product Overview				
	Firmware Option	Resolution	Focal length	Integrated illumination
V20-OB-A2-xxx	Advanced	1280 × 1024 pixels	12 mm	White, red or infrared LEDs
V20-OB-A2-xxx	Advanced	1280 × 1024 pixels	C-mount	None
V10-OB-S1-xxx	Standard	736 × 480 pixels	6 mm	White, red or infrared LEDs
V10-OB-S1-xxx	Standard	736 × 480 pixels	12 mm	White, red or infrared LEDs
V10-OB-A1-xxx	Advanced	736 × 480 pixels	6 mm	White, red or infrared LEDs
V10-OB-A1-xxx	Advanced	736 × 480 pixels	12 mm	White, red or infrared LEDs
V10-OB-A1-xxx	Advanced	736 × 480 pixels	25 mm	White, red or infrared LEDs
V10-OB-A1-xxx	Advanced	736 × 480 pixels	C-mount	None

# 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. 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.

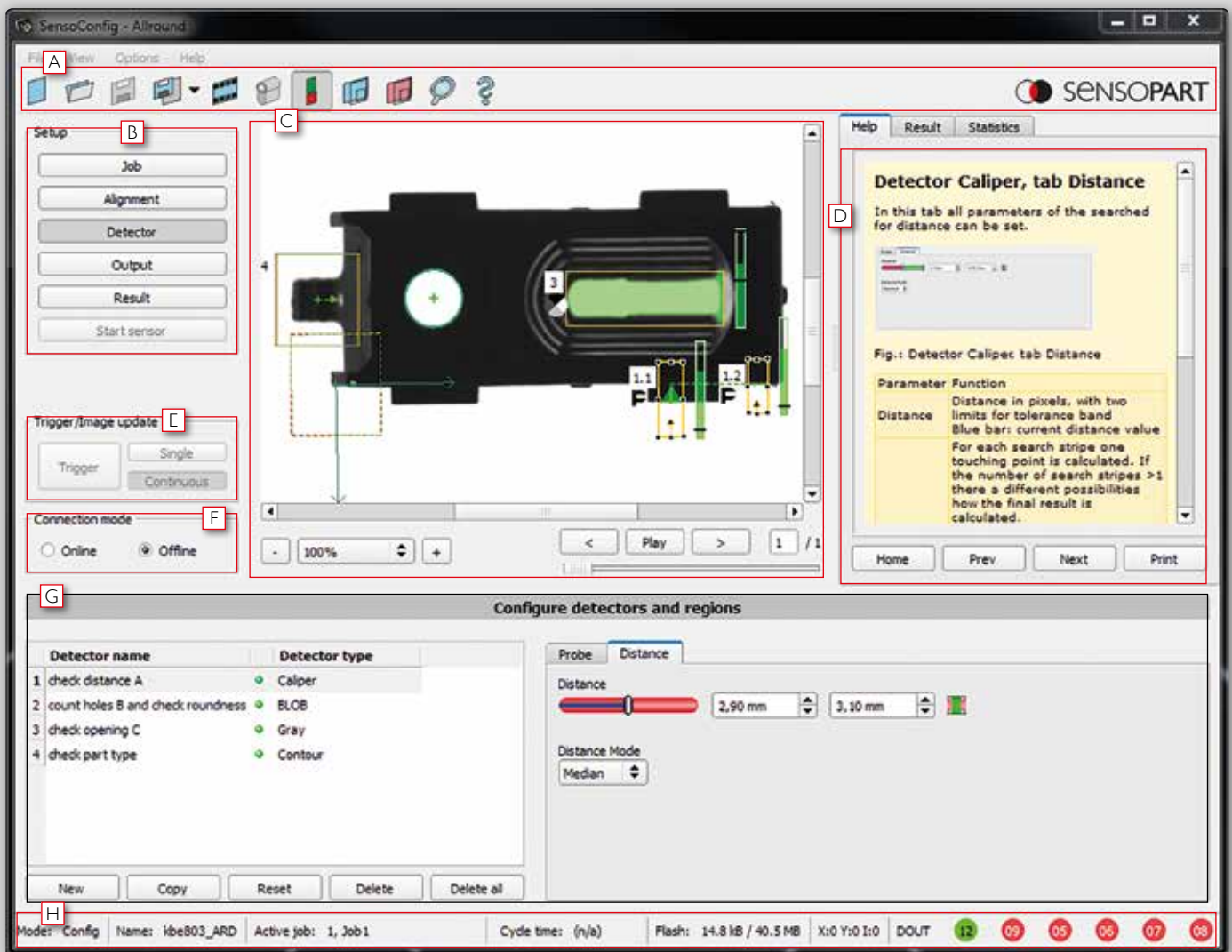
**Everything in view with the Viewer:** after completing configuration, the vision sensor works in your production plant autonomously, i.e. without a PC connection. Of course, data can be called up at any time during running operation: our own Viewer software “SensoView” with hierarchical user rights (reliably preventing unintentional changes to the configuration) is available for this. “SensoWeb” enables a simple integration into the plant visualisation via web browser. Professional image processing can be this 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	✓
Calibration	–	✓
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	✓	✓
SensoWeb	✓	✓
<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

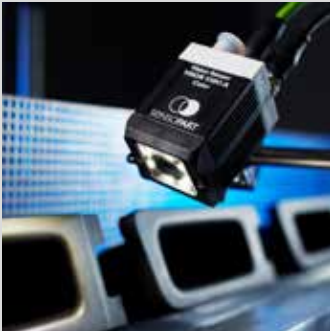
- A** **Menu bar:** rapid access to the most important functions
- B** **Setup navigation:** dependable user guidance through the configuration process
- C** **Image window:** live picture of the object with graphic display of inspection area and results
- D** **Context help:** precise information on 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

Vision sensor for the most precise object detection



 made in Germany



#### **The same or not the same?**

The VISOR® Color detects even the smallest of color nuances more reliably than the human eye. This allows, for example, the detection of color deviations or the sorting of parts by color.



#### **Incorrect occupancy ruled out:**

The VISOR® Color combines color and object detection in a single device and can therefore simultaneously inspect occupancy of the blister for completeness and for occupancy with the correct color.



#### **All LEDs in the right place?**

A unique performance feature of vision color sensors is the detection of active (self-illuminating) colors. For example, displays in the automotive industry or electronic components can be inspected for correct placement with the VISOR® Color.

## HIGHLIGHTS OF THE VISOR® COLOR

- Improved object detection through additional color information
- Powerful color detection, even with the smallest of color nuances or self-illuminating components
- Powerful part finding and tracking
- Highly accurate evaluation via 1.3 megapixel color chip
- Up to 6 digital switching outputs (another 32 with IO box)
- User-friendly configuration and viewer software with graded user rights and online help

Color is an important feature for detecting and differentiating between objects during the production process. Whether colored marks in quality assurance, colored printing or labels, LEDs or display elements, the occupancy of cable harnesses, or the browning level of baked goods – industry is much more colorful than is generally assumed.

Classic color sensors are limited to the detection of passive colors, i.e. of object colors or colored marks – they have to give up when confronted with self-illuminating objects. The VISOR® Color vision color sensor from SensoPart knows no such restrictions – it not only “sees” objects of any shape and color, but also provides additional information on color intensity and the position of the particular object. It can also represent an alternative to conventional contrast sensors for

determining grey values and contrast differences when other object features are to be evaluated simultaneously. The comprehensive calibration functions range from a simple scaling factor via the correction of image and lens distortions at a mouse click through to a point pair list for robot applications.

#### The upgrade to color is easy

The new generation of VISOR® Color vision color sensors not only supports color detection but also all the performance features of the VISOR® object sensor. The operating concept of the two vision sensors is identical – there are just three additional detectors for color detection with corresponding configuration possibilities. The introductory effort for those switching from the VISOR® object sensor is thus minimal – when will you put more colors into your applications?

VISOR® Color – product overview				
	Product variant	Resolution	Focal length	Integrated illumination
V20C-CO-A2-xx	Advanced	1280 x 1024 pixels	12 mm	White LEDs
V20C-CO-A2-xx	Advanced	1280 x 1024 pixels	C-mount	None
V10C-CO-S2-xx	Standard	736 x 480 pixels	6 mm	White LEDs
V10C-CO-S2-xx	Standard	736 x 480 pixels	12 mm	White LEDs
V10C-CO-A2-xx	Advanced	736 x 480 pixels	6 mm	White LEDs
V10C-CO-A2-xx	Advanced	736 x 480 pixels	12 mm	White LEDs
V10C-CO-A2-xx	Advanced	736 x 480 pixels	25 mm	White LEDs
V10C-CO-A2-xx	Advanced	736 x 480 pixels	C-mount	None

# VISOR® Color

## System description

The vision color sensors of the VISOR® Color series offer comprehensive functions for detecting colored objects. Instead of the usual monochrome imaging chip they are equipped with a color 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 color detection. Three color spaces (RGB, HSV, Lab) and several color channels are available.

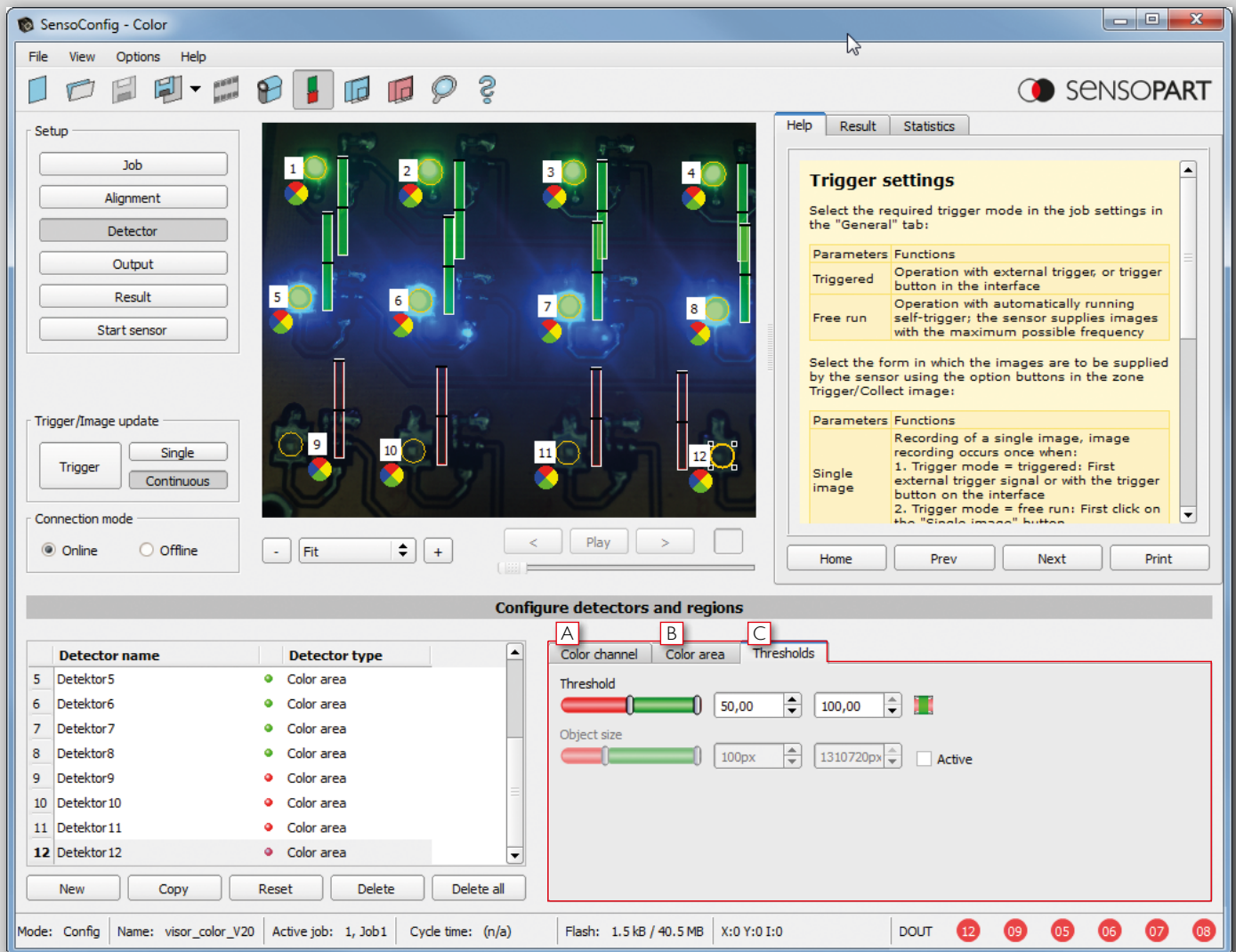
With the new color detectors, the VISOR® Color is capable of differentiating between the finest of color nuances. Any desired number of colors, color gradients or color patterns can be stored in the sensor memory and called up on demand. Moreover, objects with similar colors can be searched for.

### 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 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	✓
Calibration	–	✓
Contour (X-, Y-translation, rotation)	✓	✓
Sample comparison (X-, Y-translation)	–	✓
BLOB	–	✓
Calliper	–	✓
Grey level	–	✓
Contrast	✓	✓
Brightness	–	✓
Color value	–	✓
Color area	✓	✓
Color 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	✓	✓
SensoWeb	✓	✓
<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** **Color channel:** selection of the color space and the color channels in which the detector is to operate
- B** **Color selection:** setting of the color 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® Code Reader

In a class of its own.



## VISOR® Code Reader

### V20-CR-P2-R12

- Professional version for detecting 1D/2D codes, objects and for optical character reading with OCR
- Megapixel resolution
- Rapidly detects as many jobs and detectors as desired
- Has position tracking
- Reads several different types of codes in one reading pass

### V10-CR-S1-R12

- Standard version for detecting 1D/2D codes
- Maximum of 8 inspection tasks with one evaluation each (maximum of 5 identical types of code per reading)

The VISOR® Code Reader from SensoPart easily reads bar codes of numerous types as well as printed and directly marked data matrix codes according to the ECC200 standard, regardless of the carrier materials (metal, plastic, paper, glass). The sensor even easily deciphers skewed or distorted codes, or those attached to convex, reflective or transparent surfaces.

**Built-in early warning system:** the VISOR® Code Reader evaluates the quality of your printed and directly marked data matrix codes on the basis of standardised quality parameters according to ISO and AIM standards.

## HIGHLIGHTS OF VISOR® CODE READER

- Reliably reads bar codes as well as printed and directly marked data matrix codes, and even several codes simultaneously and mixed 1D/2D codes
- Supplementary object detection for features other than codes
- Evaluation of quality parameters according to ISO/IEC 15415 and AIM DPM 2006
- Flexible definition of output data (header, trailer, net data)
- String comparison with message via the digital switching output
- Support of EtherNet/IP and DHCP, PROFINET
- Comprehensive possibilities for archiving pictures and data
- Reading of optical characters with OCR




## Applications

- Product labelling and identification
- Automated product tracking
- Product picking, quality assurance

## Sectors

- Automotive and supplier industries
- Food and beverages industries
- Pharmaceutical and cosmetics industries
- Packaging industry and logistics
- Laboratory automation
- Solar industry

 made in Germany



Printed bar codes



Laser-printed codes on plastic



Codes on glass



*A lot of information in a small space:  
up to 2,334 ASCII symbols (7 bit) or  
3,116 digits can be coded with an  
ECC-200 data matrix code.*

VISOR® Code Reader – Product Overview				
	Product variants	Resolution	Focal length	Integrated illumination
V20-CR-A2-xxx	Advanced	1280 x 1024 pixels	12 mm	White, red, infrared LEDs or UV
V20C-CR-A2-xxx	Advanced	1280 x 1024 pixels	12 mm	White LEDs
V20-CR-A2-xxx	Advanced	1280 x 1024 pixels	C-mount	None
V20-CR-P2-xxx	Professional	1280 x 1024 pixels	12 mm	White, red or infrared LEDs
V20C-CR-P2-xxx	Professional	1280 x 1024 pixels	12 mm	White LEDs
V20-CR-P2-xxx	Professional	1280 x 1024 pixels	C-mount	None
V10-CR-S1-xxx	Standard	736 x 480 pixels	6 mm	White, red or infrared LEDs
V10-CR-S1-xxx	Standard	736 x 480 pixels	12 mm	White, red or infrared LEDs
V10-CR-S2-xxx	Standard	736 x 480 pixels	25 mm	White, red or infrared LEDs
V10-CR-A1-xxx	Advanced	736 x 480 pixels	6 mm	White, red or infrared LEDs
V10-CR-A1-xxx	Advanced	736 x 480 pixels	12 mm	White, red or infrared LEDs
V10-CR-A2-xxx	Advanced	736 x 480 pixels	25 mm	White, red or infrared LEDs
V10-CR-A1-xxx	Advanced	736 x 480 pixels	C-mount	None

# The VISOR® Code Reader reads whatever's printed, dot peened and lasered.

## System description

With its integrated object detection, the VISOR® Code Reader is unique in its price segment. The compact sensor reads conventional 1D bar codes, 2D data matrix codes and now also optical characters (OCR). It also has four detectors for object detection (pattern comparison, brightness, grey level and contrast), with which other object features – for example, stamps or logos – can be evaluated in a single reading pass. Codes and object features are even reliably detected with deviations from the taught-in position – using position tracking (optionally activated).

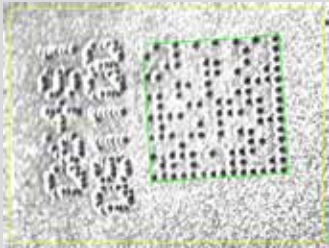
A special image filter with expanded setting options guarantees excellent reading performance even under difficult reading conditions. The test results can largely be evaluated within the sensor itself – with the option of string comparison or regular print-outs – so, in many cases it eliminates the connection requirement to PLC or PC. If, however, this proves necessary, it can be easily and flexibly connected using freely available PLC function blocks for Siemens S7, Codesys and Allen Bradley.

With integrated quality parameters complying with ISO and AIM standards, the VISOR® Code Reader also permits the informative evaluation of printed and direct marked 1D and 2D codes. Integrated red, infrared or white light variants provide maximum functional reliability through optimum code illumination.

In addition, the robust, compact and industry-oriented housings guarantee reliability even where space is restricted. Integrated 6 mm or 12 mm optics or C-mount devices also save effort and costs through their optimum adaptation to the most varied of code sizes and operating distances. The V20 variants also offer a resolution of 1.3 megapixels for particularly small codes or large search areas.

## VISOR® Code Reader product variants

Features/sensors	Standard	Advanced	Professional
<b>Functions</b>			
V10 resolution in pixels	736 x 480	736 x 480	–
V20 resolution in pixels	1280 x 1024	1280 x 1024	1280 x 1024
Image rate per second V10   V20	50   40	50   40	–   40
Number of jobs   detectors	8   2	max. 255   max. 255	max. 255   max. 255
Position tracking	–	✓	✓
Pattern comparison (X-,Y-translation)	–	✓	✓
Grey threshold	–	✓	✓
Contrast	–	✓	✓
Brightness	–	✓	✓
Data code	✓	✓	✓
Bar code	✓	✓	✓
OCR	–	–	✓
Freeform Tool	–	✓ <i>(not applicable to 1D &amp; 2 D codes)</i>	✓ <i>(not applicable to 1D &amp; 2 D codes)</i>
<b>Interfaces</b>			
Inputs   outputs	2   4	2   4	2   4
Freely definable switching outputs/inputs, PNP or NPN	2	4	4
Encoder input	–	✓	✓
I/O expansion	✓	✓	✓
RS422   RS232	✓   ✓	✓   ✓	✓   ✓
Ethernet / data transmission	✓	✓	✓
EtherNet / IP	✓	✓	✓
PROFINET	✓	✓	✓
SensoWeb	✓	✓	✓
<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	✓	✓	✓
Hierarchised user rights	✓	✓	✓



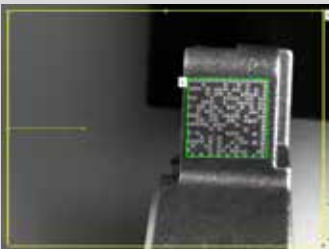
**Dot peened code on rough substrate**  
Code is made legible by powerful reading algorithm. Presence of the nailed imprint in plain text can be checked using object detection.



**Low-contrast code**  
Code is made legible through high tolerance – also towards weakly contrasting codes.



**Optical character reading**  
Dot matrix printing can also be read with OCR.



**Code with small "quiet zone"**  
Even codes with a small quiet zone or damaged finder pattern can be read.



**Code reading on solar cells**  
Even extremely small codes (e.g. on silicon solar cells) or highly reflective codes (e.g. on thin-layer solar cells) can be read.



**Printed codes on pharmaceutical packaging**  
ECC200 or bar codes (e.g. EAN 13) can be searched for simultaneously. In addition to code reading, the presence of optical characters can also be checked using object detection.

## Special features of the VISOR<sup>®</sup> Code Reader

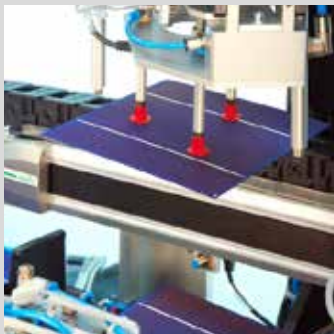
- Can be used for all common 2D codes (e.g. ECC 200 data matrix) and common 1D bar codes
- Optimum cost-effectiveness through combination of two functions in one device: code reading and object detection
- High operating dependability through reliable detection of even poorly readable codes under difficult ambient conditions
- Flexible and simple connection to PC and PLC environments due to comprehensive possibilities for archiving pictures and read results, as well as freely available PLC function blocks for Siemens S7, Codesys and Allen Bradley
- Very high flexibility, e.g. also due to reading several similar or different codes in one reading pass
- Reading of optical characters with OCR based on neural networks, particularly suitable for point printing

# VISOR® Solar sensor for inspecting solar cells

Focusing on what matters



made in Germany



*The VISOR® Solar sensor operates accurately and reliably even in fast-cycle processes.*



*The VISOR® Solar sensor measures every wafer or cell and thus detects even minimal edge breakouts.*

## HIGHLIGHTS OF VISOR® SOLAR SENSOR

- Simple integration
- Precise position detection
- Detection of Edge defects
- Detection of holes
- Transport belts can be masked via software
- Short cycle time from 60 ms
- Reliable operation, even in daylight
- No backlight necessary
- Low space requirement: operating distance from 360 mm

SensoPart has expanded its range of vision sensors with the VISOR® Solar in order to combat rising cost pressure in the production of solar cells. The compact sensor detects the position and any damage to wafers and cells. It allows robots to pick up and lay down wafers accurately. Wafers and solar cells with fine breakouts can be directly rejected during this step, before they can completely break up and damage other material.

These sensors can also be integrated in existing lines – as easily as a light barrier. Before a cell is printed, the sensor checks it for damage that could lead to breakage during the print process, preventing costly machine breakdowns.

VISOR® Solar sensor – Product Overview				
	Firmware Option	Resolution	Focal length	Integrated illumination
V20-SO-A2-xxx	Advanced	1280 x 1024 pixels	12 mm	White, red or infrared LEDs
V20-SO-A2-xxx	Advanced	1280 x 1024 pixels	C-mount	None
V10-SO-S1-xxx	Standard	736 x 480 pixels	6 mm	White LEDs
V10-SO-A1-xxx	Advanced	736 x 480 pixels	6 mm	White or infrared LEDs
V10-SO-A1-xxx	Advanced	736 x 480 pixels	12 mm	White or infrared LEDs
V10-SO-A1-xxx	Advanced	736 x 480 pixels	C-mount	None

# 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.

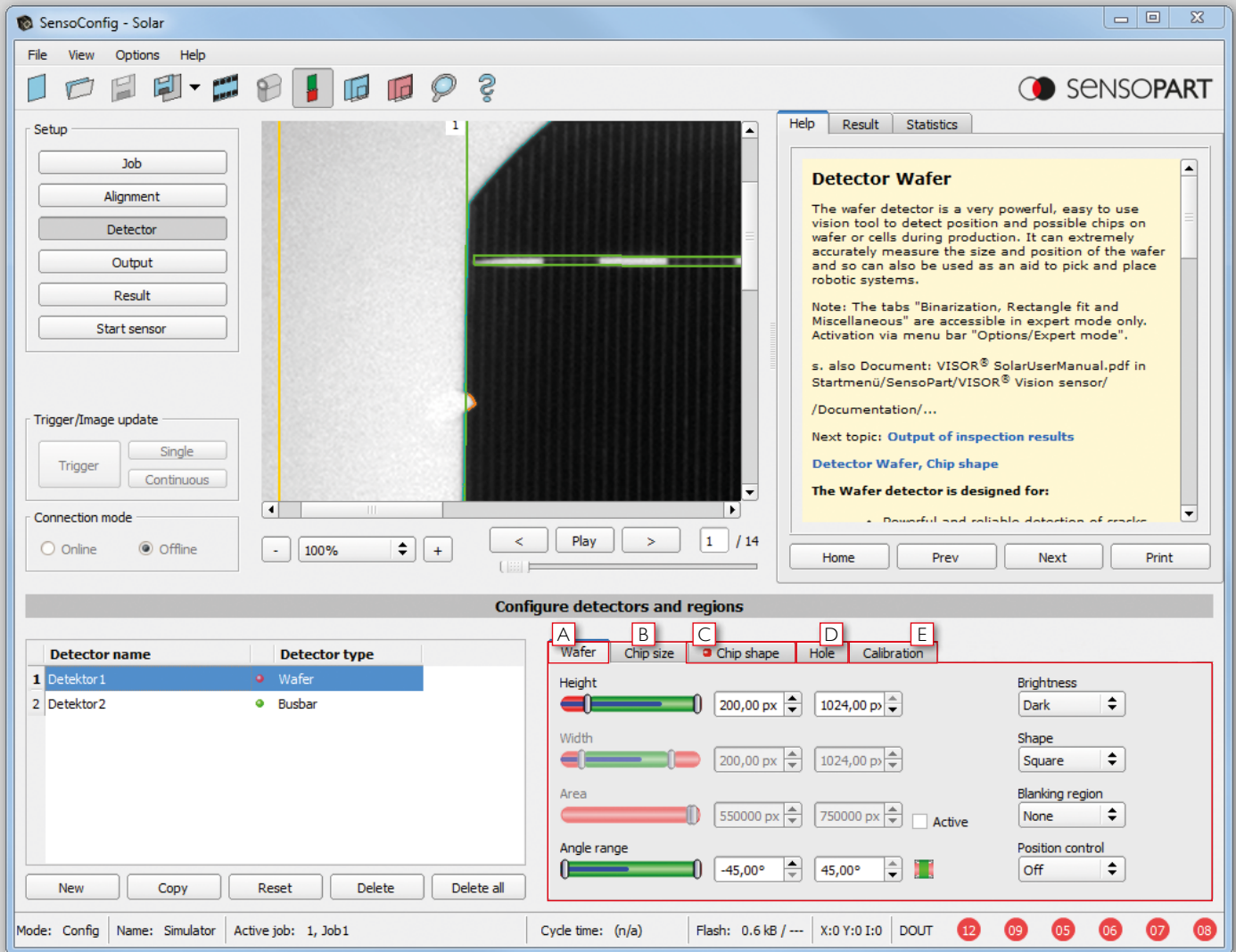
**Plug & play:** using the VISOR® Solar sensor is much easier than a classic image-processing solution. Because the functions relevant for wafer and cell inspections, e.g. the detection of wafer geometry and any defects, are already pre-configured so that the sensor is ready for operation after just 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 masked
- 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 V10/V20	50   –	50   40
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	✓	✓
SensoWeb	✓	✓
<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 differently shaped breakouts
- D Holes:** reject wafers with holes
- E Calibration:** the camera is calibrated with one click

# Eyesight vision systems – everything is possible

At last. You can do what you want!



 made in Germany



#### **Taking measures:**

The dimensional accuracy of an object (e.g. a turned or pressed part) is an important quality feature, and can indirectly provide information on its consistency, stresses or wear, preventing rejects in downstream processes.



#### **Providing direction:**

The correct alignment of an object is an important prerequisite for downstream processes, e.g. for positioning and tracking a gripper. Colors, shapes and contours are suitable for monitoring correct orientation.



#### **Preventing faults:**

Very different features can be checked at a glance with the Eyesight – here, for example, the position and color of the cap, filling level and presence of the use-by date. This pays, because each unnoticed fault may be expensive later.

## 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 one's own functions
- Image processing simulated on PC without camera
- Freely programmable data protocol for Ethernet and serial interface



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: graphic programming by means of drag & drop makes it easy for you to “construct” your own applications.

Eyesight has numerous of routines for object measurement, position determination and tracking, data communication, warpage point determination, contour inspection/tracking, color selection/monitoring, brightness correction as well as a variety of filter functions. What can otherwise only be achieved by fully-fledged image-processing systems, you can implement with Eyesight with considerably less effort – and at an affordable price.

Eyesight Vision Systems – Product Overview				
	Firmware Option	Resolution	Focal length	Integrated illumination
V20-EYE-A2-xxx	Monochrome, color	1280 x 1024 pixels	12	White, red or infrared LEDs
V20-EYE-A2-xxx	Monochrome, color	1280 x 1024 pixels	C-Mount	None
V10-EYE-A1-xxx	Monochrome, color	736 x 480 pixels	6	White, red or infrared LEDs
V10-EYE-A1-xxx	Monochrome, color	736 x 480 pixels	12	White, red or infrared LEDs
V10-EYE-A1-xxx	Monochrome, color	736 x 480 pixels	C-Mount	None

# 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.

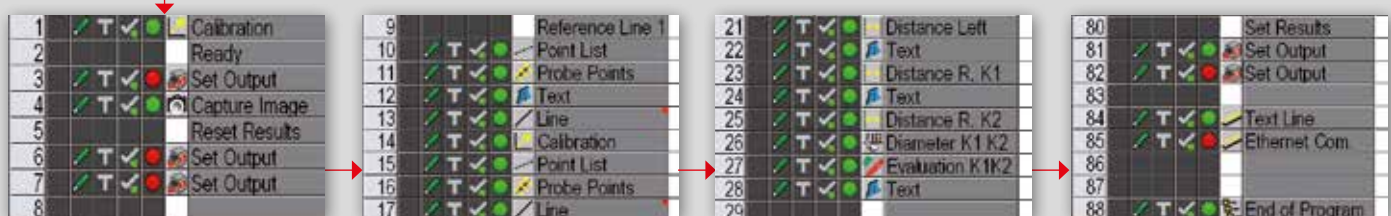
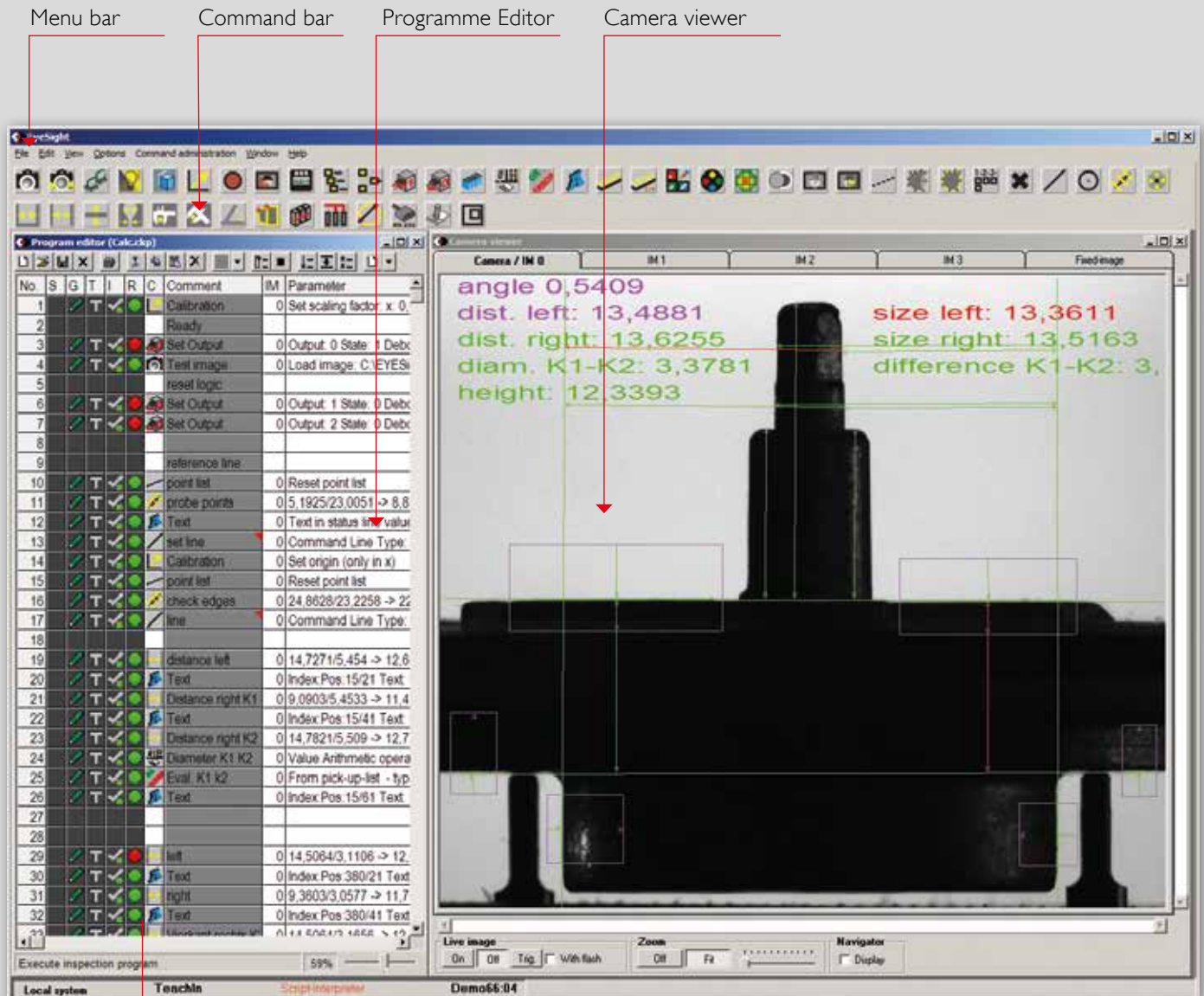
### EYESIGHT HIGHLIGHTS

- 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)	No limitation (max. 40 Mb)	No limitation (max. 40 Mb)	No limitation (max. 40 Mb)
Function blocks	See overview of commands	See overview of commands	See overview of commands	See overview of commands
<b>Interfaces</b>				
Inputs   outputs	2   4	2   4	2   4	2   4
Freely definable switching outputs/inputs	4	4	4	4
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

# Technical data

## Optical data

Number of pixels, chip size	VISOR®-V10...: 736 (H) × 480 (V), 1/3", 6,0 µm square VISOR®-V20...: 1280 (H) × 1024 (V), 1/1.8", 5,3 µm square			
Technology	CMOS (mono / color)			
Integrated measuring lighting	8 LEDs (except C-Mount)			
Integrated measurement distance	6, 12 or 25 mm, focal position adjustable			
	<b>V10</b>	<b>V10</b>	<b>V10</b>	<b>V20</b>
Lens (adjustable up to ∞)	6 mm	12 mm	25 mm	12 mm
Minimum measurement distance	6 mm	30 mm	140 mm	30 mm
Minimum field of view X × Y	5 × 4 mm	8 × 6 mm	18 × 14 mm	16 × 13 mm

## Electrical data

Operating voltage +U <sub>B</sub>	18 ... 26.4V DC <sup>1</sup>
Power consumption (without lighting and I/O)	≤ 120 mA
Power consumption (without I/O)	≤ 200 mA
Protection circuits	Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs
Rise-time delay	Approx. 13 s after Power on
Outputs	PNP / NPN (switchable)
Max. output current (per output)	50 mA, 100 mA (pin 12)
Inputs	PNP/NPN High > U <sub>B</sub> -1V, Low < 3V
Input resistance	> 20 kΩ
Encoder input	High > 4V
Interfaces	Ethernet (LAN), RS422, RS232, EtherNet/IP, PROFINET, SensoWeb
Inputs / Outputs	2 inputs, 4 outputs, 4 selectable inputs/outputs

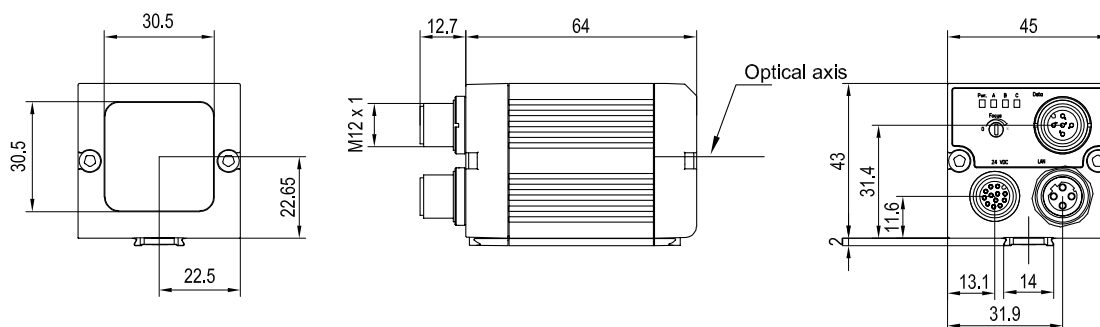
## Mechanical data

Dimensions	65 × 45 × 45 mm (without connector)
Enclosure rating	IP 65 <sup>4</sup> / IP 67
Material housing	Aluminium, plastic
Material, front screen	Plastic
Ambient temperature: operatin	0 ... +50° C <sup>2</sup>
Ambient temperature: Storage	-20 ... +60° C <sup>2</sup>
Weight	Approx. 160 g
Plug Connections	Supply and I/O M12, 12-pin, Ethernet M12, 4-pin, Data M12, 5-pin
Vibration / shock resistance	EN 60947-5-2



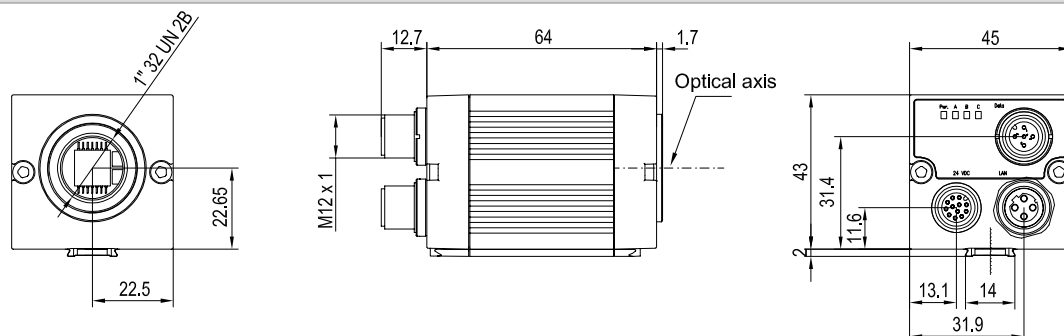
<sup>1</sup> Max. ripple < 5V<sub>SS</sub>    <sup>2</sup> 80 % air humidity, non-condensing    <sup>3</sup> dependent on model    <sup>4</sup> C-mount protective casing

## Vision sensor VISOR® with integrated optics & lighting

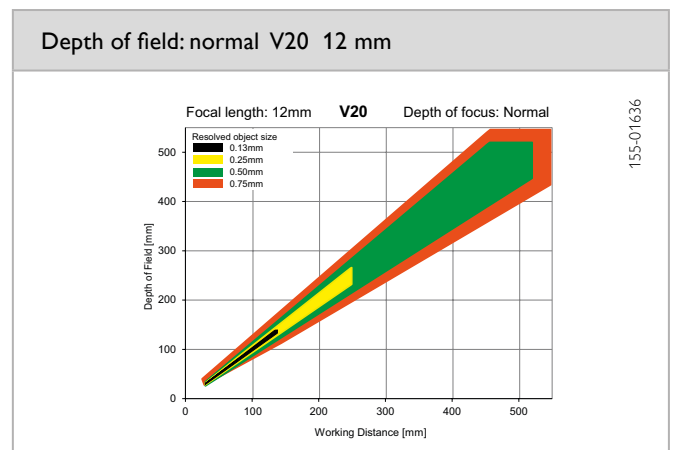
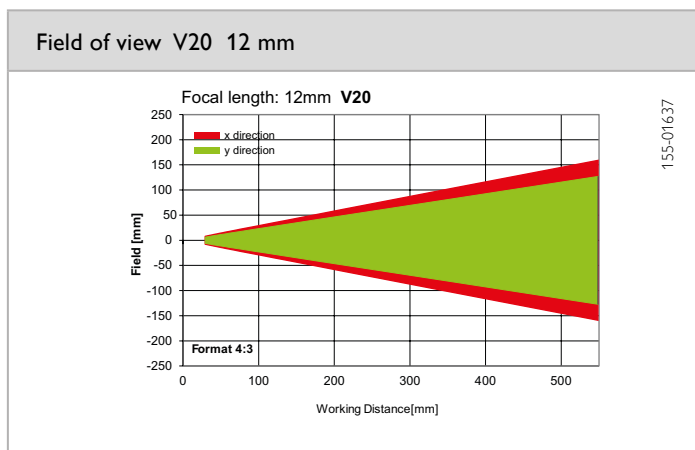
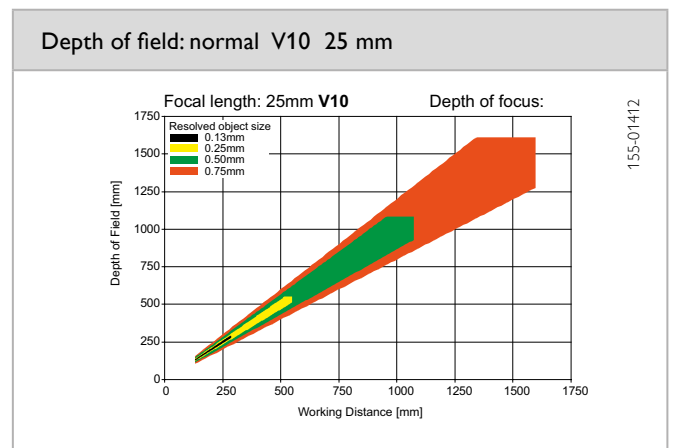
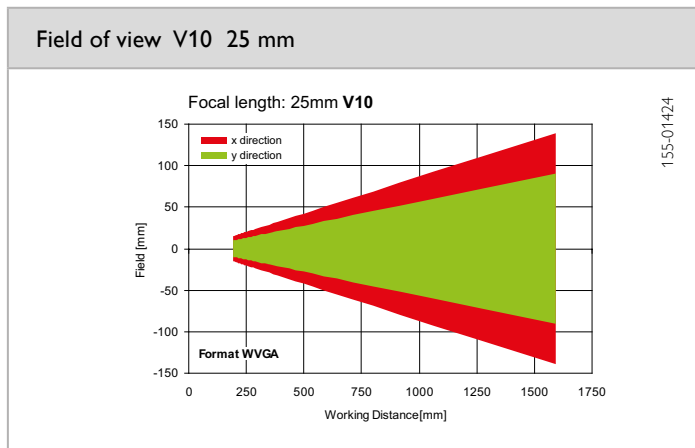
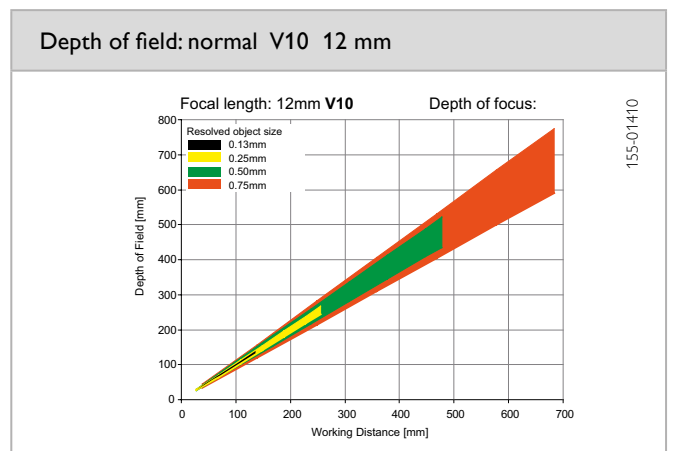
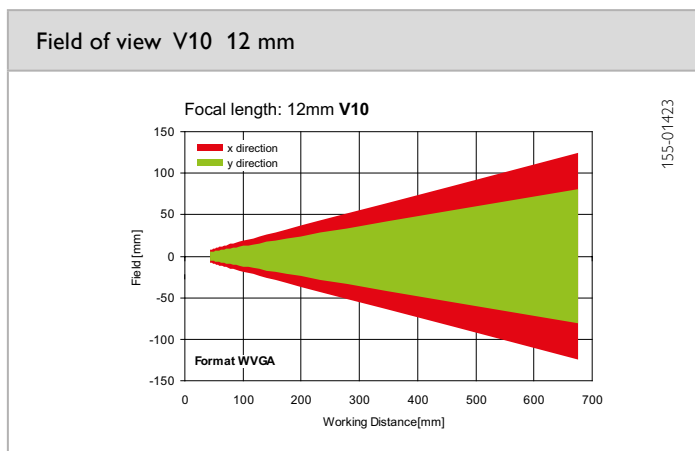
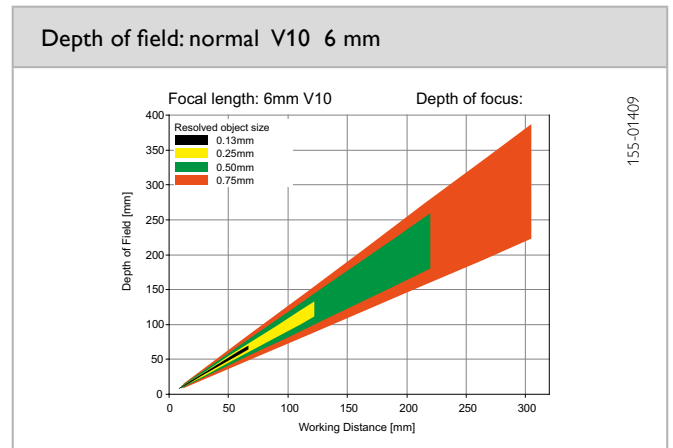
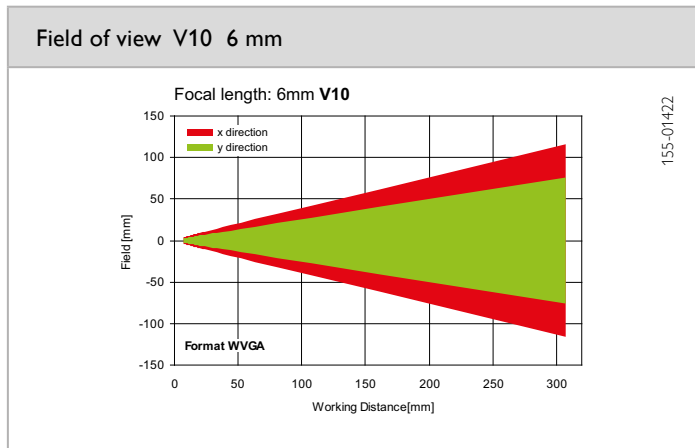


153-00911

## Vision sensor VISOR® C-mount



153-00912



# Accessories

## Brackets


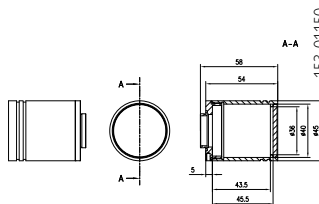

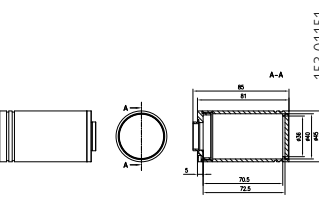

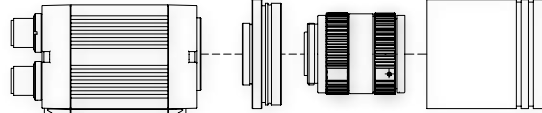
Brackets for V10,V20									
		<p>153-01181</p> <p>Part number / Article number</p> <p>Description</p> <p>Suitable for</p>	<p>MG 3A / 543-11024</p> <p>Mounting angle with 2 axes and drilled hole for mounting rod</p> <p>Material: anodised aluminium</p> <p>V10 / V20</p>						
									
		<p>153-00547</p> <p>Part number / Article number</p> <p>Description</p> <p>Suitable for</p>	<p>MP 45 / 543-11003</p> <p>Mounting plate for mounting rod</p> <p>Material: anodised aluminium</p> <p>MST 45-xx</p>						
	 <table border="1" data-bbox="518 1377 742 1489"> <tr> <td>x = 200</td> <td>MST 45-20</td> </tr> <tr> <td>x = 300</td> <td>MST 45-30</td> </tr> <tr> <td>x = 400</td> <td>MST 45-40</td> </tr> </table>	x = 200	MST 45-20	x = 300	MST 45-30	x = 400	MST 45-40	<p>153-00545</p> <p>Part number / Article number</p> <p>Description</p> <p>Suitable for</p>	<p>MST 45-20 / 543-11005</p> <p>MST 45-30 / 543-11006</p> <p>MST 45-40 / 543-11007</p> <p>Mounting rod with M6 internal thread</p> <p>Material: stainless steel</p> <p>MP 45, MB ST 1, MG 45, MB 45, MZ 45</p>
x = 200	MST 45-20								
x = 300	MST 45-30								
x = 400	MST 45-40								
		<p>153-00776</p> <p>Part number / Article number</p> <p>Description</p> <p>Suitable for</p>	<p>MG 45 / 543-11008</p> <p>Mounting clamp for mounting rod</p> <p>Material: anodised aluminium, steel screw with plastic handle</p> <p>MST 45-xx</p>						

Brackets for V10, V20 (Cont.)			
		Part number / Article number	MA 45 / 543-11001
		Description	Mounting angle Material: stainless steel V2A
		Suitable for	MK 45 MK 45 L MB 45
		Part number / Article number	MA 45 L / 543-11013
		Description	Mounting angle, long Material: stainless steel V2A
		Suitable for	MK 45 MK 45 L MB 45
		Part number / Article number	MK 45 / 543-11000
		Description	Mounting clamp, dovetail Material: anodised aluminium Screw: steel
		Suitable for	V10 / V20
		Part number / Article number	MK 45 L / 543-11021
		Description	Mounting clamp, dovetail, long Material: anodised aluminium, Screw: steel
		Suitable for	V10 / V20
		Part number / Article number	MZ 45 / 543-11004
		Description	Intermediate mounting piece for mounting rod Material: anodised aluminium
		Suitable for	MST 45-xx
		Part number / Article number	MB 45 / 543-11002
		Description	Mounting block for mounting rod Material: anodised aluminium
		Suitable for	MST 45-xx MA 45 MA 45 L

# Accessories


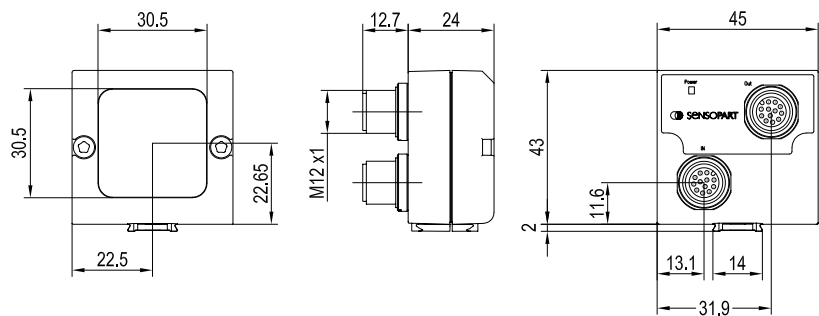
## Lenses

Lenses				
		Part number	Article number	Description
		LR 5	543-11011	Intermediate ring 5 mm
		ETS	527-51143	Intermediate ring set: 1 x 0.5 mm 2 x 1 mm 1 x 5 mm 1 x 10 mm 1 x 20 mm 1 x 40 mm
		Part number	Article number	Description
		LOF-BP-R635 -30,5x0,5	533-01015	Red filter for C-mount lens, Bandpass 610 - 660 nm
		LOF-LP-IR850 -30,5x0,5	533-01010	Infrared filter for C-mount lens, Transmission > 825 nm
		LOF-PF-30,5 x 0,5	526-51531	Polarisation filter for C-mount lens


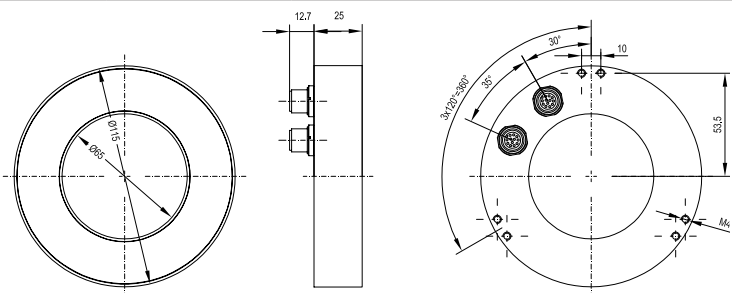
Protective casing and polarizer glasses				
		Part number / Article number	LPT 45 CML 5 / 527-51132	
		Description	C-mount IP 65 protective casing Flange 5 mm Maximum lens dimensions: diameter: 38 mm length: 42 mm	
		Suitable for	V10 / V20 C-Mount	
		Part number / Article number	LPT 45 CML 5L / 527-51134	
		Description	C-mount IP 65 protective casing Flange 5 mm Maximum lens dimensions: diameter: 38 mm length: 60 mm	
		Suitable for	V10 / V20 C-Mount	
		V10, V20	C-mount IP 65 protective casing LPT 45 CML 5 / 527-51132	C-mount lenses LO C 8 / 526-51513 LO C 12 / 526-51514 LO C 16 / 526-51515 LO C 25 / 526-51516 LO C 35 / 526-51525 LO C 50 / 526-51113 LO C 75 / 526-51116



## Illumination

Surface light for V10,V20			
	Part number	Article number	Description
	LF45 W-24-2L12	525-51147	Surface light,V10 /V20, white, 12-pin
	LF45 R-24-2L12	525-51148	Surface light,V10 /V20, red, 12-pin
	LF45 IR-24-2L12	525-51149	Surface light,V10 /V20, infrared, 12-pin*
			153-00924



\* External IR illumination can only be combined with IR Types or C-Mount sensors.  
 LED area lighting for incidental illumination in IP67 housings. Can be cascaded to illuminate from several directions.  
 No switching amplifier required.

Ring light for V10,V20				
	Part number	Article number	Description	Angle bracket
	LFR 115 WD-24-2L12	525-51150	Ring light,V10 /V20, white, diffuse, 12-pin	543-11015
	LFR 115 RD-24-2L12	525-51151	Ring light,V10 /V20, red, diffuse, 12-pin	543-11015
	LFR 115 ID-24-2L12	525-51152	Ring light,V10 /V20, infrared, diffuse, 12-pin*	543-11015
	LFR 115 WK-24-2L12	525-51153	Ring light,V10 /V20, white, clear, 12-pin	543-11015
	LFR 115 RK-24-2L12	525-51154	Ring light,V10 /V20, red, clear, 12-pin	543-11015
	LFR 115 IK-24-2L12	525-51155	Ring light,V10 /V20, infrared, clear, 12-pin*	543-11015
				153-00926

\* External IR illumination is only possible for IR types or C-Mount sensors.  
 LED ring lighting for the incidental illumination of objects in IP67-tight housings. No switching amplifier is required and cascading is possible.

# Accessories

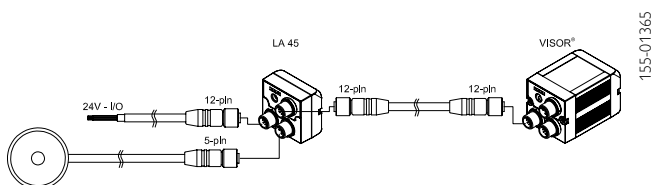
## Cables

	Part number	Article number	Description
	<b>Power supply and I/O cables for V10, V20</b>		
	C L12FG-S-2m-PUR	902-51801	Power supply and I/O cable, 2 m, M12, straight, 12-pin, shielded, suitable for drag chains
	C L12FG-S-5m-PUR	902-51796	Power supply and I/O cable, 5 m, M12, straight, 12-pin, shielded, suitable for drag chains
	C L12FG-S-10m-PUR	902-51797	Power supply and I/O cable, 10 m, M12, straight, 12-pin, shielded, suitable for drag chains
	C L12FG-S-20m-PUR	902-51805	Power - I/O, cable, 20 m, M12, straight, 12-pin, shielded, suitable for drag chains
	C L12FG-S-30m-PUR	902-51845	Power - I/O, cable, 30 m, M12, straight, 12-pin, shielded, suitable for drag chains
	C L12FW-S-2m-PUR	902-51798	Power supply and I/O cable, 2 m, M12, 90°, 12-pin, shielded, suitable for drag chains
	C L12FW-S-5m-PUR	902-51799	Power supply and I/O cable, 5 m, M12, 90°, 12-pin, shielded, suitable for drag chains
	C L12FW-S-10m-PUR	902-51800	Power supply and I/O cable, 10 m, M12, 90°, 12-pin, shielded, suitable for drag chains
	C L12FW-S-20m-PUR	902-51821	Power - I/O, cable, 20 m, M12, 90°, 12-pin, shielded, suitable for drag chains
C L12FW-S-30m-PUR	902-51846	Power - I/O, cable, 30 m, M12, 90°, 12-pin, shielded, suitable for drag chains	
	<b>Ethernet cables for V10/V20</b>		
	CI L4MG/RJ45G-GS-3m-PUR	902-51754	Ethernet cable, 3 m, M12, straight, 4-pin/RJ45, shielded, suitable for drag chains
	CI L4MG/RJ45G-GS-5m-PUR	902-51782	Ethernet cable, 5 m, M12, straight, 4-pin/RJ45, shielded, suitable for drag chains
	CI L4MG/RJ45G-GS-10m-PUR	902-51784	Ethernet cable, 10 m, M12, straight, 4-pin/RJ45, shielded, suitable for drag chains
	CI L4MG/RJ45G-GS-20m-PUR	902-51820	Ethernet, cable, 20m, M12, straight connector; 4-pin/RJ45 shielded
	CI L4MG/RJ45G-GS-30m-PUR	902-51843	Ethernet, cable, 30m, M12, straight connector; 4-pin/RJ45 shielded
	CI L4MW/RJ45G-GS-3m-PUR	902-51786	Ethernet cable, 3 m, M12, 90°, 4-pin/RJ45, shielded, suitable for drag chains
	CI L4MW/RJ45G-GS-5m-PUR	902-51788	Ethernet cable, 5 m, M12, 90°, 4-pin/RJ45, shielded, suitable for drag chains
	CI L4MW/RJ45G-GS-10m-PUR	902-51790	Ethernet cable, 10 m, M12, 90°, 4-pin/RJ45, shielded, suitable for drag chains
	CI L4MW/RJ45G-GS-20m-PUR	902-51822	Ethernet, cable, 20m, M12, angled connector; 4-pin/RJ45 shielded
CI L4MW/RJ45G-GS-30m-PUR	902-51844	Ethernet, cable, 30m, M12, angled connector; 4-pin/RJ45 shielded	
	<b>Data cables for V10/V20</b>		
	CI L5FG-S-2m-PUR	902-51813	Data cable, 2 m, straight, shielded, suitable for drag chains
	CI L5FG-S-5m-PUR	902-51814	Data cable, 5 m, straight, shielded, suitable for drag chains
	CI L5FG-S-10m-PUR	902-51815	Data cable, 10 m, straight, shielded, suitable for drag chains
	CI L5FW-S-2m-PUR	902-51816	Data cable, 2 m, 90°, shielded, suitable for drag chains
	CI L5FW-S-5m-PUR	902-51817	Data cable, 5 m, 90°, shielded, suitable for drag chains
CI L5FW-S-10m-PUR	902-51818	Data cable, 10 m, 90°, shielded, suitable for drag chains	

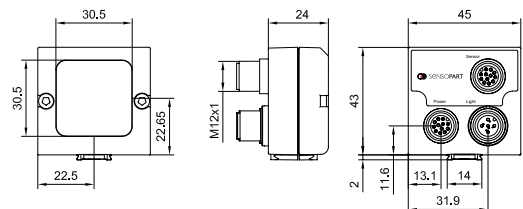
Connection cables	Part number	Article number	Description
	<b>Illumination cables for V10/V20</b>		
	CB L12FS/L12FS-0,35m-GG-PUR	902-51841	Illumination cable 2 x M12/12-pin, 0.35 m, straight, shielded, suitable for drag chains
	CB L12FS/L12FS-0,5m-GG-PUR	902-51806	Illumination cable 2 x M12/12-pin, 0.5 m, straight, shielded, suitable for drag chains
	CB L12FS/L12FS-2m-GG-PUR	902-51807	Illumination cable 2 x M12/12-pin, 2 m, straight, shielded, suitable for drag chains
	CB L12FS/L12FS-10m-GG-PUR	902-51854	Illumination cable 2 x M12/12-pin, 10 m, straight, shielded, suitable for drag chains
	CB L12FS/L12FS-0,35m-WVV-PUR	902-51842	Illumination cable 2 x M12/12-pin, 0.35 m, 90°, shielded, suitable for drag chains
	CB L12FS/L12FS-0,5m-WVV-PUR	902-51808	Illumination cable 2 x M12/12-pin, 0.5 m, 90°, shielded, suitable for drag chains
	CB L12FS/L12FS-2m-WVV-PUR	902-51809	Illumination cable 2 x M12/12-pin, 2 m, 90°, shielded, suitable for drag chains
	CB L4MG-10m-PUR	902-51756	Câble d'éclairage 1 x M12/4 pôles, 10 m, adapté aux chaînes porte-câbles pour raccordement direct de 535-51000 à 532-51044

#### Connection adapter for illumination on V10, V20

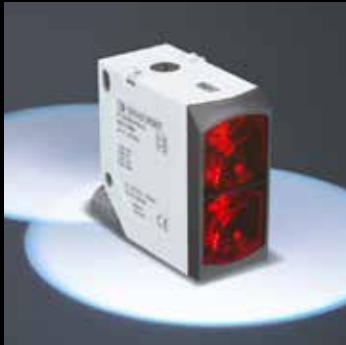
	<b>Connection adapter, illumination</b> LA45V-24-2L12	525-01001	V10 / V20 connection adapter for LED illumination with 5-pin M12 plug
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155-01365



153-00916



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**Germany**  
SensoPart  
Industriesensorik GmbH  
79288 Gottenheim  
Tel. +49 7665 94769-0  
info@sensopart.de

**France**  
SensoPart France SARL  
77420 Champs sur Marne  
Tel. +33 164 730061  
info@sensopart.fr

**United Kingdom**  
SensoPart UK Limited  
Pera Business Park, Nottingham Road,  
Melton Mowbray, Leicestershire, LE13 0PB  
Tel. +44 1664 561539  
uk@sensopart.com

**USA**  
SensoPart Inc.  
Perrysburg OH 43551,  
Tel. +1 866 282-7610  
usa@sensopart.com

**China**  
SensoPart China  
201803 Shanghai  
Tel. +86 21 69017660  
china@sensopart.cn