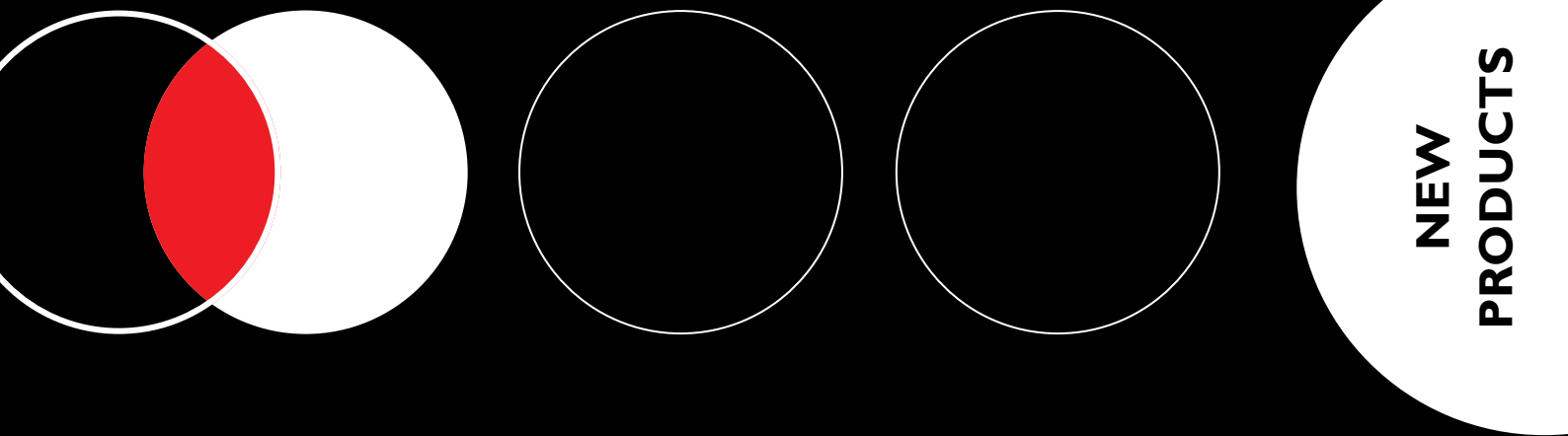


# Catalogue supplement

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



# Product news

## VISOR® object sensor V20 Advanced

from chapter 4

*Vision sensors for object detection and classification*

- Highly accurate evaluation via 1.3 megapixel chip
- 255 inspection tasks available, 255 evaluations can be used for each inspection task



## VISOR® Color

from chapter 4

*Improved object detection through additional colour information*

- Highly accurate evaluation via 1.3 megapixel colour chip
- Powerful colour detection, even with the smallest of colour nuances or self-illuminating components
- 255 inspection tasks available, 255 evaluations can be used for each inspection task



## Eyesight vision systems V20 Advanced

from chapter 4

*Complete image-processing package with robust and flexible smart camera*

- Highly accurate evaluation via 1.3 megapixel (colour) chip
- No limitation of inspection tasks (max. 40 MB)



## F 10 – Bluelight

from chapter 8

*Very high detection efficiency*

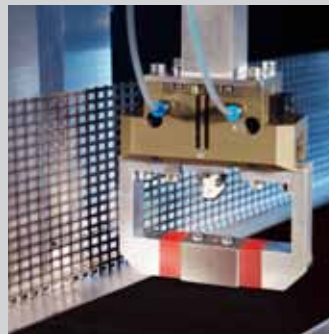
- For extremely dark objects
- Transparent objects
- Large scanning angles



Multi-functional image processors –  
VISOR® vision sensors



Vision sensor with a good eye –  
VISOR® vision sensors



Fits into a robot arm – F 10 sub-miniature sensors



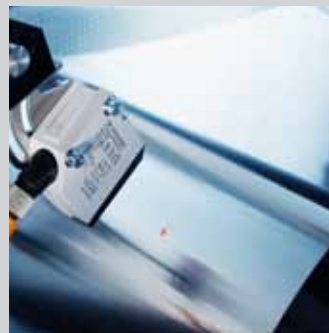
Reliable colour detection in a miniature housing – FT 25-C



All LEDs in the right place? –  
VISOR® Color



Dancer roll regulation – FT 25-RA



Determining coil thickness – FT 55  
Time-of-flight sensors



Specialist proves to be an all-rounder –  
F 10 Bluelight

**FT 25-RA – sub-miniature distance sensor**

from chapter 6

*For control tasks such as dancer roll regulation on automatic winding machines thanks to high repeatability*

- Operating range (scanning distance) from 20 mm to 200 mm
- Simple integration thanks to small housings
- Analogue output 1 ... 10 V



**FT 25 C – miniature RGB colour sensor**

from chapter 7

*Smallest RGB colour sensor with a high switching frequency of  $\leq 10$  kHz for rapid applications*

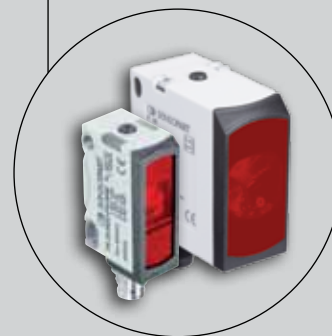
- Reliable detection of "non-colours", e. g. black, white and grey
- Very small and precise light spot for the detection of the smallest of marks



**FR 25/55-RLO – autocollimation photoelectric sensors**  
from chapter 8

*The specialists for small-part and front-edge detection*

- Detection possible from range zero
- High switching accuracy and positioning accuracy on lateral object approach
- Detection of small objects (for example the point of a needle)




**F 55 – time-of-flight sensors**  
from chapter 8

*Compact sensors for distance measurement and object detection*

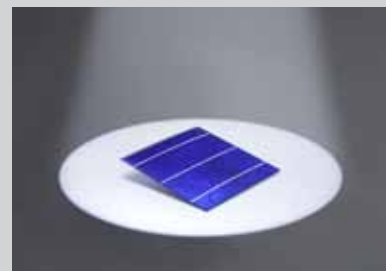
- For measurement, regulatory and detection tasks on all object surfaces at large distances
- Reliable object detection even with bright, highly reflective or shiny backgrounds



 made in Germany

Product news		
	Special features	Cat. Chapter
VISOR® Object sensor V20 Advanced	Vision sensor for object detection and classification with 1.3 megapixel resolution	4
VISOR® Color	Improved object detection through additional colour information	4
Eyesight Vision-Systems V20 Advanced	Complete image-processing package with robust and flexible Smart Camera	4
F 10 – Bluelight	Very high detection efficiency for extremely dark objects, transparent objects and large scanning angles	8
FT 25-RA – miniature distance sensor	For control tasks such as dancer roll regulation on automatic winding machines thanks to high repeatability	6
FT 25 C – miniature RGB colour sensor	Smallest colour sensor with a high switching frequency of $\leq 10$ kHz for rapid applications	7
FR 25/55-RLO – autocollimation photoelectric sensors	The specialists for small-part and front-edge detection and particularly precise detection	8
F 55 – time-of-flight sensors	Compact sensors for distance measurement and object detection at long distances	8

# Product overview – vision sensors and systems



Features/sensors	VISOR® Object Sensor		VISOR® Color		VISOR® Solar Sensor
	V10 Standard	V10/V20 Advanced	V10C Standard	V10C/V20C Advanced	V10 Standard
<b>Highlights</b>	Object detection and classification		Improved object detection through additional colour information		Positioning and inspecting solar cells
			Colour area	Colour area	Wafer position and breakouts
			–	Colour list	–
			–	Colour value	–
<b>Functions</b>					
Resolution in pixels V10	736 x 480 Mono	736 x 480 Mono	736 x 480 Colour	736 x 480 Colour	736 x 480 Mono
Resolution in pixels V20	–	1280 x 1024 Mono	–	1280 x 1024 Colour	–
Image rate per second V10   V20	50   –	50   40	40   –	40   20	50   –
Number of jobs   detectors	<b>8</b>   32	max. 255   max. 255	8   32	max. 255   max. 255	<b>8</b>   32
Position tracking	✓	✓	✓	✓	–
Contour matching (X-,Y-translation, rotation)	✓	✓	✓	✓	–
Pattern comparison (X-,Y-translation)	✓	✓	–	✓	–
<b>BLOB</b>	–	✓	–	✓	–
<b>Calliper</b>	–	✓	–	✓	–
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	2	4	2	4	2
Encoder input	–	✓	–	✓	–
I/O expansion	–	✓	–	✓	–
RS 422   RS 232	–   –	✓   ✓	–   –	✓   ✓	–   –
Ethernet	✓	✓	✓	✓	✓
EtherNet/IP	✓	✓	✓	✓	✓
<b>PROFINET</b>	✓	✓	✓	✓	✓
<b>Lens</b>					
V10 integrated, 6 mm   12 mm   25 mm	✓   ✓   –	✓   ✓   ✓	✓   ✓   –	✓   ✓   ✓	✓   –   –
V20 integrated, 12 mm	–	✓	–	✓	–
C-mount	–	✓	–	✓	–

More information in catalogue chapters 4 and 5



V10/V20 Advanced	VISOR® Allround		VISOR® Code Reader		
	V10/V20	V10C/V20C	V10 Standard	V10/V20 Advanced	V20 Professional (OCR)
	Object detection and identification		Code reading		
Wafer position and breakouts	–	Colour area	–	–	–
Busbar position and number	–	Colour list	–	–	–
	–	Colour value	–	–	–
	Data code	Data code	Data code	Data code	Data code
	Bar code	Bar code	Bar code	Bar code	Bar code
	Optical character recognition (OCR)	Optical character recognition (OCR)	–	–	Optical character recognition (OCR)
736 x 480 Mono	736 x 480 Mono	736 x 480 Colour	736 x 480 Mono	736 x 480 Mono	–
1280 x 1024 Mono	1280 x 1024 Mono	1280 x 1024 Colour	–	1280 x 1024 Mono/ <b>Colour</b>	1280 x 1024 Mono/ <b>Colour</b>
50   40	50   40	40   20	50   –	50   40	–   40
max. 255   max. 255	max. 255   max. 255	max. 255   max. 255	8   <b>2</b>	max. 255   max. 255	max. 255   max. 255
✓	✓	✓	–	✓	✓
–	✓	✓	–	–	–
✓	✓	✓	–	✓	✓
–	✓	✓	–	–	–
✓	✓	✓	–	–	–
✓	✓	✓	–	✓	✓
✓	✓	✓	–	✓	✓
✓	✓	✓	–	✓	✓
✓	✓ (not with data codes and bar codes)	✓ (not with data codes and bar codes)	–	✓ (not with data codes and bar codes)	✓ (not with data codes, bar codes and OCR)
2   4	2   4	2   4	2   4	2   4	2   4
4	4	4	2	4	4
✓	✓	✓	–	✓	✓
✓	✓	✓	✓	✓	✓
✓   ✓	✓   ✓	✓   ✓	✓   ✓	✓   ✓	✓   ✓
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓
✓   ✓   –	✓   ✓   ✓	✓   ✓   ✓	✓   ✓   ✓	✓   ✓   ✓	–
✓	✓	✓	–	✓	✓
✓	✓	✓	–	✓	✓

# Product overview – Eyesight vision systems



Features/system	Eyesight vision systems	
	V10 /V20	V10C/V20C (Colour)
<b>Functions</b>		
Resolution in pixels V10	736 x 480 Mono	736 x 480 Colour
Resolution in pixels V20	1280 x 1024 Mono	1280 x 1024 Colour
Image rate per second V10   V20	50   40	40   20
Number of inspection programmes	max. 40 Mbyte	max. 40 Mbyte
<b>Commands</b>		
Image/camera	Image capture, camera settings	
Colours	Select colour channel, colour inspection, colour filter (V10C./V20C)	
Pre-processing	Calibration and position tracking, correct brightness, remove background, filter functions	
Inputs/outputs	Test input, set output, access INI file, text, data transfer – serial, data transfer – LAN	
Visualisation	Image transfer	
Measurement	Image information, area test, list of points, determine points, determine lines, calculate circle, calculate distance, line distance, calculate cross-section, measure gap width, calipers, calculate angle, determine warpage point	
Programme control	Stop watch, control of sequence and loop options, subprogramme, access variable, evaluation	
Pattern/contour comparison	Count objects, inspect contour; track contour; correlation	
Scanning	Scan points, circular scanner; edge counter; find edges (projected), search ring for counting	
Access to libraries	Script interpreter	
<b>Interfaces</b>		
Inputs   outputs	2   4	2   4
Freely definable switching outputs/inputs	4	4
I/O expansion	✓	✓
RS422   RS232	✓   ✓	✓   ✓
Ethernet	✓	✓
<b>Lens</b>		
V10 integrated, 6 mm   12 mm	✓	✓
V20 integrated, 12 mm	✓   ✓	✓   ✓
C-mount	✓	✓

































































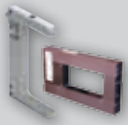
More information in catalogue chapter 4

### Overview of commands: Eyesight vision systems

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

# Product overview – optical sensors








Product family Dimensions (H x W x D)		Distance sensors (Analogue sensors)	Colour (C), contrast (K) and luminescence sensors (UV)	Proximity switches
<b>F 10</b> 21,1 x 14,6 x 8 mm <sup>3</sup>				
<b>F 25</b> 34 x 20 x 12 mm <sup>3</sup>		FT 25-RA   20–80 mm 	FT 25-RL   250 mm   K  	FT 25-RL   250 mm  
		FT 25-RA   30–200 mm 	FT 25-W   12 mm   K 	FT 25-R   800 mm 
			FT 25-RGB   12 mm   K 	
			FT 25-C   12 mm   C 	
<b>F 55</b> 50 x 50 x 23 mm <sup>3</sup>		FT 55-RLAP   5 m  		FT 55-RL2   1,200 mm  
				FT 55-R   2,000 mm 
	Stainless steel			FT 55-RM   1,750 mm 
<b>F 20</b> 32 x 20 x 12 mm <sup>3</sup>		FT 20-RA   20–80 mm 		FT 20-RL   150 mm  
				FT 20-R   300 mm 
				FT 23-R   300 mm
<b>F 50</b> 50 x 50 x 17 mm <sup>3</sup>		FT 50-RLA-20   40–60 mm 	FT 50-C   32 mm   C  	
		FT 50-RLA-40   45–85 mm 	FT 50-C-UV   50 mm   UV  	
		FT 50-RLA-70   30–100 mm   		
		FT 50-RLA-100   70–170 mm   		
		FT 50-RLA-220   80–300 mm   		
<b>Cylindrical sensors</b> Ø 4/5 mm Ø 12 mm Ø 18 mm Ø 30 mm				FM 04/05   50 mm
				FT 12-R   300 mm
				FT 18-2-R   400 mm
				FMS 18-B   400 mm
				FT 18-2-IR   800 mm
				FMS 30-B   1.000 mm
<b>FL 70</b> 84 x 35 x 10 mm <sup>3</sup>		FL 70-RA-xD    		
		Proximity switch 310 mm P/E switch 810 mm		
<b>F 80</b> 83 x 65 x 25 mm <sup>3</sup> <b>F 90</b> 95 x 93 x 42 mm <sup>3</sup>		FT 80-RLA-500   250–750 mm   		
		FT 91/92-ILA   6 m    		
		FT 90-ILA   10 m    		
		FR 91/92-ILA   50 m    		
		FR 90-ILA   250 m    		
<b>FG   FGL</b>				



Proximity switches with background suppression (BGS)/with foreground suppression (FGS)	Photoelectric reflex switches	Through-beam photoelectric switches	Fibre-optic sensors
FT 10-RLH   60 mm	FR 10-RL   2 m	FS/FE 10-RL   3 m	
FT 10-B-RLF   15/30 mm	FR 10-R   1.6 m		
FT 10-RH   70 mm			
FT 10-RF   15/30/50 mm			
FT 10-BF   30/50 mm (Bluelight)			
FT 25-RLH   120 mm	FR 25-RL   13 m	FS/FE 25-RL   18 m	
FT 25-RH   200 mm	FR 25-R   6 m	FS/FE 25-R   13 m	
FT 25-RHD   400 mm	FR 25-RF   3 m	FS/FE 25-RF   4 m	
FT 25-RF   60/80 mm	FR 25-RGO   2 m		
FT 25-RV (FGS)   200 mm	FR 25-RLO   4 m		
FT 55-RLH   800 mm	FR 55-RL   12 m	FS/FE 55-RL   25 m	
FT 55-RL2H   1.000 mm	FR 55-R   12 m	FS/FE 55-R   20 m	
FT 55-B-RH   800 mm	FR 55-RLO   20 m		
FT 55-RH   1,200 mm			
FT 55-RLHP2   5 m			
FT 55-RHM   550 mm	FR 55-RM   11 m	FS/FE 55-RM   15 m	
FT 20-RLH   60 mm	FR 20-RL   3 m	FS/FE 20-R   8 m	FL 20-R   Proximity switch 100 mm
FT 20-RLHD   110 mm	FR 20-R   2.5 m	FS/FE 23-R   4 m	P/E switch 1.000 mm
FT 20-RH   100 mm	FR 20-RD   3.5 m		
FT 23-RF   60 mm	FR 23-R   2.5 m		
FT 20-IH   150 mm	FR 20-RG/RG 1   0.5 m		
	FR 20-RLO   4 m		
FT 50-RLH   150 mm	FR 50-RL   20 m	FS/FE 50-I   15 m	
FT 50-RLHD   300 mm	FR 50-R   5.5 m		
FT 50-RH   300 mm			
FT 50-IH   600 mm			
FT 12-RH   60 mm	FR 12-R   1.5 m	FS/FE 12-RL   5 m	
FT 12-RF   24 mm		FS/FE 12-R   4 m	
FMH 18   120 mm		FS/FE 18-RL   50 m	FMS 18-U   Proximity switch 160 mm
	FR 18-2-R   3 m	FS/FE 18-R   20 m	P/E switch 700 mm
	FR 18-2-IR   3.6 m	FLS/FLE 18-W   50 m	FMS 30-U   Proximity switch 800 mm
		FSE 18-2-I   10 m	P/E switch 4.800 mm
			FAV 30   500 mm
			FL 70-R   Proximity switch 310 mm
			P/E switch 810 mm
FT 92-IL			
		FGL-RK /-IK   30–120 mm	
		FGL 5-IK   5 mm	
		FGL   5–220 mm	
		FG   40–120 x 80 mm <sup>2</sup>	

# Product overview – ultrasonic, inductive and capacitive sensors, Smart

## Ultrasonic Sensors

Products		Adjustment	Scanning distances	Special features
UT 20		Teach-in 	140 mm / 150 mm / 240 mm / 700 mm	Ultrasonic sensors with soundpipe, PNP, NPN, analogue output
UT 12		Via control input	400 mm	PNP, NPN, analogue output
UT/UM 18		Via control input	250 mm / 300 mm / 800 mm	Variants with stainless steel housings, PNP, NPN, analogue output
UMT 30		Teach-in or display  	350 mm / 1300 mm / 3400 mm / 6000 mm	Display, PNP, 2 x PNP or analogue output


## Inductive Sensors

Products		Design	Switching distance	Special features
IT 8 / 10 / 12 / 40 IS 455 / 588		Cubic	0.8 mm / 1.5 mm / 3 mm / 4 mm / 8 mm / 15 mm / 20 mm / 35 mm	Miniature housing, AC/DC variants
IS 33		Cylindrical Ø 3 mm	0.6 mm	PNP, NPN
ISN 44-20 IS 34 IT 4		Cylindrical Ø 4 mm	0.8 mm	PNP, NPN, NAMUR, stainless steel housing
IMT 5		Cylindrical Ø 5 mm	0.8 mm	PNP, NPN, stainless steel housing
ISZ 46 IS 46 / 56 IDT 6		Cylindrical Ø 6,5 mm	1.5 mm / 2 mm / 3 mm	PNP, NPN
IS 48 / 58 IMT 8		Cylindrical Ø 8 mm	1.5 mm / 2 mm / 3 mm / 6 mm	PNP, NPN
IMT 12 IT 12 IS 512		Cylindrical Ø 12 mm	2 mm / 4 mm / 6 mm / 10 mm	PNP, NPN
IS 514		Cylindrical Ø 14 mm	3 mm	PNP, stainless steel housing
IMT 18 IS 518 IT 18		Cylindrical Ø 18 mm	5 mm / 8 mm / 10 mm / 12 mm / 20 mm	PNP, NPN, stainless steel housing
IMT 30 IS 530 IT 30		Cylindrical Ø 30 mm	10 mm / 15 mm / 20 mm / 22 mm / 40 mm	PNP, NPN, stainless steel housing
IS 512 / 518		Cylindrical Ø 12 mm / 18 mm analogue	6 mm / 10 mm	Analogue output

## Capacitive Sensors

Products		Installation	Adjustment	Switching distance
KD / KL 06		Flush / non-flush	Potentiometer	0.1 ... 1.5 / 0.1 ... 3 mm
KD / KL 08		Flush / non-flush	Potentiometer	0.1 ... 1.5 / 0.1 ... 3 mm
KD / KL 12		Flush / non-flush	Potentiometer	1 ... 4 / 1 ... 8 mm
KD / KL 18		Flush / non-flush	Potentiometer	2 ... 8 / 2 ... 15 mm
KD / KL 30		Flush / non-flush	Potentiometer	1 ... 20 / 1 ... 30 mm

## SmartPlug

Products	Special features
MFI (Inverter)	 <p>Inverts NPN to PNP or PNP to NPN devices, N.C./N.O. also adjustable</p> <p>Adjustable counter (pulses or intervals) between 1 ... 65535</p> <p>Adjustable on-delay or drop-out delay between 1 ... 65535 ms</p> <p>Adjustable frequency monitoring between 15 ... 1000 Hz</p> <p>Adjustable wipe function for falling or rising edges; time range 1 ... 65535 ms</p> <p>All-in multifunctional switching device programmable via USB</p>
MFC (Counter)	
MFT (Timer)	
MFF (Frequency)	
MFW (Wipe Function)	
MFU (Universal)	

## Accessories

Products	Description
<b>Mechanical accessories</b> 	Brackets for sensors
	Mountings for VISOR® and illumination
<b>Optical accessories</b> 	Reflectors and reflective tape
	Lenses and protective casings
	Illumination
<b>Electrical accessories</b> 	Cables
	Converters
	Power supply units, switching devices and Panel Viewer

# 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 united in one device
- Highly accurate evaluation via 1.3 megapixel chip
- Powerful colour detection of version with colour chip
- Ethernet, Profinet and EtherNet/IP, RS422/RS232 available for data communication
- User-friendly configuration and viewer software with graded user rights and online help

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)
- User-friendly configuration and viewer software with hierarchical user rights and contextual help

VISOR® Color



## Improved object detection through supplementary colour information

- Powerful colour detection, even with small colour nuances or self-lighting components
- Powerful part-finding and tracking
- High evaluation accuracy through 1.3 megapixel colour chip
- Up to 6 digital switching outputs (a further 32 with IO Box)
- User-friendly configuration and viewer software with hierarchical user rights and contextual help

## 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.

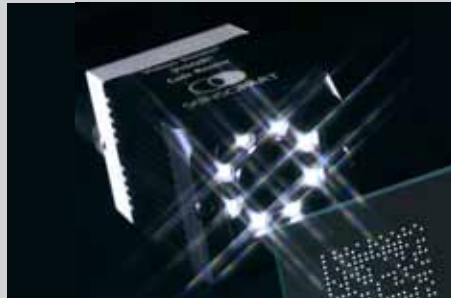
## VISOR® Solar sensor



### 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

## 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

## Eyesight vision system



### Complete image procession 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



#### **C-mount variants:**

- C-mount for many variants can be combined with C-mount protective casing
- VISOR® V20 variants with megapixel resolution for greater accuracy

# VISOR® Allround

## System description

### VISOR® Allround – Object detection in colour 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 unites the functions of the object sensor (i.a. 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 datamatrix 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 colour version with up to 1.3 megapixel. Thus additional "Detectors" are available for colour evaluation. Even the subtlest nuances in shade can be reliably detected. The relevant object colours, for example, can be taught-in quite simply by push of a button or - thanks to the intuitive colour histogram - set graphically for each channel in the colour space. The authorised colour 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

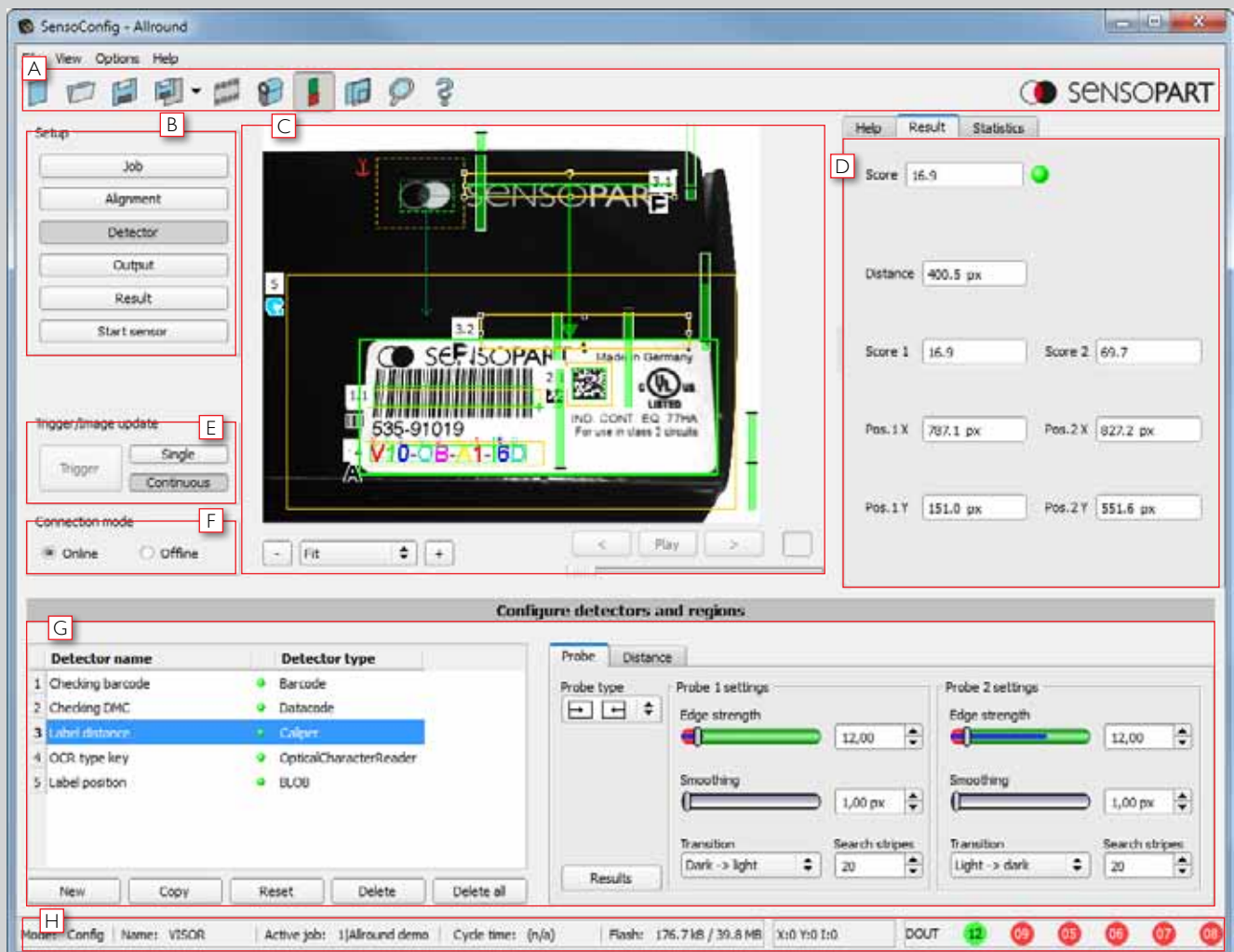
In addition to EtherNet/IP and TCP/IP, the VISOR® vision sensors also support the fieldbus standard Profinet IO and thus "understand" the most common communication standards of Industrial Ethernet. Thanks to freely available PLC function blocks for Siemens S7, Codesys and Allen Bradley, the VISOR® can 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	VISOR® Allround V10/V20	VISOR® Allround V10C/V20C
<b>Functions</b>		
Resolution V10 in pixels	736 x 480 Mono	736 x 480 Colour
Resolution V20 in pixels	1280 x 1024 Mono	1280 x 1024 Colour
Image rate per second V10   V20	50   40	40   20
Number of jobs   detectors	max. 255   max. 255	max. 255   max. 255
Position tracking	✓	✓
Contour (X-,Y-translation, rotation)	✓	✓
Pattern comparison (X-,Y-translation)	✓	✓
BLOB	✓	✓
Calliper	✓	✓
Grey threshold	✓	✓
Contrast	✓	✓
Brightness	✓	✓
Colour area	–	✓
Colour list	–	✓
Colour value	–	✓
Data code	✓	✓
Bar code	✓	✓
Optical character recognition (OCR)	✓	✓
Freeform Tool	✓ (not with data codes and bar codes)	✓ (not with data codes and bar codes)
<b>Interfaces</b>		
Inputs   outputs	2   4	2   4
Freely definable switching outputs/ inputs, PNP or NPN	4	4
Encoder input	✓	✓
I/O expansion	✓	✓
RS232   RS422	✓   ✓	✓   ✓
Ethernet/data transmission	✓	✓
EtherNet/IP	✓	✓
PROFINET	✓	✓
<b>Lens</b>		
V10 integrated, 6 mm   12 mm   25 mm	✓   ✓   ✓	✓   ✓   ✓
V20 integrated, 12 mm	✓	✓
C-mount	✓	✓
<b>Operation/visualisation</b>		
Viewer software with user guidance	✓	✓
Hierarchical user rights	✓	✓



## Overview of the user interface

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

# VISOR® Object sensor

## System description

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

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

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

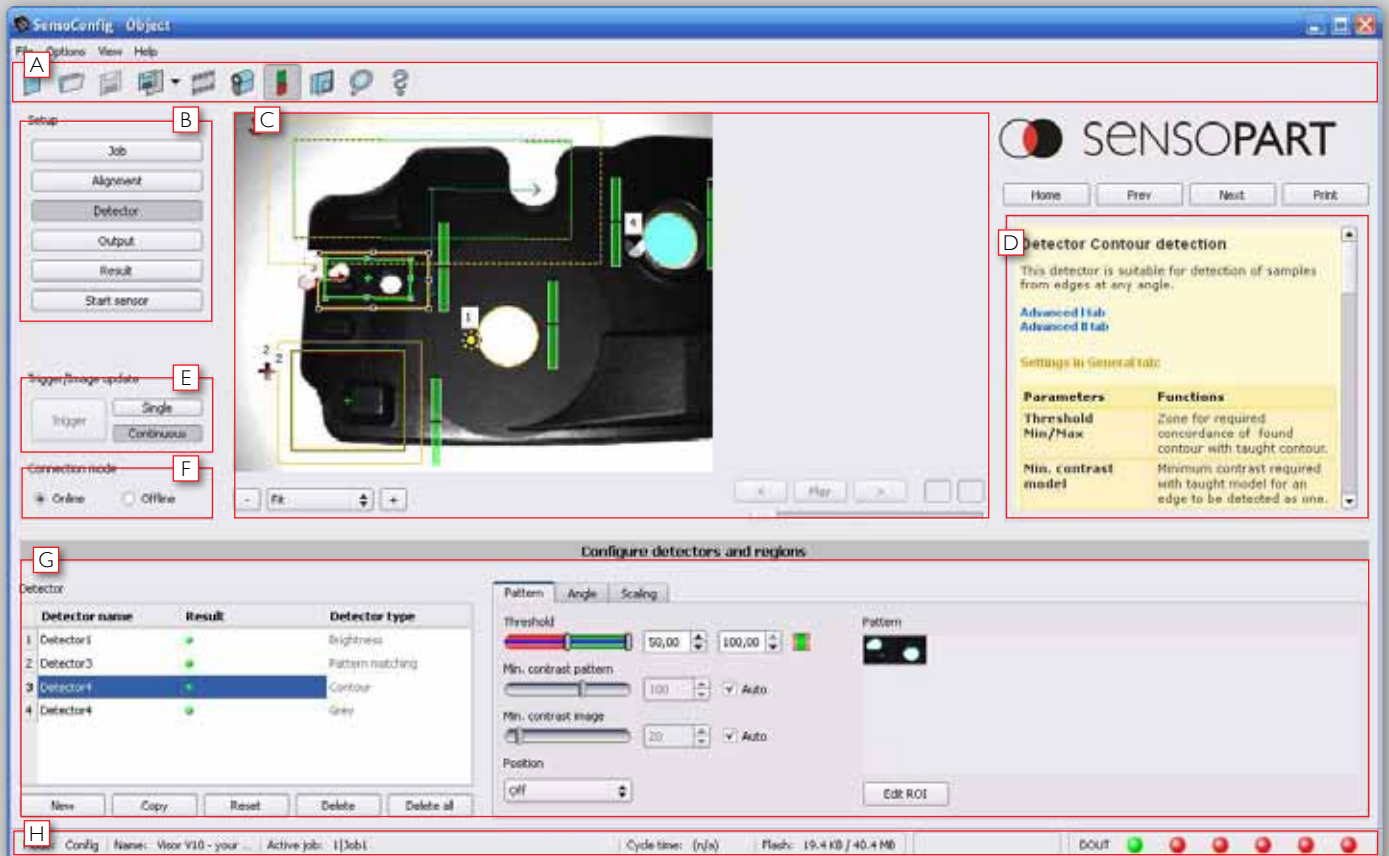
### Step-by-step to your goal

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

### Product variants: the VISOR® Object sensor

Features/sensors	Standard	Advanced
<b>Functions</b>		
Resolution V10 in pixels	736 x 480	736 x 480
Resolution V20 in pixels	–	1280 x 1024
Image rate per second V10   V20	50   –	50   40
Number of jobs   detectors	8   32	max. 255   max. 255
Position tracking	<b>Contour only</b>	✓
Contour (X-,Y-translation, rotation)	✓	✓
Pattern comparison (X-,Y-translation)	✓	✓
	–	✓
<b>BLOB</b>	–	✓
<b>Calliper</b>	✓	✓
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	✓	✓
<b>PROFINET</b>	✓	✓
<b>Lens</b>		
V10 integrated, 6 mm   12 mm   25 mm	✓   ✓   –	✓   ✓   ✓
V20 integrated, 12 mm	–	✓
C-mount	–	✓
<b>Operation/visualisation</b>		
Viewer software with user guidance	✓	✓
Hierarchical user rights	✓	✓





## Overview of the user interface

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

# VISOR® Color

## System description

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

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

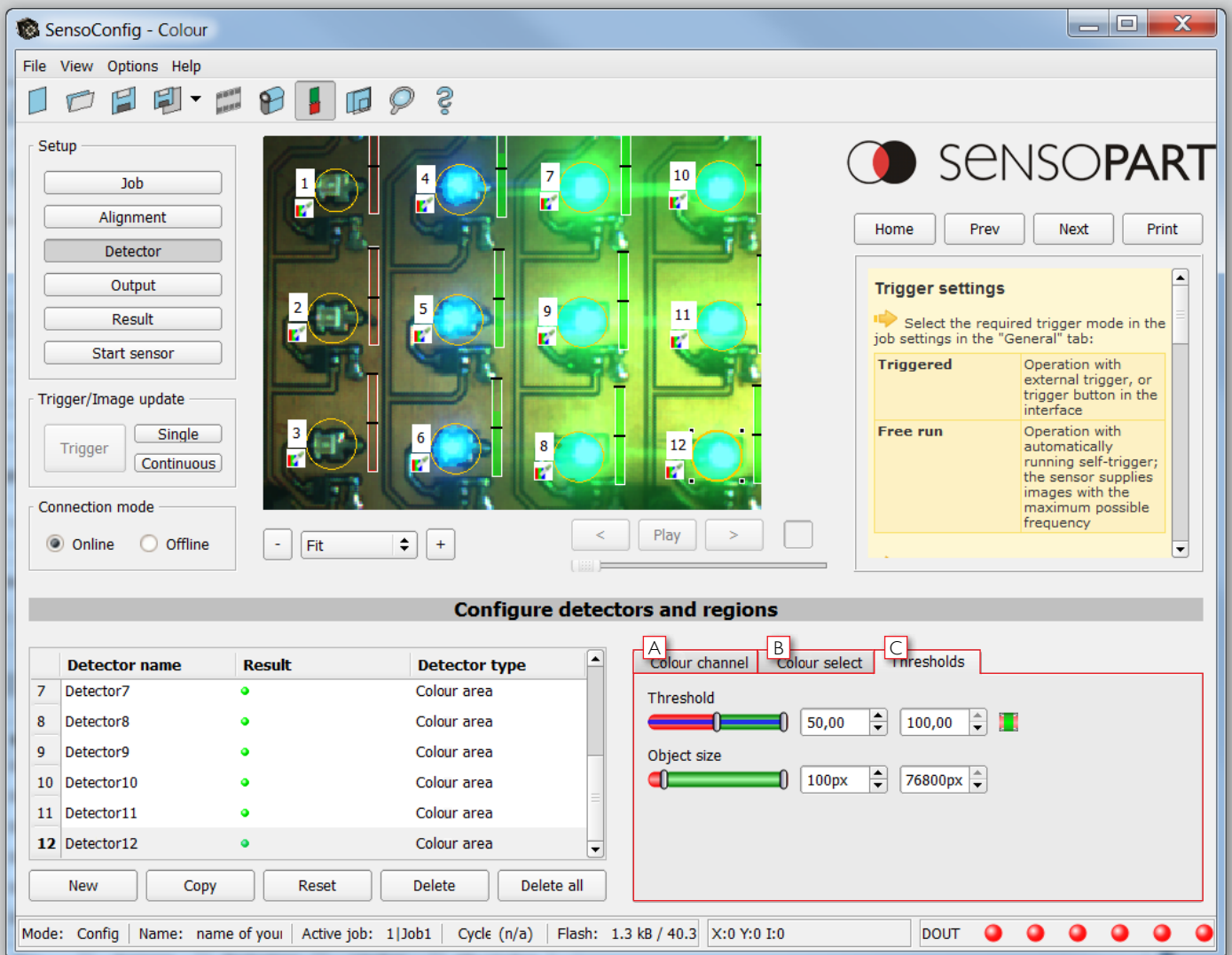
With the new colour detectors, the VISOR® Color is capable of differentiating between the finest of colour nuances. Any desired number of colours, colour gradients or colour patterns can be stored in the sensor memory and called up on demand. Moreover, objects with similar colours can be searched for.

### Uniform operation for all VISOR® sensors

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

## Product variants: VISOR® Color

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



### Overview of the user interface

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

# VISOR® Solar sensor

## System description

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

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

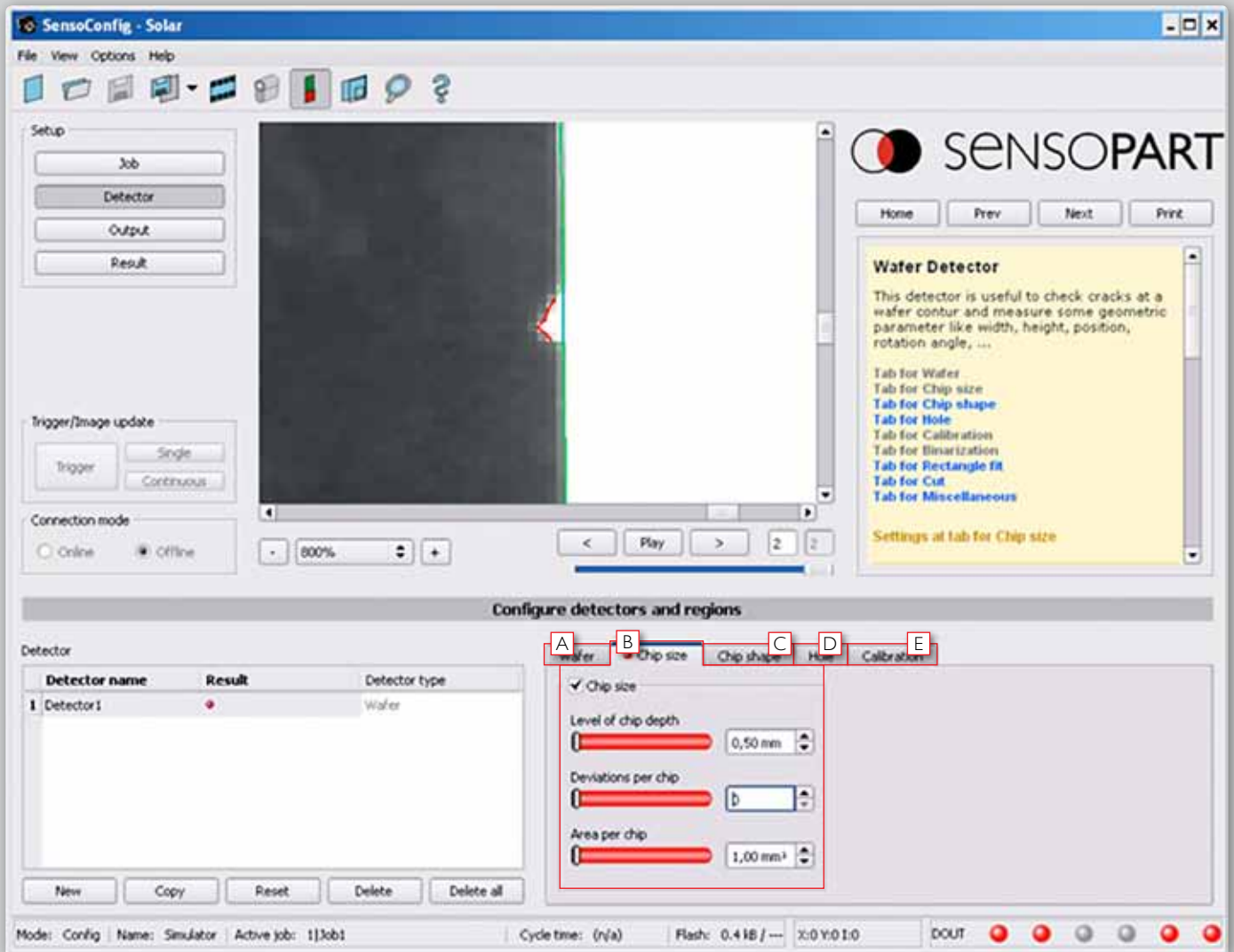
**Plug & play:** using the VISOR® Solar sensor is much easier than a classic image-processing solution. Because the functions relevant for wafer and cell inspections, e.g. the detection of wafer geometry and any defects, are already pre-configured so that the sensor is ready for operation after just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

### HIGHLIGHTS OF THE VISOR® SOLAR SENSOR

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

### Product variants: the VISOR® Solar sensor

Features/sensors	Standard	Advanced
<b>Functions</b>		
Resolution in pixels,V10	736 x 480	736 x 480
Resolution in pixels,V20	–	<b>1280 x 1024</b>
Image rate per second	50	50
Number of jobs   detectors	<b>8</b>   32	255   255
Position tracking	–	✓
Pattern comparison (X-,Y-translation)	–	✓
Grey threshold	✓	✓
Contrast	✓	✓
Brightness	✓	✓
Wafer position and breakouts	✓	✓
Busbar position and number	–	✓
<b>Calliper</b>	–	✓
<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	✓	✓
<b>PROFINET</b>	✓	✓
<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

## 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.

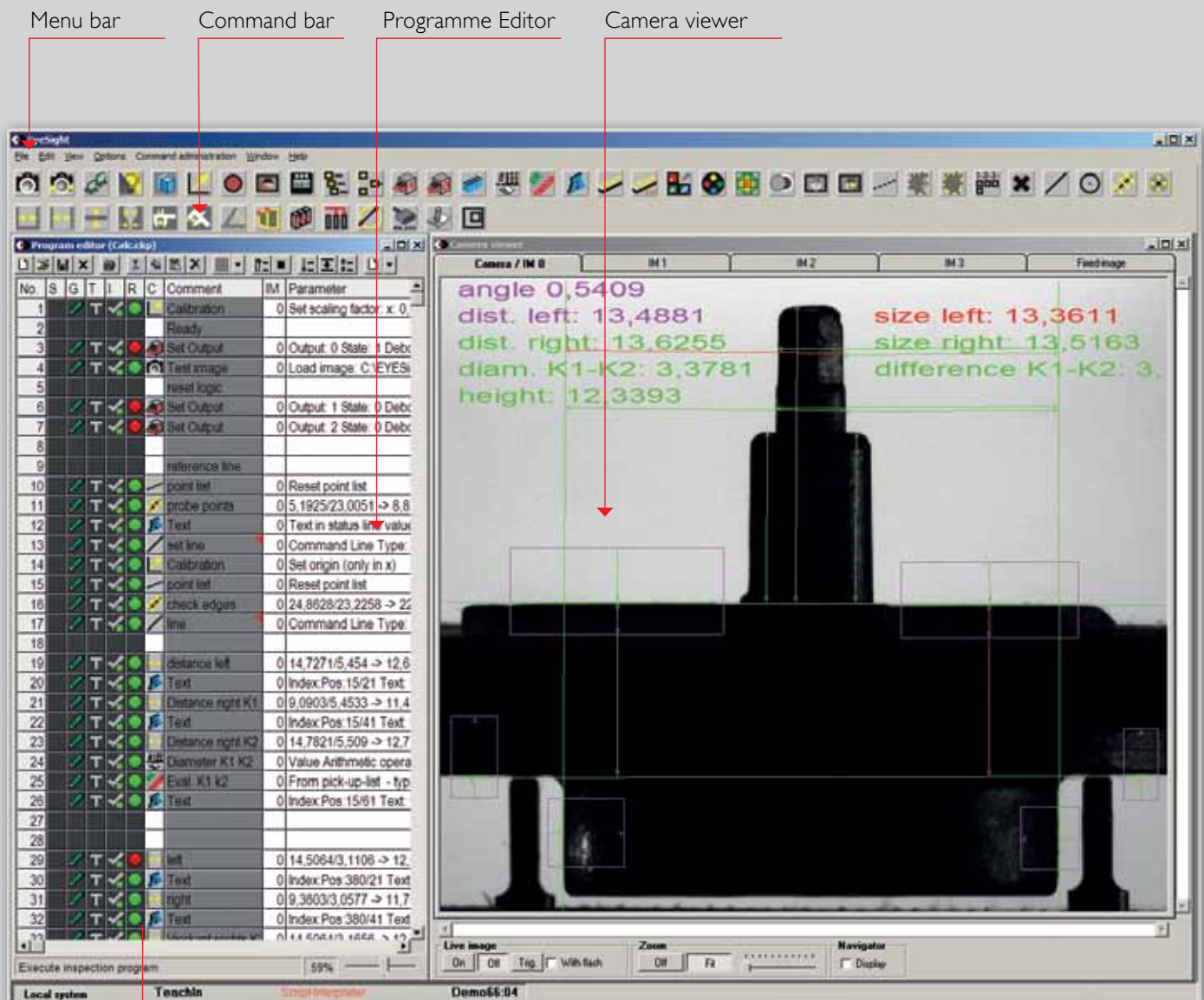
### EYESIGHT HIGHLIGHTS

- 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, colour	736 x 480, colour
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 >> Page 24	See overview of commands >> Page 24	See overview of commands >> Page 24	See overview of commands >> Page 24
<b>Interfaces</b>	2   4	2   4	2   4	2   4
Inputs   outputs	4	4	4	4
Freely definable switching outputs/inputs	✓	✓	✓	✓
I/O expansion	✓   ✓	✓   ✓	✓   ✓	✓   ✓
RS422   RS232	✓	✓	✓	✓
Ethernet/data transmission				
<b>Lens</b>	-   ✓	✓   ✓	-   ✓	✓   ✓
Integrated 6 mm   12 mm	✓	✓	✓	✓
C-mount				
<b>Operation/visualisation</b>	✓	✓	✓	✓
Viewer software eye view				

## Overview of the user interface



### Step-by-step to your goal

#### Step 1

##### Image capture

- Calibration
- Reset outputs
- Enter triggered image

#### Step 2

##### Referencing

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

#### Step 3

##### Inspection of parts

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

#### Step 4

##### Output of results

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

# Eyesight vision systems

## System description

### Overview of commands: Eyesight vision systems

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

\* with colour version



#### Circle calculator:

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



#### Angle calculation:

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



#### Distance calculation:

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



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

## System description

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

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

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

### A few basics regarding good illumination



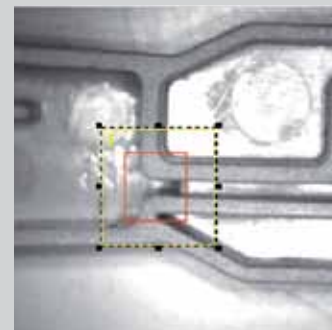
#### White, red or infrared light?

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



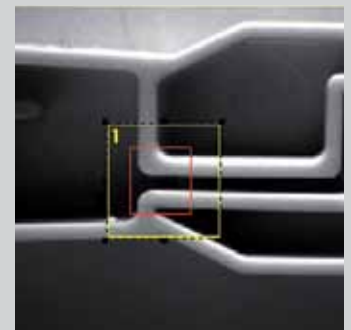
#### Surface or ring lighting?

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



#### Light or dark field?

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



#### With a bright field

Edges and background are difficult to differentiate.

#### With a dark field

Edges are clearly highlighted using dark field illumination.

# 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).

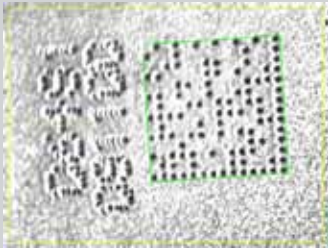
A special image filter with expanded setting options guarantees excellent reading performance even under difficult reading conditions. The test results can largely be evaluated within the sensor itself – with the option of string comparison or regular print-outs – so that there is no need for a PLC or PC connection in many cases. 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 new V20 variants also offer a resolution of 1.3 megapixels for particularly small codes or large search areas.

## VISOR® Code Reader product variants

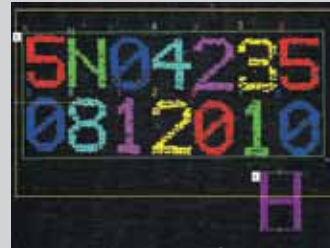
Features/sensors	Standard	Advanced	Professional
<b>Functions</b>			
V10 resolution in pixels	736 x 480	736 x 480	–
V20 resolution in pixels	–	1280 x 1024	1280 x 1024
Image rate per second V10   V20	50   –	50   40	–   40
Number of jobs   detectors	8   <b>2</b>	max. 255   max. 255	max. 255   max. 255
Position tracking	–	✓	✓
Pattern comparison (X-,Y-translation)	–	✓	✓
Grey threshold	–	✓	✓
Contrast	–	✓	✓
Brightness	–	✓	✓
Data code	✓	✓	✓
Bar code	✓	✓	✓
OCR	–	–	✓
Freeform Tool	–	✓	✓
		(not with data codes and bar codes)	(not with data codes, bar codes and OCR)
<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	✓	✓	✓
<b>PROFINET</b>	✓	✓	✓
<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	✓	✓	✓



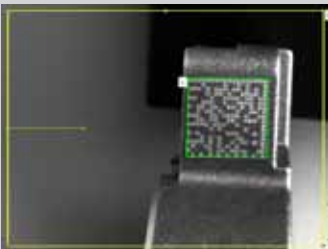
**Dot peened code on rough substrate**  
Code is made legible by powerful reading algorithm. Presence of the nailed imprint in plain text can be checked using object detection.



**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.



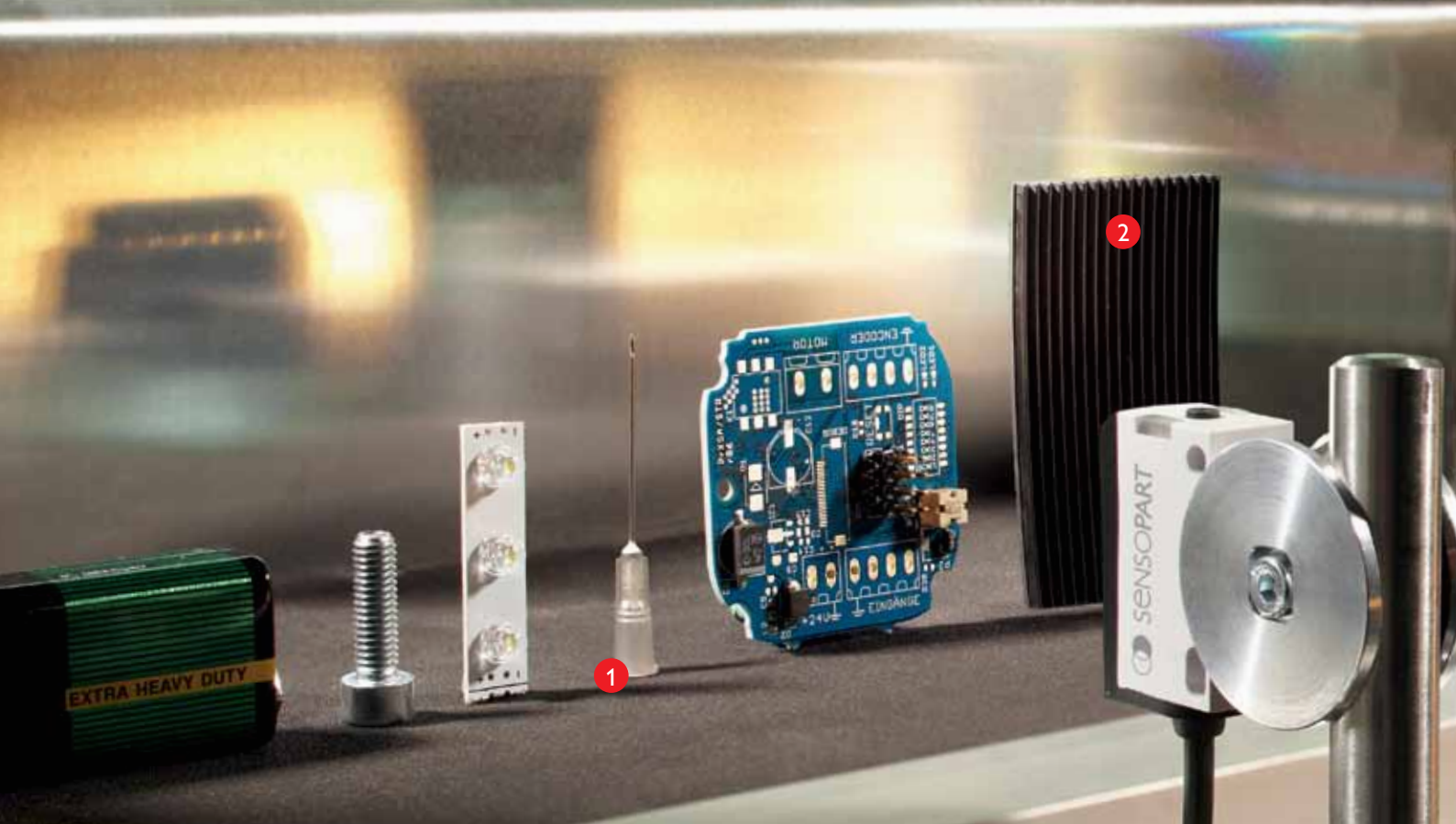
**Printed codes on pharmaceutical packaging**  
ECC200 or bar codes (e.g. EAN 13) can be searched for simultaneously. In addition to code reading, the presence of optical characters can also be checked using object detection.

## 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 neuronal networks, particularly suitable for point printing

# By far the best object detection

Our sensors detect almost any object in any surroundings thanks to the distance principle

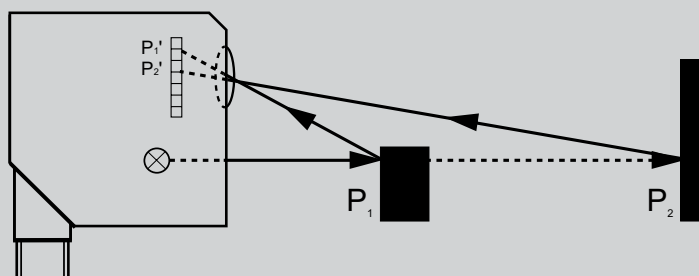


## A challenge for every sensor

Polished covering panels on machinery, blinking warning lamps on passing vehicles, moving machine parts, sunlight coming through a window – all these are background effects that can make detection of the actual target object considerably more difficult. So it is a major advantage if one uses sensors that one can rely on: proximity sensors with background suppression from SensoPart. They only see what they are supposed to see: the object itself – regardless of the material, shape and colour – and nothing else!

## Object detection by means of distance measurement

SensoPart proximity sensors with background suppression can always differentiate between object and background even in strongly reflective environments. The sensor measures the distance to the object,  $P_1$ , and to the possible background,  $P_2$ , according to the triangulation process and not the reflectivity of the object. The signal,  $P_2$ , coming from the background is then cut out. SensoPart has implemented the detection principle of distance measurement with incomparable precision. This high quality could be achieved because we have developed an optoelectronic, integrated circuit (an ASIC), in which the optical receiver cell and the evaluation electronics are integrated in the smallest of spaces





## Your advantages

- Reliable object detection
- High process stability
- An economical solution

### Technology provides the technical edge

Thanks to its tiny dimensions, the ASIC microchip even fits into the sub-miniature sensors of the F 10 series. Thus SensoPart offers the world's smallest laser sensor with adjustable background suppression.

With the latest generation F 10, F 25, and F 55 series, SensoPart offers photoelectric proximity sensors with the best background suppression currently available.

**1** *Reliable detection of the thinnest tubes in front of metallic backgrounds thanks to focused laser light spot and precise background suppression.*

**2** *Detection of black foam rubber pads against reflective backgrounds.*

**3** *Strongly reflective CDs are reliably detected against metallic backgrounds and with ambient light effects.*

**4** *Solar wafers with shimmering blue surfaces against polished metal surfaces with ambient light reflections are reliably detected.*

### Your advantage is our priority

#### Reliable object detection

- Regardless of size, shape, colour, material and surface properties of the target object
- Detection using the distance measurement principle: precise and reliable

#### High process stability

- Reliable suppression of undesirable reflections and ambient light
- Suppression of moving parts in the background (e.g. conveyor belts, machine parts, persons)
- Reliable detection of the target object even when close to the background

#### The economical solution

- Usable in all task areas
- Rapid commissioning thanks to simple teach-in
- High machine run-times through quality sensors from SensoPart, made in Germany

All good things come in ...



3 sensor classes: compact, miniature, subminiature - solutions for a multitude of applications

- Top performance and flexibility in every size
- Numerous versions with different functions in a standardised design: e.g. object sensor, colour/contrast sensor and distance sensor



Unbeatable, no matter the size.

Highlight: F 10 BlueLight with extra reliable detection with

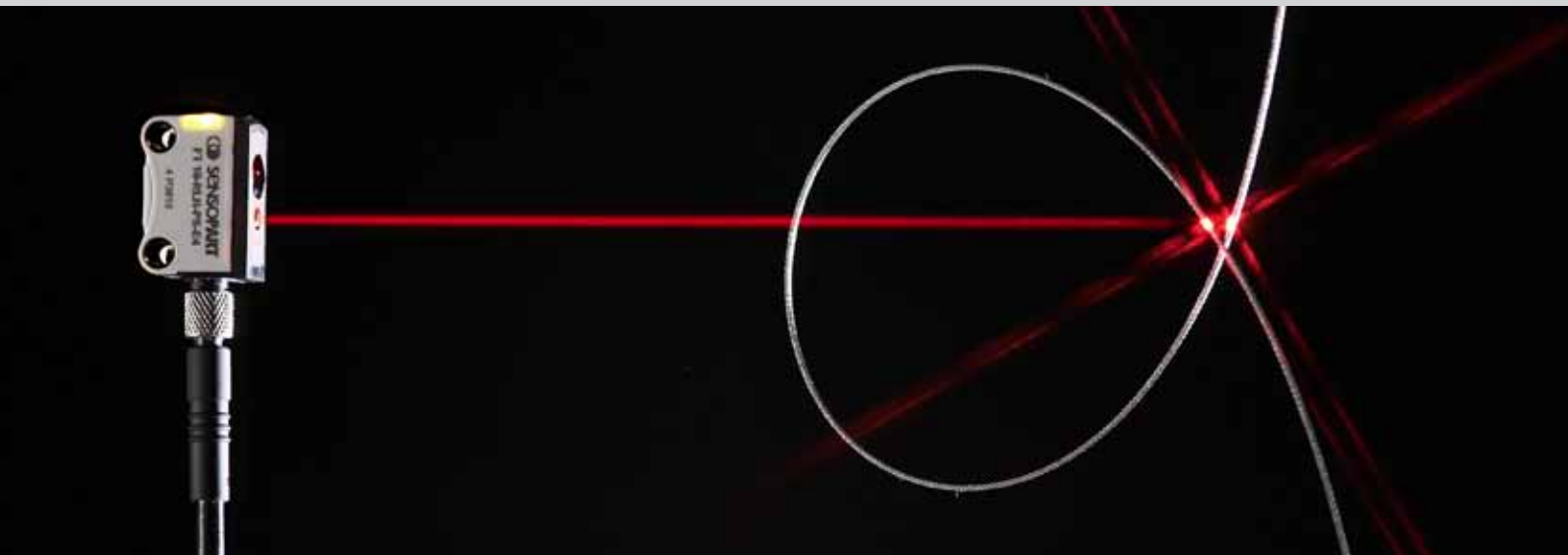
- very dark objects
- transparent objects
- large scanning angles


③ 3 sensor sizes, 3000 applications!

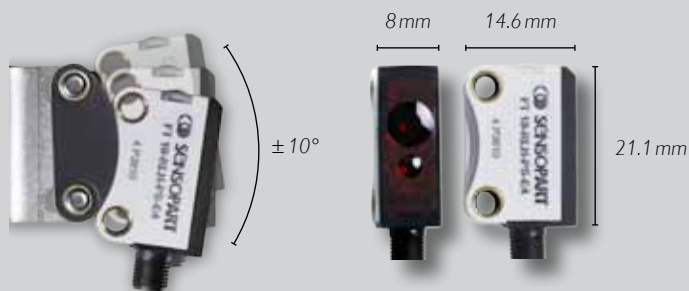


# F 10 – family of sub-miniature sensors

Small housings, great performance



 made in Germany



### Simple mounting:

Mounting using a dovetail that permits fine retro-adjustment of the sensor is particularly recommended when space is limited.

### Special characteristics:

The glass-fibre-reinforced plastic housing with its integrated mounting sleeve, dovetail guide on the back, and laser-marked indelible type code are characteristic of the F 10.

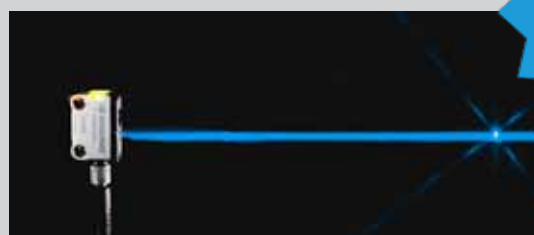


### Mini-sensor with maximum ease-of-use:

Simple commissioning with an electronic teach-in button and easily visible status LEDs is by no means typical for housings of this size.

## TYPICAL F 10














- Sub-miniature sensor for installation in the smallest of spaces and in moving machine parts
- The world's smallest laser sensor with background suppression, adjustable via teach-in
- Sensors as LED or laser versions
- F 10 Bluelight: specially designed for scanning solar wafers and strongly light-absorbing objects
- User-friendly commissioning via electronic teach-in button or control wire
- Well thought-out mounting accessories for rapid and simple integration





The sensors of the F 10 series, available as LED and laser versions, form one of the most comprehensive series on the market in sub-miniature housings. Their precise background suppression, adjustable via teach-in, makes the sensors unique. The light spot of the F 10 laser sensors also remains so focused that small parts in the millimetre range can still be reliably detected even at long distances – for example, a wire with a diameter of 0.5 mm at a distance of 60 mm. One highlight of the new F 10 LED sensors is the F 10 Bluelight with its blue transmission LED, specially developed for detecting solar wafers and strongly light-absorbing objects using the scanning principle.

The F 10 sensors not only impress through their excellent performance data, but also through their unmistakable design with special features – unique in this size of housing. The dovetail mounting system considerably simplifies fine adjustment, particularly in difficult installation locations, and the various connection variants allow rapid commissioning and replacement. The mounting holes of the sub-miniature sensors are reinforced with metal eyelets. A small sensor that will give users great pleasure!

F 10 Product Overview					
	Type of light	Adjustment	Scanning distance/range	Special features	Chapter
<b>Photoelectric proximity sensors with background suppression</b>					
FT 10-RLH	Laser 	Teach-in 	60 mm	The only scanner with scanning distance adjustment	<b>8</b>
FT 10-RLHR	Laser 	Teach-in 	60 mm	Broad-beam light spot	
FT 10-B-RLF	Laser 	Fixed focus	15 mm / 30 mm		
FT 10-RH	LED	Teach-in 	70 mm		
FT 10-RF	LED	Fixed focus	15 mm / 30 mm / 50 mm		
<b>FT 10-BF Bluelight</b>	<b>LED, blue</b>	<b>Fixed focus</b>	<b>30 mm / 50 mm</b>	<b>Blue transmission LED for strongly light-absorbing objects</b>	
<b>Retroreflective photoelectric sensors</b>					
FR 10-RL	Laser 	Teach-in 	2 m	Long range, precise small-part detection	<b>8</b>
FR 10-R	LED	Teach-in 	1.6 m	Long range	
<b>Through-beam photoelectric sensors</b>					
FS/FE 10-RL	Laser 	Teach-in 	3 m	Sensor pair, very accurate object positioning	<b>8</b>
FS 10-RL/FE 10-RL	Laser 	Teach-in 	3 m	Transmitter/receiver, very accurate object positioning	

# FT 10-BF

Bluelight photoelectric proximity sensor with background suppression, fixed focus



## PRODUCT HIGHLIGHTS

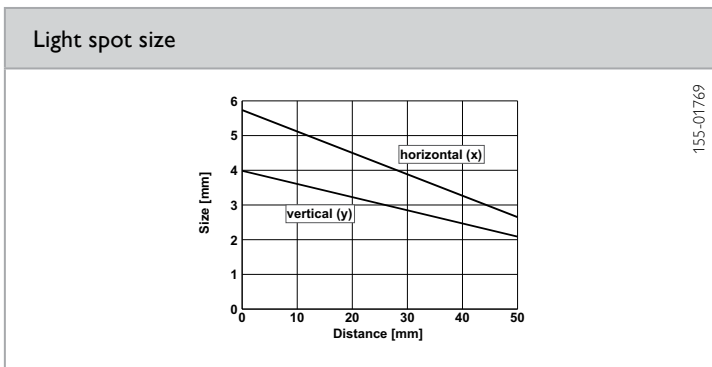
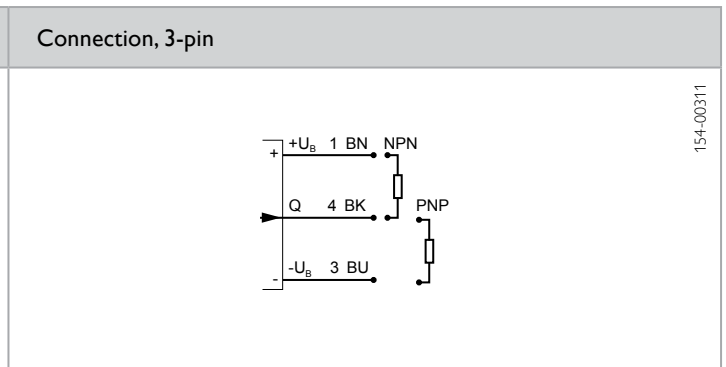
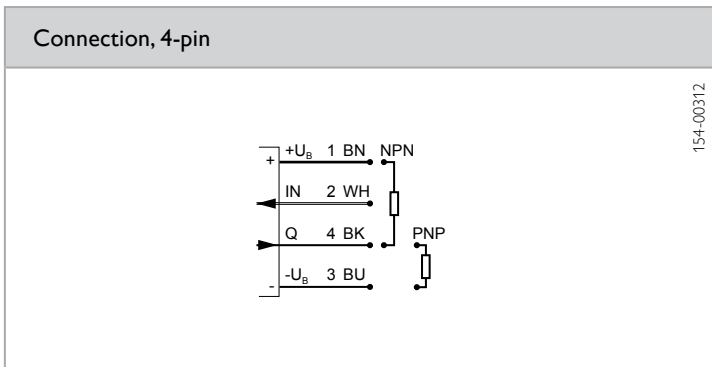
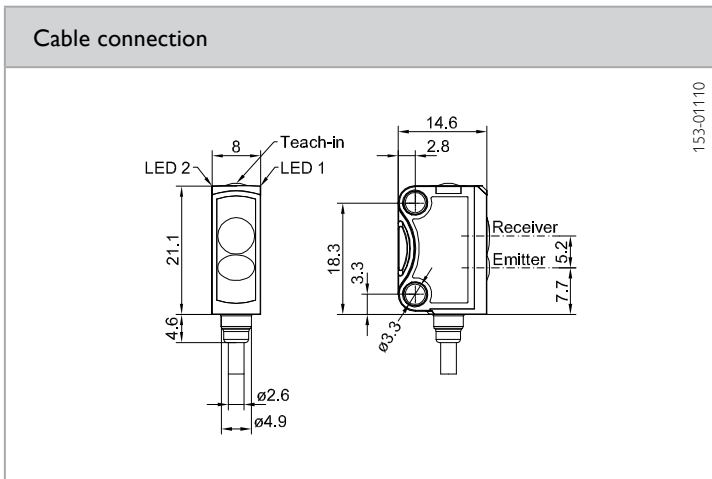
- Sub-miniature sensor with blue transmission LED and precise fixed background suppression
- Reliable switching behaviour with strongly light-absorbing objects, e.g. solar wafers
- Reliable operation without reflector - even with critical surfaces
- Tamper-proof sensor design - no misalignment possible
- Simple mounting and adjustment through innovative dovetail clamp mounting

Optical data		Functions	
Scanning distance	2 ... 30 mm <sup>1</sup> / 2 ... 50 mm <sup>1</sup>	Indicator LED, green	Operating voltage indicator
Optimum scanning distance	15 ... 20 mm	Indicator LED, yellow	Switching output indicator
Used light	LED, blue, 450 nm	Adjustment possibilities	N.O. / N.C. via control input <sup>3</sup>
LED risk group (DIN 62471)	2		
Light spot size	See diagram		
Electrical data		Mechanical data	
Operating voltage +U <sub>B</sub>	10 ... 30V DC <sup>2</sup>	Dimensions	21,1 x 14,6 x 8 mm <sup>3</sup>
No-load supply current I <sub>0</sub>	≤ 20 mA	Enclosure rating	IP 67 <sup>4</sup>
Output current I <sub>e</sub>	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U <sub>B</sub> / short-circuit protection (Q)	Material, front screen	PMMA
Protection class	2	Type of connection	See Selection Table
Power On Delay	< 300 ms	Ambient temperature: operation	-20 ... +50 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (cable device)	approx. 22 g
Switching frequency, f (ti/tp 1:1)	800 Hz	Weight (pigtail)	approx. 10 g
Response time	625 μs		
Control input, IN <sup>3</sup>	+U <sub>B</sub> = N.C. -U <sub>B</sub> / Open = N.O.		

<sup>1</sup> Reference material white, 90 % reflectivity    <sup>2</sup> Max. residual ripple 10 %, within U<sub>B</sub>, approx. 50 Hz/100 Hz    <sup>3</sup> only 4-pin design    <sup>4</sup> with connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
2 ... 30 mm <sup>1</sup>	PNP	Cable, 2 m, 4-wire	FT 10-BF2-PS-K4	600-11026
2 ... 30 mm <sup>1</sup>	NPN	Cable, 2 m, 4-wire	FT 10-BF2-NS-K4	600-11029
2 ... 30 mm <sup>1</sup>	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF2-PS-KM4	600-11027
2 ... 30 mm <sup>1</sup>	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF2-NS-KM4	600-11030
2 ... 30 mm <sup>1</sup>	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-BF2-PS-KM3	600-11028
2 ... 30 mm <sup>1</sup>	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-BF2-NS-KM3	600-11031
2 ... 50 mm <sup>1</sup>	PNP	Cable, 2 m, 4-wire	FT 10-BF3-PS-K4	600-11036
2 ... 50 mm <sup>1</sup>	NPN	Cable, 2 m, 4-wire	FT 10-BF3-NS-K4	600-11039
2 ... 50 mm <sup>1</sup>	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF3-PS-KM4	600-11037
2 ... 50 mm <sup>1</sup>	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF3-NS-KM4	600-11040
2 ... 50 mm <sup>1</sup>	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-BF3-PS-KM3	600-11038
2 ... 50 mm <sup>1</sup>	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-BF3-NS-KM3	600-11041

Including dovetail clamp mounting MBD F 10 for all types




**Accessories**

Connection cables	See product catalogue/ accessories
Brackets	

# F 25 – the miniature sensor family of the new generation

The best of its type



 made in Germany



## The specialist for glass detection:

The FR 25-RGO retroreflective photoelectric sensor has been specially designed for detecting transparent objects. It offers absolutely precise and reproducible switching behaviour thanks to its autocollimation principle and automatic adaptation of the switching threshold (the DELTA function).

(Left) **Simple mounting, precise adjustment:** The robust aluminium dovetail mounting is particularly suitable when installation space is limited. It allows easy and accurate fine adjustment of the sensor after installation.

**Precise background suppression:** Thanks to extremely precise background suppression, the sensors of the F 25 series are completely immune to reflective and glossy machine parts and background effects. Together with switching that is independent of colour and object properties, F 25 sensors are the best on the market.



## TYPICAL F 25





- The best black/white-shift on the market in this sensor class
- Precise background suppression thanks to the ASIC microchip
- Auto-detect: automatic adjustment of the switching output (PNP/NPN), unique on the market
- Precise detection of transparent objects of any shape (FR-25-RGO with DELTA function)
- Long ranges with compact miniature housing
- All sensors available in laser and LED designs
- Robust glass-fibre-reinforced plastic housings (IP 69K & IP 67, Ecolab)
- Robust sensor design with metal plug and mounting holes reinforced with metal inserts
- Simplest mounting thanks to dovetail, patented rod mounting and clamping jaws
- Safe operation thanks to Laser Class 1

The right sensor for every application: the new F 25 sensor family from SensoPart offers a very large range of variants – from the LED through-beam photoelectric sensor to the laser photoelectric proximity sensor with adjustable background suppression. Everything that the user could want is in the programme, including special applications: the FR 25-RGO autocollimation sensor detects transparent objects of any shape whilst automatically adapting its switching threshold to the operating conditions (the DELTA function).

Whether small-part detection or checking presence on a conveyor belt, the excellent performance of the F 25 series is always

impressive. Thus the FT 25-RHD scanner not only offers very precise background suppression, but also the best black/white-shift in its class.

The robust design with tightly sealed housings (IP 69K & IP 67), the tough metal plugs and mounting holes with metal inserts, the simple dovetail mounting, the easy setup via teach-in or control input, and the many other clever details ensure uncomplicated and efficient operating processes. Not to mention the Auto-detect function that is exclusive to SensoPart: sensors equipped with it autonomously detect whether there is PNP or NPN wiring.

F 25 – Product Overview					
	Type of light	Adjustment	Scanning distance / range	Special features	Chapter
<b>Photoelectric proximity sensors with background suppression</b>					
FT 25-RLH	Laser 	Teach-in 	120 mm	Most accurate small-part detection	8
FT 25-RH	LED	Teach-in 	200 mm		
FT 25-RHD	LED	Teach-in 	400 mm	Long scanning distance	
FT 25-RF1/2	LED	Fixed focus	60 mm / 80 mm		
<b>Photoelectric proximity sensors with foreground suppression</b>					
FT 25-RV	LED	Teach-in 	200 mm	Window function (switching window)	8
<b>Photoelectric proximity sensors</b>					
FT 25-RL	Laser 	Teach-in 	250 mm	Detection of minimal grey value differences	8
FT 25-R	LED	Teach-in 	800 mm		
<b>Retroreflective photoelectric sensors</b>					
FR 25-RGO	LED	Teach-in 	2 m	Autocollimation, detection of transparent objects	8
FR 25-RGO2	LED	Teach-in 	2 m	Autocollimation	
FR 25-RLO	Laser 	Teach-in 	4 m	Autocollimation, most accurate small-part detection	
FR 25-RL	Laser 	Teach-in 	15 m	Most accurate small-part detection	
FR 25-R	LED	Teach-in 	7 m		
FR 25-RF	LED	Fixed setting	5 m		
<b>Through-beam photoelectric sensors</b>					
FS/FE 25-RL	Laser 	Teach-in 	20 m	Most accurate small-part detection	8
FS/FE 25-R	LED	Teach-in 	15 m		
FS/FE 25-RF	LED	Fixed setting	6 m		

# FT 25-RV

## Photoelectric proximity sensor with foreground suppression



### PRODUCT HIGHLIGHTS

- Auto-detect photoelectric proximity sensor with real PNP and real NPN functions
- Precisely adjustable foreground suppression
- Long scanning distance of 200 mm with small and compact housings
- Additional adjustable window function (switching window)
- 2-point teach-in or dynamic teach-in also possible via external control line

Optical data		Functions	
Scanning distance	30 ... 200 mm <sup>1</sup>	Indicator LED, green	Operating voltage indicator
Type of light	LED, red, 632 nm	Indicator LED, yellow	Switching output indicator
Light spot size	See diagram	Scanning distance adjustment	Via Teach-in button and control input
		Teach-in modes	Mode 1: during running process Mode 2: during standing process Mode 3: switching window
		Adjustment possibilities	N.O./N.C. via Teach-in button and control input Button lock via control input Auto-detect / NPN/ PNP via Teach-in button and control input (only Auto-detect-variants)
		Default settings	Max. scanning distance and N.O.
Electrical data		Mechanical data	
Operating voltage, +U <sub>B</sub>	10 ... 30V DC <sup>2</sup>	Dimensions	34 x 20 x 12 mm <sup>3</sup>
No-load current, I <sub>0</sub>	≤ 30 mA	Enclosure rating	IP 69K & IP 67 <sup>3</sup>
Output current, I <sub>e</sub>	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U <sub>B</sub> / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	< 300 ms	Ambient temperature: operation	-20 ... +60 °C <sup>4</sup>
Switching output, Q	PNP/NPN / Auto-Detect (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (metal plug device <sup>5</sup> )	10 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN	+U <sub>B</sub> = teach-in, -U <sub>B</sub> = button locked Open = normal operation		

<sup>1</sup> Reference material: white, 90 % reflectivity

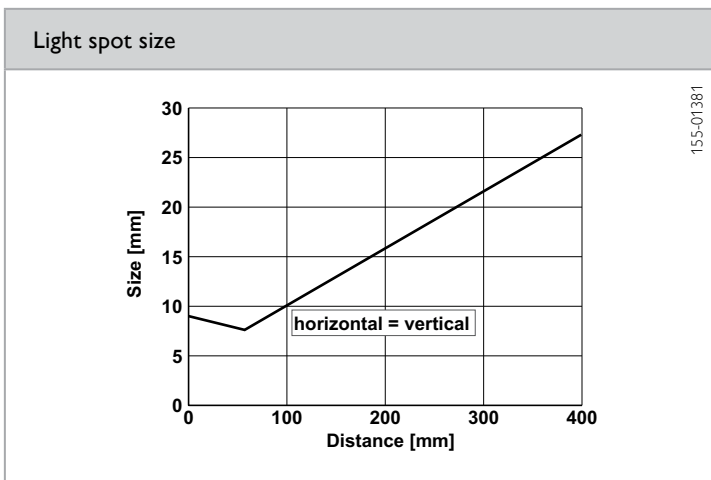
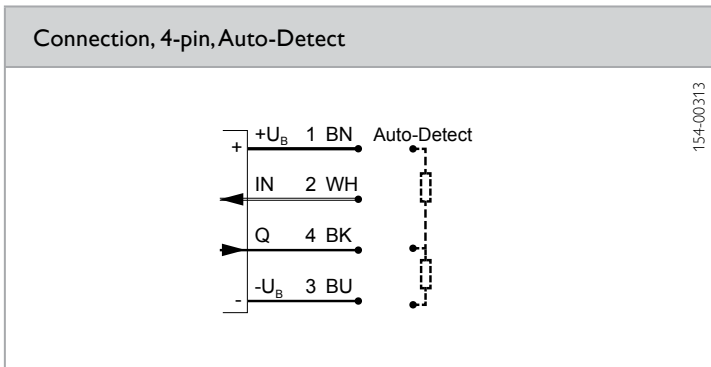
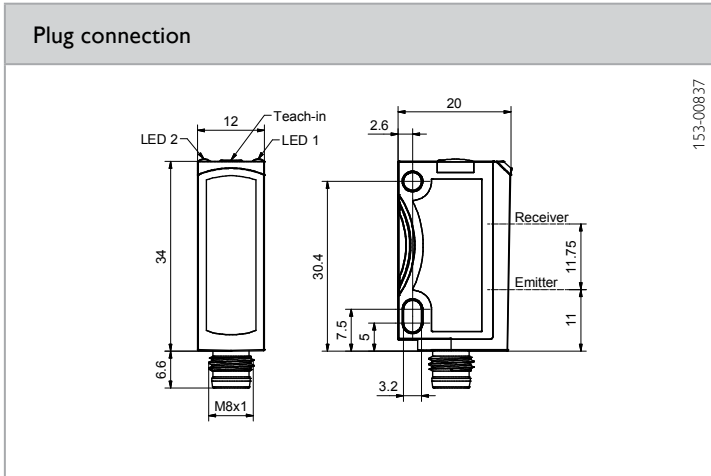
<sup>2</sup> Max. 10 % ripple, within U<sub>B</sub>, ~ 50 Hz / 100 Hz

<sup>3</sup> With connected IP 67 / IP 69K plug

<sup>4</sup> UL: -20 °C... + 50 °C

<sup>5</sup> No Ecolab

Scanning distance	Switching output	Type of connection	Part number	Article number
30 ... 200 mm	PNP	Plug, M8x1, 4-pin	FT 25-RV-PS-M4	604-41006
30 ... 200 mm	NPN	Plug, M8x1, 4-pin	FT 25-RV-NS-M4	604-41007
30 ... 200 mm	Auto-Detect	Plug, M8x1, 4-pin	FT 25-RV-PNS-M4	604-41005
30 ... 200 mm	Auto-Detect	Metal plug, M8x1, 4-pin	FT 25-RV-PNS-M4M	604-41004



Reference material	Detection range
White (90 %)	30 ... 200 mm
Grey (18 %)	30 ... 200 mm
Black (6 %)	30 ... 200 mm


**Accessories**

Connection cables	See product catalogue/ accessories
Brackets	

# FT 55 – Time-of-flight sensors with ranges of up to 5 metres

Compact sensors for precise measurement tasks and reliable object detection



 made in Germany



#### **Reliable object detection:**

Even objects with highly reflective metal surfaces and at critical measurement angles are reliably detected.



#### **Precise fine adjustment:**

The clever mounting and adjustment concept has been specially developed for FT 55 distance sensors. Small changes in angle allow precise alignment of the light spot, even at long distances.

#### TYPICAL FT 55

- Long ranges and scanning distances (up to 5 m on light objects and 3 m on dark ones) in compact easy-to-install housings (50 x 50 x 23 mm<sup>3</sup>)
- Reliable object detection against any backgrounds thanks to light time-of-flight process
- High switching frequency (500/250 Hz) for rapid processes
- High repeatability in the mm range
- Laser Class 1, no danger to the human eye
- Glass-fibre-reinforced, high-density plastic housings (IP67/IP69K)
- Simple mounting and operation (dovetail, teach-in)









## Measuring or switching – the right variant for every application

### Measuring distances: laser distance sensors with analogue output

The distance sensors of type FT 55-RLAP, operating on the principle of light time-of-flight, measure distances of up to 5 m with great precision. They provide a signal that is proportional to the distance via the integrated analogue output (4...20 mA/0...10 V, invertible characteristics) and also have a switching output with switching window function that is adjustable independently of the analogue measurement range. The measuring distance sensor with analogue output is used, for example, for inspecting the diameter of coils, positioning robots or measuring filling levels and stack heights.

### Object detection: laser proximity sensor with background suppression

The proximity sensor variants of type FT 55-RLHP2 are available with one or two digital switching outputs and offer reliable object detection at long distances (up to 5 m on white objects and 3 m on black objects). Dependable detection of the target object is also guaranteed in front of interfering backgrounds regardless of the colour, shape, structure and alignment of the object. The light time-of-flight scanners are used, for example, for inspecting the mounting of rubber and plastic components during car production, for checking the occupancy of shelves in high-bay warehouses, or for inspecting the position of logs.

FT 55 – Product Overview					
	Type of light	Adjustment	Scanning distance/range <sup>1</sup>	Special features	Chapter
<b>Laser distance sensor (scanner)</b>					
FT 55-RLAP	Laser 	Teach-in 	0.1 ... 5 m	<ul style="list-style-type: none"> <li>• Measurement over long distances</li> <li>• 4...20 mA or 0...10 V analogue output</li> <li>• Separate switching output with window function</li> <li>• Simple operation</li> <li>• Laser Class 1</li> </ul>	<b>6</b>
<b>Photoelectric proximity sensors with background suppression</b>					
FT 55-RLHP2	Laser 	Teach-in 	0 ... 5 m	<ul style="list-style-type: none"> <li>• Precise object detection over long distances</li> <li>• 1 or 2 switching outputs</li> <li>• Laser Class 1</li> </ul>	<b>8</b>
FT 55-RLH	Laser 	Potentiometer	0.05 ... 0.8 m	<ul style="list-style-type: none"> <li>• Precise background suppression and small-part detection</li> <li>• Laser Class 1</li> </ul>	
FT 55-RL2H	Laser 	Potentiometer	0.05 ... 1 m	<ul style="list-style-type: none"> <li>• Precise background suppression and small-part detection</li> <li>• Laser Class 2</li> </ul>	

<sup>1</sup> Reference material white, 90% reflectivity

# FT 55-RLAP

Distance sensor for large distances – Time-of-flight technology



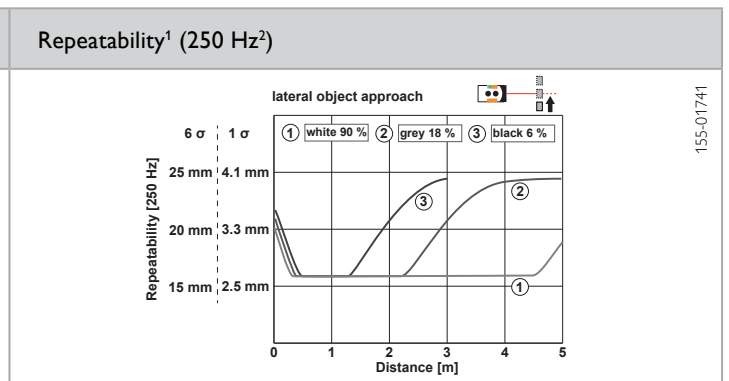
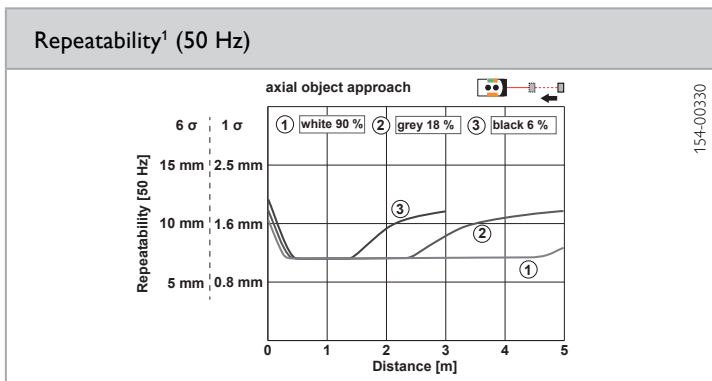
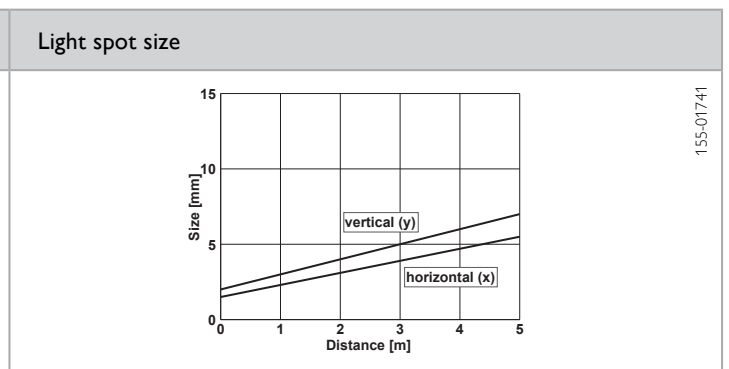
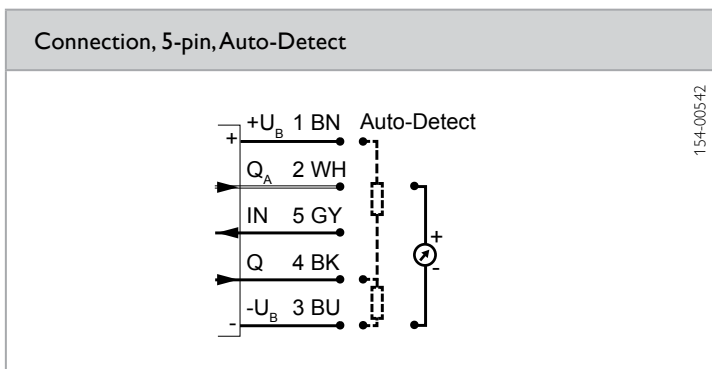
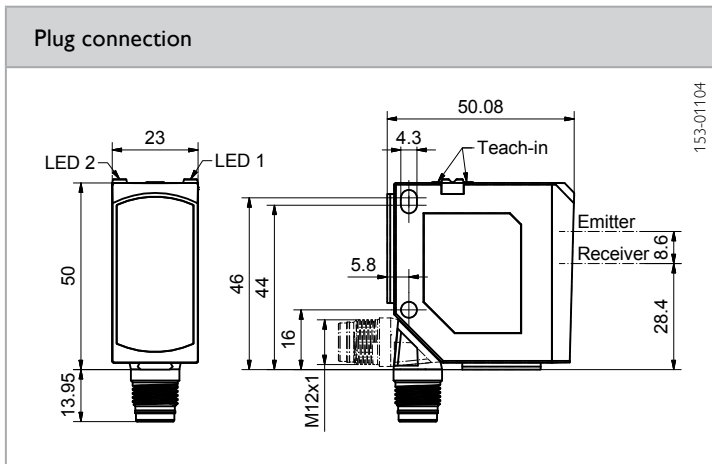
## PRODUCT HIGHLIGHTS

- For measurement and control tasks with all object surfaces at long scanning distances
- Stable and precise distance measurement even with tilted objects and with bright, highly reflective or shiny backgrounds
- Compact design for an easy integration
- High flexibility thanks to invertible analogue characteristic ( $Q_A$ ) and window mode (Q)
- Easy installation and operation via external teach-in
- Clearly visible laser light spot (laser class 1) for an easy alignment and full eye safety

Optical data		Functions	
Measurement range	0.1 ... 5 m (see Selection Table) <sup>1</sup>	Indicator LED 2, green	Operating voltage indicator
Resolution	< 5 mm (12-bit)	Indicator LED 2, yellow	Status indicator analogue output
Linearity	$\pm 30 \text{ mm}^{1,2}$	Indicator LED 1 yellow	Switching output indicator
Repeatability	$1.2 \text{ mm}^{1,2,3}$	Measurement range adjustment	Via Teach-in button or control input
Hysteresis	20 mm	Adjustment possibilities	Analogue measurement range $Q_A$
Type of light	Laser, red 655 nm		Invertible analogue characteristic
Laser class (DIN EN 60825-1:2008-5)	1		Switching output Q (window mode)
			N.O. / N.C. and Auto-Detect / NPN / PNP via teach-in and control line
			Button lock via control input
		Default settings	See Selection Table
Electrical data			
Operating voltage $+U_B$	18 ... 30V DC	Response time Q	2 ms
No-load current I	$\leq 60 \text{ mA}$	Load	$\leq 500 \text{ Ohm}$ (4 ... 20 mA) $\geq 4 \text{ k Ohm}$ (0 ... 10 V)
Output current $I_e$ Q	100 mA	Analogue output $Q_A$	4 ... 20 mA / 0 ... 10 V
Protection circuits	Reverse polarity protection $U_B$ / short-circuit protection (Q)	Update rate $Q_A$	2 ms
Protection class	2	Temperature drift	< 0.1 %/K
Power On Delay	< 5 s	Warm-up time	20 min.
Switching output Q	Auto-Detect (PNP/NPN)	Control input IN	$+U_B$ = Teach-in $-U_B$ = Button locked Open = normal operation
Output function	N.O. / N.C.		
Switching frequency f (ti/tp 1:1) Q	$\leq 250 \text{ Hz}$		
Mechanical data			
Dimensions	50 x 50.08 x 23 mm <sup>3</sup>	Ambient temperature: operation	-40 ... +60 °C <sup>5</sup>
Enclosure rating	IP 67 & IP 69K <sup>4</sup>	Ambient temperature: storage	-40 ... +80 °C
Material, housing	ABS	Weight (plug device)	42 g
Material, front screen	PMMA	Resistance to vibration and impacts	EN 60947-5-2
Type of connection	See Selection Table		

<sup>1</sup> Reference material 90 % reflectivity    <sup>2</sup> At 50 Hz    <sup>3</sup> For 1  $\sigma$ , see diagram for further values    <sup>4</sup> With connected IP 67 / IP 69K plug    <sup>5</sup> Up to +50 °C with current output 4 ... 20 mA

Measurement range <sup>1</sup>	Analogue output	Switching output	Type of connection	Part Number	Article number
0.1 ... 5 m	4 ... 20 mA	Auto-Detect	Plug, M12x1, 5-pin	FT 55-RLAP-5-PNSI-L5	622-21018
0.1 ... 5 m	0 ... 10V	Auto-Detect	Plug, M12x1, 5-pin	FT 55-RLAP-5-PNSU-L5	622-21021



<sup>1</sup> At constant ambient conditions    <sup>2</sup> Automatic adjustment to 50 Hz at constant distance

Characteristic analogue curve	Reference material	Measurement range
	White (90 %)	0.1 ... 5 m
	Grey (18 %)	0.1 ... 5 m
	Black (6 %)	0.1 ... 3 m
	<b>Default setting<sup>3</sup></b>	
	Analogue output $Q_A$ (4...20 mA / 0,09 ... 10V)	0.3 ... 3 m
	Switching output Q (A1...A2), N.O., Auto-Detect	0.3 ... 3 m
<b>Accessories</b>		
	Connection cables	See product catalogue/ accessories
	Brackets	

155-01742

155-01681

<sup>3</sup>The specified precision is achieved by teaching the distances

# FT 55-RLHP2

Laser photoelectric proximity sensor with background suppression – Time-of-flight technology



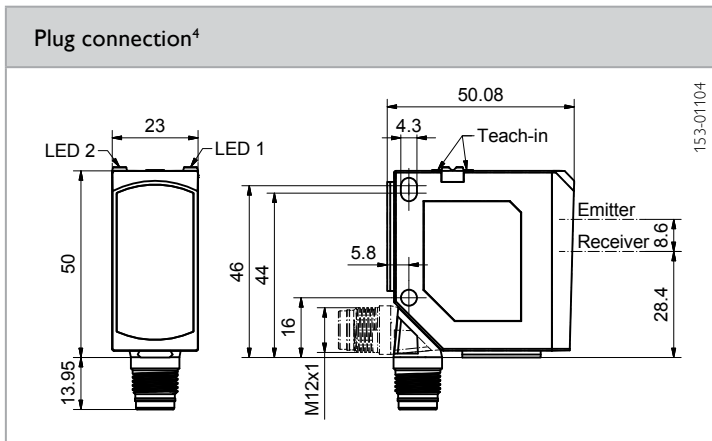
## PRODUCT HIGHLIGHTS

- For detection tasks with all object surfaces at high scanning distances
- Reliable object detection even with tilted objects and with bright, highly reflective or shiny backgrounds
- Compact housing for an easy integration
- Simple teach-in (also external)
- Clearly visible laser light spot (laser class 1) for an easy alignment and full eye safety

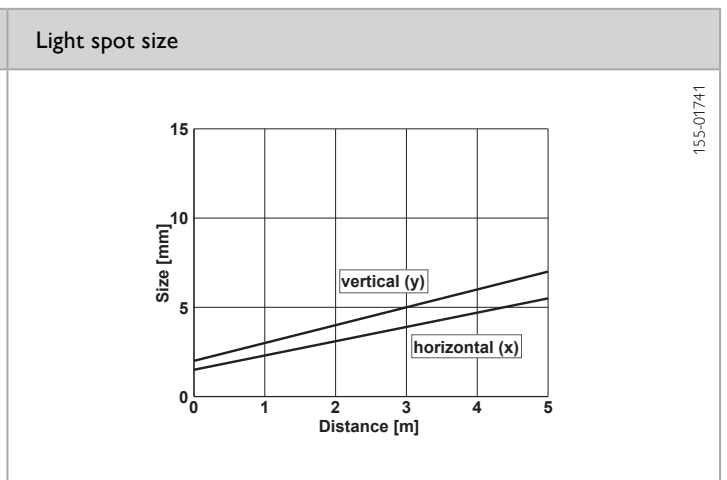
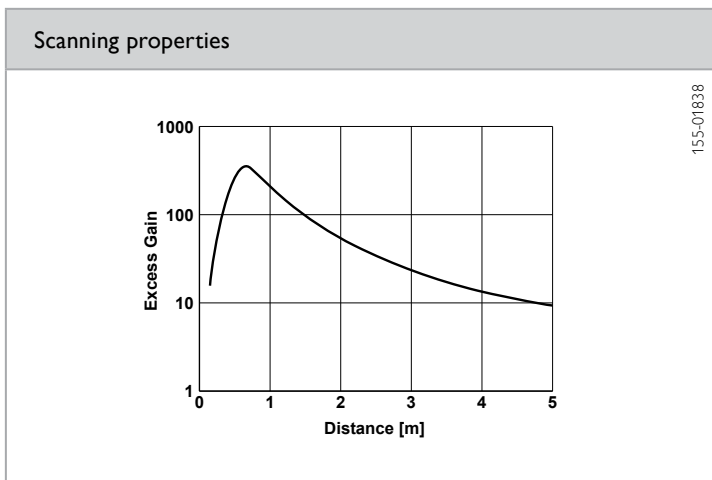
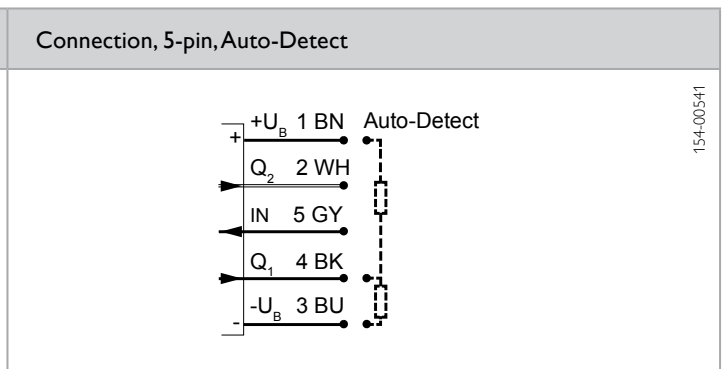
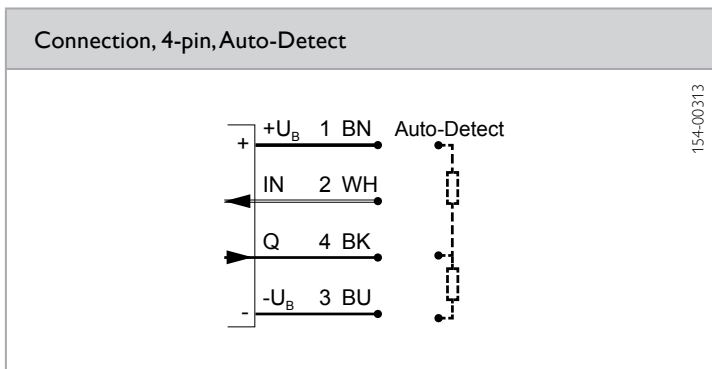
Optical data		Functions	
Scanning distance	0 ... 5 m (see Selection Table) <sup>1</sup>	Indicator LED 2 green	Operating voltage indicator
Hysteresis	20 mm	Indicator LED 2 yellow <sup>2</sup>	Switching output indicator Q2
Black/white shift (6%/90%)	≤ ± 40 mm	Indicator LED 1 yellow	Switching output indicator Q resp. Q1
Grey value shift (18%/90%)	≤ ± 40 mm	Scanning distance adjustment	Via Teach-in Button and control input
Type of light	Laser, red 655 nm	Adjustment possibilities	N.O. / N.C. via Teach-in Button and control input
Laser class (DIN EN 60825-1:2008-5)	1	Default settings	Key lock via control input
			3 m, N.O.
Electrical data		Mechanical data	
Operating voltage +U <sub>b</sub>	18 ... 30V DC	Dimensions	50 × 50,08 × 23 mm <sup>3</sup>
No-load current I <sub>0</sub>	≤ 60 mA	Enclosure rating	IP 67 & IP 69K <sup>3</sup>
Output current I <sub>e</sub> Q	≤ 100 mA	Material, housing	ABS
Protection circuits	Reverse polarity protection U <sub>b</sub> / short-circuit protection (Q)	Material, front screen	PMMA
Protection class	2	Type of connection	See Selection table
Power On Delay	< 5 s	Ambient temperature: operation	-40 ... +60 °C
Switching output Q	1 × PNP/NPN/Auto-Detect 2 × PNP/NPN/Auto-Detect	Ambient temperature: storage	-40 ... +80 °C
Output function	N.O. / N.C.	Weight (plug device)	42 g
Switching frequency f (ti/tp 1:1) Q	≤ 500 Hz	Resistance to vibration and impacts	EN 60947-5-2
Response time Q	1 ms		
Temperature drift	< 0.1 %/K		
Warm-up time	20 min.		
Control input IN	+U <sub>b</sub> = Teach-in -U <sub>b</sub> = Button locked Open = normal operation		

<sup>1</sup> Reference material 90 % reflectivity    <sup>2</sup> For variant FT 55-RLHP2-2PNS-L5    <sup>3</sup> With connected IP 67 / IP 69K plug

Scanning distance	Switching output	Type of connection	Part Number	Article number
0 ... 5 m	1 × Auto-Detect	Plug, M12x1, 4-pin	FT 55-RLHP2-PNS-L4	623-11031
0 ... 5 m	2 × Auto-Detect	Plug, M12x1, 5-pin	FT 55-RLHP2-2PNS-L5	623-11034



<sup>4</sup> FT 55-RLHP2-PNS-L4 with a teach-in button



Reference material	Scanning distance
White (90 %)	0 ... 5 m
Grey (18 %)	0 ... 5 m
Black (6 %)	0.05... 3 m

**Accessories**

Connection cables	See product catalogue/ accessories
Brackets	

# Fork sensors and optical windows

Experts in small part detection and counting tasks

## FGL-RK – LED red light fork sensors

from chapter 10

- Precise small part detection from 0.2 mm
- Indicator LEDs with all-round visibility over entire fork edge
- Simple sensor mounting via dovetail guides
- Sensitivity adjustment via teach-in button or control line

## FGL-IK – infrared fork sensors

from chapter 10

- Precise small part detection from 0.2 mm
- Indicator LEDs with all-round visibility over entire fork edge
- Simple sensor mounting via dovetail guides
- Sensitivity adjustment via teach-in button or control line

## FGL 5-IK – LED fork sensors for the detection of labels and multilayers

from chapter 10

- Specially designed for label dispensers
- High speed of 12 kHz for very accurate positioning
- Robust metal housing
- Easy teach-in during operation

## FGL – LED red light fork sensors with metal housings

from chapter 10

- Resistant zinc die-cast housings
- High switching frequency up to 3 kHz
- Sensitivity adjustment via potentiometer



Fork sensors and optical windows display characteristic properties as a result of their special housing design: thanks to their precise beam guidance they are particularly suitable for small part detection. The sensors are also easy to mount because no time-consuming adjustment is required.

The fork sensors of the FGL-IK and FGL-RK series detect parts from a diameter of 0.2 mm. They are used, for example, for small part detection on conveyor sections and chutes or for counting bulk goods on vibration conveyors. Rotational speed measurement is another typical application. The optical windows of the FG series are employed, for example, for detecting thread breaks in the textile industry, for part detection in transparent tubes in pneumatic conveyors, or for ejection detection. Fork sensors and optical windows are frequently the first choice for use in plants subject to strong vibrations, in particular, thanks to their robust housings and the design-related fixed light beam.

### Precise detection and user-friendly details: plastic fork sensors

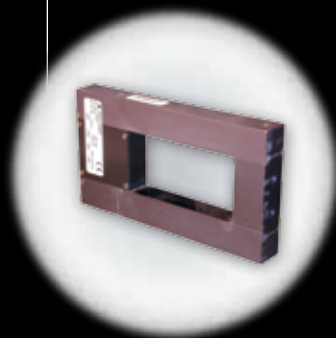
Fork sensors with plastic housings (FGL-RK and -IK series) are, in all respects, perfectly thought-through products. On the one hand, they are particularly shatterproof thanks to the elastic housing material, on the other hand, their numerous user-friendly detail solutions are highly impressive. Thus, in addition to the usual mounting holes, threaded sleeves and dovetail designs are also integrated. In combination with the MBD-S94 bracket, the latter permits flexible mounting in almost any desired position in the process. Operation by means of dynamic teach-in is also very easy: the measurement sensitivity can be directly adjusted on moving objects. In addition, the switching distance can be checked anytime thanks to the all-round visibility of the indicator LEDs. Even a product that, at first glance, appears simple can be quite refined!



FGL with mounted MBD-S94 bracket and easily visible indicator LEDs on the fork edge.

## FG – Infrared optical windows from chapter 10

- Robust metal housings
- Sensitivity adjustment per potentiometer
- Adjustable output signal duration of 10 ... 300 ms
- Dynamic signal evaluation



made in Germany

## TYPICAL SENSOPART

- Simple and robust housing
- Metal or plastic housing options (FGL) or robust metal housings (FG)
- High resolution for precise small part detection (fork sensors from 0.2 mm, optical windows from 0.8 mm)
- Various fork and window widths available
- Easy, rapid mounting without complicated adjustment
- Red light or infrared LED options
- High switching frequency of up to 3 kHz
- Dynamic signal evaluation (FG)
- 3- or 4-pin connector depending on variant
- Reliable function even in harsh conditions
- Indicator LEDs easy to see from all sides

### Fork Sensors and Optical Windows – Product Overview

	Type of light	Adjustment	Fork width / window size	Special features	Chapter
<b>Fork sensors</b>					
FGL-RK	Red light	Teach-in	30/50/80/120 mm	Teach-in, dovetail mounting	10
FGL-IK	Infrared	Teach-in	30/50/80/120 mm	Teach-in, dovetail mounting	
<b>FGL 5-IK</b>	<b>Infrared</b>	<b>Teach-in</b>	<b>5 mm</b>	<b>Teach-in, dovetail mounting</b>	
FGL	Red light	Potentiometer	5/10/20/30 mm	Metal housings	
FGL	Red light	Potentiometer	50/80/120/180/220 mm	Metal housings	
<b>Optical windows</b>					
FG	Infrared	Potentiometer	40 x 80 mm <sup>2</sup> /80 x 80 mm <sup>2</sup> /120 x 80 mm <sup>2</sup>	Metal housings	10

# FGL 5-IK

Fork sensors for the detection of labels and multilayers



## PRODUCT HIGHLIGHTS

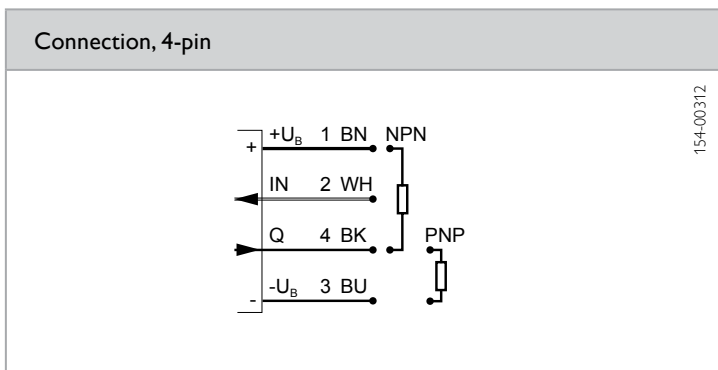
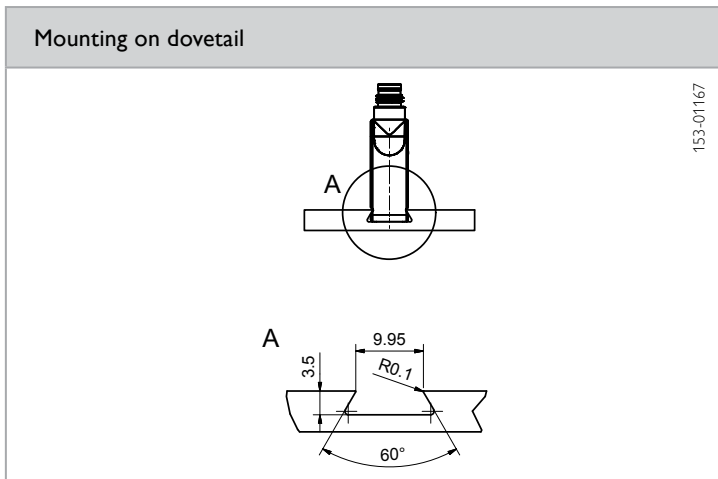
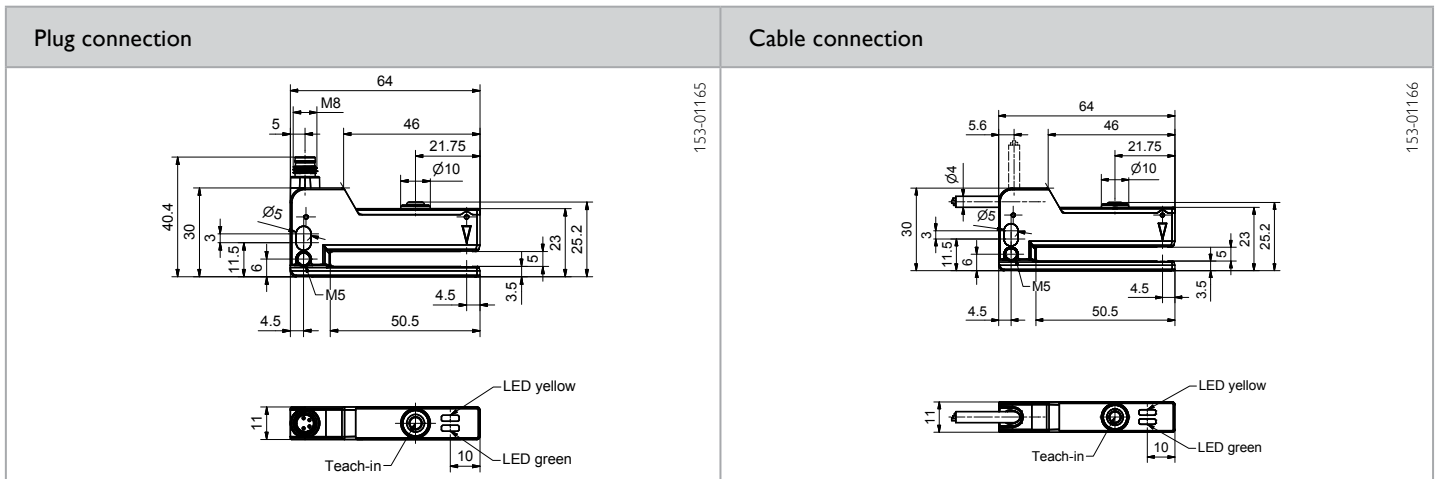
- Detects even semi-transparent labels on carrier material
- Non-distorting and robust metal housing with cable or M8 plug
- Design with small arm adapted to label dispenser
- Easy adjustment via teach-in button or control line
- Versatile mounting possibilities
- N.O./N.C. switchable
- High positioning accuracy thanks to 12 kHz switching frequency

Optical data		Functions	
Fork width	5 mm	Indicator LED, green	Operating voltage indicator
Fork depth	50 mm	Indicator LED, yellow	Switching output indicator
Type of light	Infrared, 850 nm	Sensitivity adjustment	Via Teach-in button and control input
Minimum label width	0.5 ... 2 mm <sup>1</sup>	Teach-in modes	Mode 1: during running process Mode 2: process at standstill
Minimum distance between labels	0.5 ... 2 mm <sup>1</sup>	Adjustment possibilities	N.O. / N.C. via Teach-in button and control input Button lock via control input Default: via Teach-in button and control input
		Default setting	Active on carrier material - reset via control line or teach-in button
Electrical data		Mechanical data	
Operating voltage, +U <sub>B</sub>	10 ... 30V DC <sup>2</sup>	Dimensions	64 x 40.4 x 11 mm <sup>3</sup>
No-load current, I <sub>0</sub>	≤ 30 mA	Enclosure rating	IP 65 <sup>4</sup>
Output current, I <sub>e</sub>	100 mA	Material, housing	Aluminium, Zinc alloy and PBT (cover)
Protective circuits	Reverse polarity protection, U <sub>B</sub> / Short-circuit protection (Q)	Material, lens	PC
Protection Class	2	Type of connection	See Selection Table
Switching output, Q	PNP / NPN <sup>3</sup> (see Selection Table)	Ambient temperature: operation	-20 ... +55 °C
Output function	N.O. / N.C.	Ambient temperature: storage	-20 ... +70 °C
Switching frequency, f (ti/tp 1:1)	12000 Hz	Weight	See Selection Table
Response time	Max. 40 µs	Vibration and impact resistance	11 ms (30 G) 6 shocks per every axis EN 60068-2-27
Control input, ET <sup>2</sup>	+U <sub>B</sub> = Teach-in, -U <sub>B</sub> = normal operation Open = normal operation		

<sup>1</sup> Max. 10 % ripple, within U<sub>B</sub>    <sup>2</sup> Voltage peak max. 2Vpp    <sup>3</sup> Pull up/down resistance 33 kOhm    <sup>4</sup> With connected IP 67 plug

Fork width	Switching output	Type of connection	Weight	Part number	Article number
5 mm	PNP	Metal plug, M8x1, 4-pin	46 g	FGL 5-IK-50-PS-M4	830-11011
5 mm	NPN	Metal plug, M8x1, 4-pin	46 g	FGL 5-IK-50-NS-M4	830-11013
5 mm	PNP	Cable, 2 m, 4-wire	85 g	FGL 5-IK-50-PS-K4	830-11010
5 mm	NPN	Cable, 2 m, 4-wire	85 g	FGL 5-IK-50-NS-K4	830-11012





Accessories	
Connection cables	See product catalogue/ accessories
Brackets	

# Accessories

Meeting all needs

## Mechanical accessories from chapter A

- *Brackets for sensors*
- *Mountings for VISOR® and illumination*



## Optical accessories from chapter A

- *Reflectors and reflective tape*
- *Lenses and protective casings*
- *Illumination*



A sensor rarely comes unaccompanied: accessories supporting their mounting, commissioning and use are of considerable importance for the reliable functioning of an automation solution. The characteristic practical orientation of SensoPart products is thus also evident in a particularly versatile and user-friendly range of accessories. In this section they are divided into categories: mechanical, optical and electrical accessories.

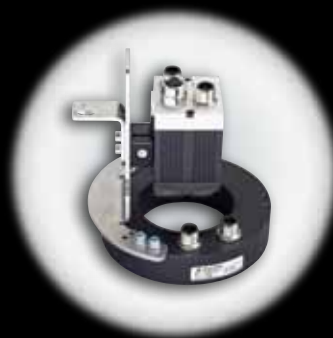
The mechanical accessories include everything that is involved in mounting and protecting the sensor: mounting brackets, blocks, rods and rails, brackets with protective hoops, stainless steel casings for hygienic areas and many others. All accessories are extremely robust and designed to meet practical demands. We thus offer clever, sometimes patented, detailed solutions that greatly simplify the mounting and fine adjustment of sensors, particularly in difficult locations, such as dovetail mountings or rotatable brackets.

Optical accessories include lenses as well as protective casings, external illumination such as ring and surface lights, and reflectors of differing designs, shapes and sizes. All SensoPart lenses offer high optical quality. We offer C-mount lenses as an alternative to integrated lenses especially for vision sensors when, for example, very high measurement distances are required.

Our electrical accessories include a great variety of cables and adapters, power supply units and switching devices, as well as interface components for the integration of supplementary functions. One example of the latter category is the SmartPlug – very popular amongst users – which expands switching sensors with logic and control functions such as counters, timing elements, inverters or frequency converters. The SmartPlug is simply plugged in between the sensor and the cable – a brilliant little product that is only available from SensoPart!

**Electrical accessories  
from chapter A**

- Cables
- Converters
- Power supply units, switching devices and Panel Viewer



**Flexible:** MG 3A Mounting angle with 2 axes and drilled hole for mounting rod.



**Practical:** sensors can be comfortably and precisely aligned after mounting with the help of rod brackets.



**Versatile:** SensoPart offers a comprehensive selection of reflectors and reflective tape: rectangular, square or round.



**Robust:** all mounting and bracket elements are extremely stable and offer additional protection for sensors when necessary.

Accessories – Product Overview	
	Chapter
<b>Mechanical accessories</b>	<b>A</b>
Brackets for sensors	
Mountings for VISOR® and illumination	
<b>Optical accessories</b>	
Reflectors and reflective tape	
Lenses and protective casings	
Illumination	
<b>Electrical accessories</b>	
Cables	
Converters	
Power supply units, switching devices and Panel Viewer	

# Accessories

## Brackets



- Brackets
- Mountings

### Brackets for F 25 series

		153-01155	<p>Part number / Article number</p> <p>Description</p>	<p>MBD F 25ST2 / 661-01005</p> <p>Clamping bracket for Ø 12 mm mounting rod and 10 x 10 mm square profile, with M4 screw and M3 nut</p> <p>Material: die-cast zinc</p>
		153-01156	Suitable for	F 25
		153-01155	<p>Part number / Article number</p> <p>Description</p>	<p>Set: MBD F 25STP / 661-01004</p> <p>Clamping bracket for Ø 12 mm mounting rod and 10 x 10 mm square profile, with protective casing, M4 screw, M4 thumbscrew, M4 nut, 2x M3 screw</p> <p>Material: die-cast zinc</p> <p>Casing Material: stainless steel V2A</p>
		153-01163	Suitable for	F 25

### Brackets for F 55, FGL series


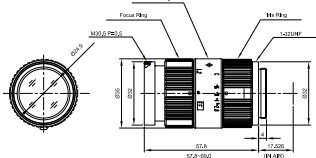
 		153-01164	<p>Part number / Article number</p> <p>Description</p>	<p>MB ST2 / 661-01007</p> <p>Mounting component for Ø 12 mm mounting rod and 10 x 10 mm square profile, and F 55 and fork sensors (FGL), with M4 screw</p> <p>Material: die-cast zinc</p>
		Suitable for	F 55, FGL, MST 45-20, MST 45-30, MST 45-40	


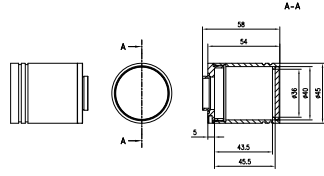

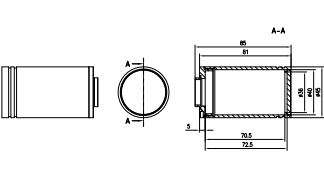

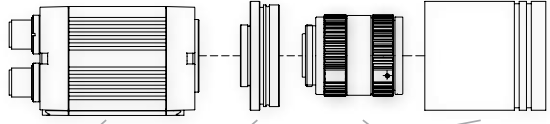
## Brackets

Mountings for V10, V20 (Cont.)			
		<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>Part number / Article number</p> <p>Description</p> <p>Suitable for</p>	<p>LPT W50 / 527-51135</p> <p>Spark protection V10/V20</p> <p>Material: anodised aluminium</p> <p>V10 / V20</p>
		<p>Part number / Article number</p> <p>Description</p> <p>Suitable for</p>	<p>LPT S5 / 527-51136</p> <p>Replacement front screen, set of 5 pcs for LPT W50</p> <p>Material: glass</p> <p>LPT W50</p>
Brackets for light strips, High Power, LBxxx			
		<p>Part number / Article number</p> <p>Description</p> <p>Suitable for</p>	<p>MG LB L / 543-11025</p> <p>Mounting clamp light strip long</p> <p>Material: nickel-plated steel</p> <p>Light strips High Power; LBxxx</p>
		<p>Part number / Article number</p> <p>Description</p> <p>Suitable for</p>	<p>MG LB LL / 543-11026</p> <p>Mounting angle light strip long, lite</p> <p>Material: anodised aluminium</p> <p>Light strips High Power; LBxxx</p>

# Accessories


## Lenses

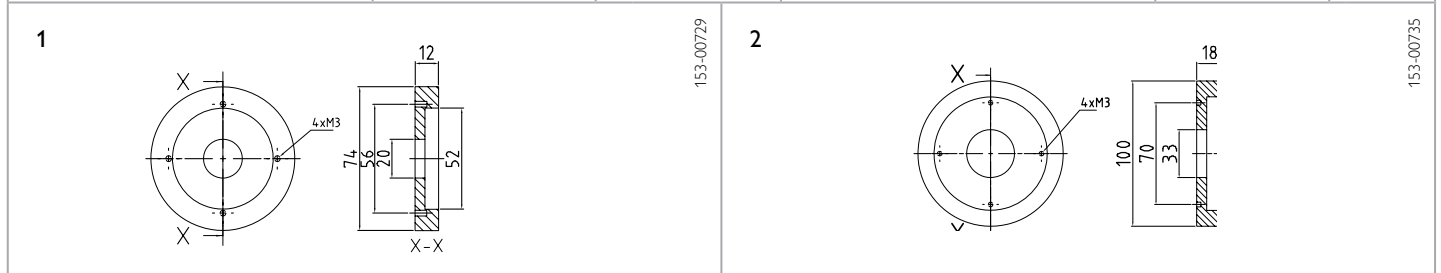
Lenses, C-mount			
		Part number / Article number	LO C 75 / 526-51116
		Description	C-mount lens 75 mm focal length Aperture/focus: manual Filter thread: 30.5/0.5 Diameter: 35.0 mm Length: 57.75 mm Weight: 113 g
		Suitable for	V10 / V20 C-Mount


Protective casings			
		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
		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

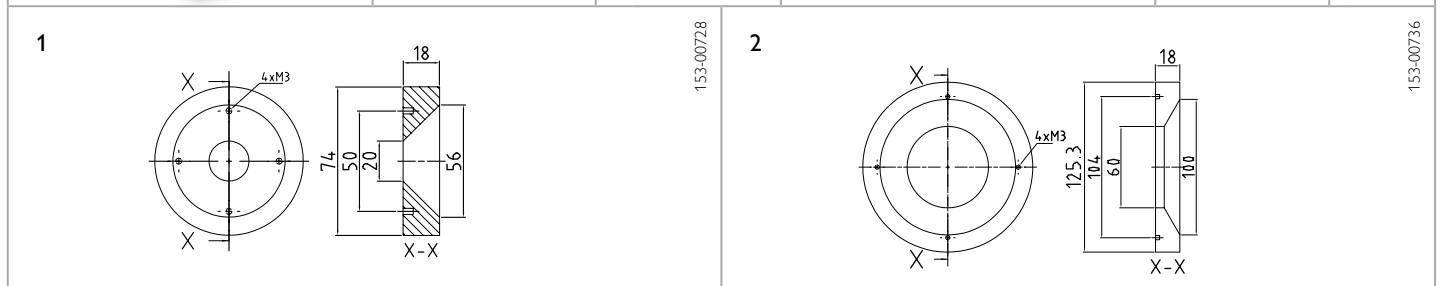
Accessories, lenses			
	Part number	Article number	Description
	ET 0,5	038-12399	Intermediate ring 0.5 mm
	ET 1	038-12400	Intermediate ring 1 mm
	LR 5	543-11011	Intermediate ring 5 mm
	ET 10	038-12402	Intermediate ring 10 mm
	ETS	527-51129	Intermediate ring set
	Part number	Article number	Description
	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

## Illumination


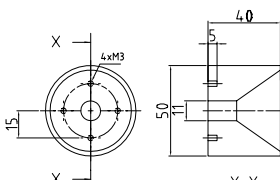
Ring light, indirect, diffuse					
	Part number	Article number	Description	Angle bracket	Draw.
	LR 70 WID-24-KFL5	532-51030	Ring light, indirect, diffuse, 70 mm, white	543-11019	1
	LR 100 WID-24-KFL5	532-51031	Ring light, indirect, diffuse, 100 mm, white	543-11018	2
	LR 70 RID-24-KFL5	532-51032	Ring light, indirect, diffuse, 70 mm, red	543-11019	1
	LR 100 RID-24-KFL5	532-51033	Ring light, indirect, diffuse, 100 mm, red	543-11018	2



Ring light, indirect, diffuse					
	Part number	Article number	Description	Angle bracket	Draw.
	LR 70 WD-24-KFL5	532-51034	Ring light, diffuse, 70 mm, white	543-11019	1
	LR 100 WD-24-KFL5	532-51035	Ring light, diffuse, 100 mm, white	543-11015	2
	LR 70 RD-24-KFL5	532-51036	Ring light, diffuse, 70 mm, red	543-11019	1
	LR 100 RD-24-KFL5	532-51037	Ring light, diffuse, 100 mm, red	543-11015	2



LED ring light with LEDs shining surfacely and directly on centre of circle.  
Requires connection adapter for LED illumination LA45V-24-2L12.

Ring light, dome, diffuse				
	Part number	Article number	Description	Angle bracket
	LD 50 WD-24-KFL5	532-51038	Ring light, dome, diffuse, 50 mm, white	543-11016
	LD 50 RD-24-KFL5	532-51039	Ring light, dome, diffuse, 50 mm, red	543-11016
				153-00704

LED ring lighting with funnel-shaped diffuser sheet for strongly reflective objects.  
Requires connection adapter for LED illumination LA45V-24-2L12.

# Accessories

## Illumination

### Light strips, High Power, LBxxx

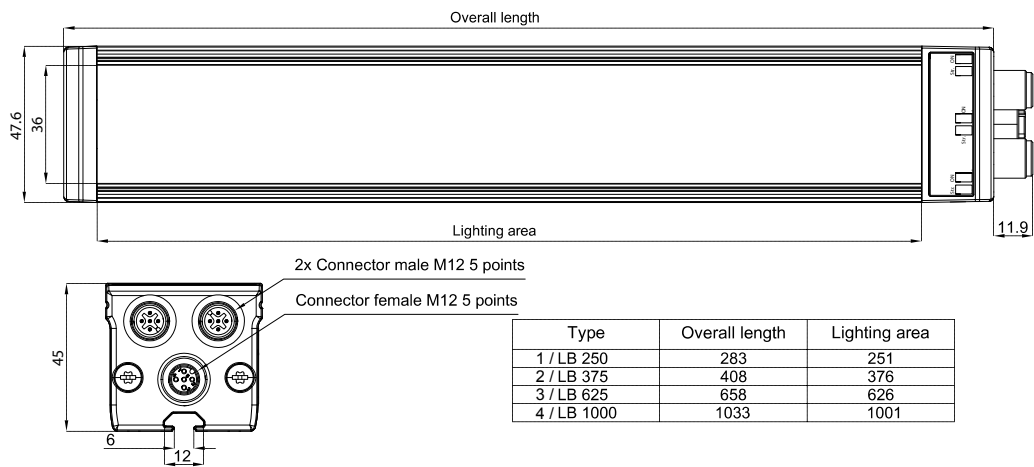
	Part number	Article number	Description	Type
	LB 250 WK 24 A15 3L5	532-51056	Light strip, 250mm, white, clear glass, 24V DC, 15°, 3 x M12, 5-pin	1
	LB 375 WK 24 A15 3L5	532-51057	Light strip, 375mm, white, clear glass, 24V DC, 15°, 3 x M12, 5-pin	2
	LB 625 WK 24 A15 3L5	532-51058	Light strip, 625mm, white, clear glass, 24V DC, 15°, 3 x M12, 5-pin	3
	LB 1000 WK 24 A15 3L5	532-51059	Light strip, 1,000mm, white, clear glass, 24V DC, 15°, 3 x M12, 5-pin	4
	LB 250 WK 24 A35 3L5	532-51060	Light strip, 250mm, white, clear glass, 24V DC, 35°, 3 x M12, 5-pin	1
	LB 375 WK 24 A35 3L5	532-51061	Light strip, 375mm, white, clear glass, 24V DC, 35°, 3 x M12, 5-pin	2
	LB 625 WK 24 A35 3L5	532-51062	Light strip, 625mm, white, clear glass, 24V DC, 35°, 3 x M12, 5-pin	3
	LB 1000 WK 24 A35 3L5	532-51063	Light strip, 1,000 mm, white, clear glass, 24V DC, 35°, 3 x M12, 5-pin	4
	LB 250 RK 24 A15 3L5	532-51064	Light strip, 250 mm, red, clear glass, 24V DC, 15°, 3 x M12, 5-pin	1
	LB 375 RK 24 A15 3L5	532-51065	Light strip, 375 mm, red, clear glass, 24V DC, 15°, 3 x M12, 5-pin	2
	LB 625 RK 24 A15 3L5	532-51066	Light strip, 625 mm, red, clear glass, 24V DC, 15°, 3 x M12, 5-pin	3
	LB 1000 RK 24 A15 3L5	532-51067	Light strip, 1,000 mm, red, clear glass, 24V DC, 15°, 3 x M12, 5-pin	4
	LB 250 RK 24 A35 3L5	532-51068	Light strip, 250 mm, red, clear glass, 24V DC, 35°, 3 x M12, 5-pin	1
	LB 375 RK 24 A35 3L5	532-51069	Light strip, 375 mm, red, clear glass, 24V DC, 35°, 3 x M12, 5-pin	2
	LB 625 RK 24 A35 3L5	532-51070	Light strip, 625 mm, red, clear glass, 24V DC, 35°, 3 x M12, 5-pin	3
	LB 1000 RK 24 A35 3L5	532-51071	Light strip, 1,000 mm, red, clear glass, 24V DC, 35°, 3 x M12, 5-pin	4
	LB 250 IRK 24 A15 3L5	532-51055	Light strip, 250 mm, infrared, clear glass, 24V DC, 15°, 3 x M12, 5-pin	1
	LB 375 IRK 24 A15 3L5	532-51072	Light strip, 375 mm, infrared, clear glass, 24V DC, 15°, 3 x M12, 5-pin	2
	LB 625 IRK 24 A15 3L5	532-51073	Light strip, 625 mm, infrared, clear glass, 24V DC, 15°, 3 x M12, 5-pin	3
	LB 1000 IRK 24 A15 3L5	532-51074	Light strip, 1,000 mm, infrared, clear glass, 24V DC, 15°, 3 x M12, 5-pin	4
	LB 250 IRK 24 A35 3L5	532-51075	Light strip, 250 mm, infrared, clear glass, 24V DC, 35°, 3 x M12, 5-pin	1
	LB 375 IRK 24 A35 3L5	532-51076	Light strip, 375 mm, infrared, clear glass, 24V DC, 35°, 3 x M12, 5-pin	2
	LB 625 IRK 24 A35 3L5	532-51077	Light strip, 625 mm, infrared, clear glass, 24V DC, 35°, 3 x M12, 5-pin	3
	LB 1000 IRK 24 A35 3L5	532-51078	Light strip, 1,000 mm, infrared, clear glass, 24V DC, 35°, 3 x M12, 5-pin	4



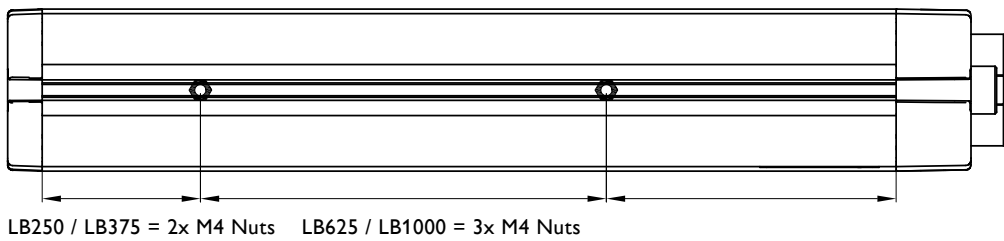
For further accessories see Sensopart's Complete Catalogue, chapter Accessories, or [www.sensopart.com](http://www.sensopart.com)



Light strips, High Power, LBxxx

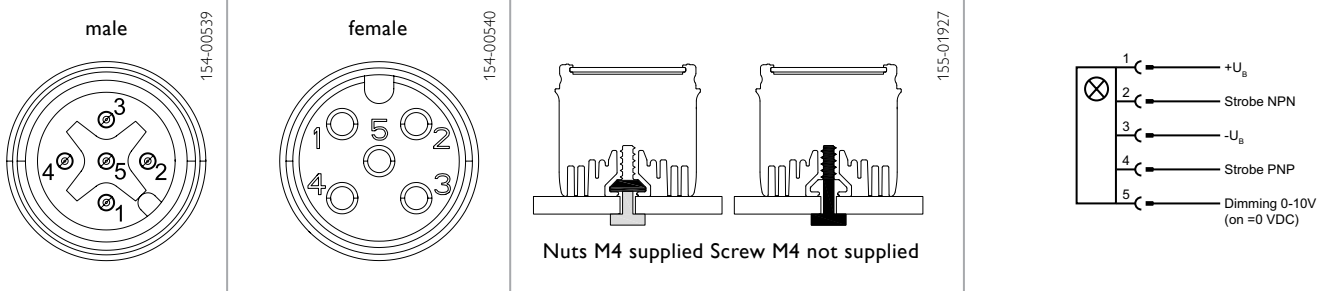


Mounting

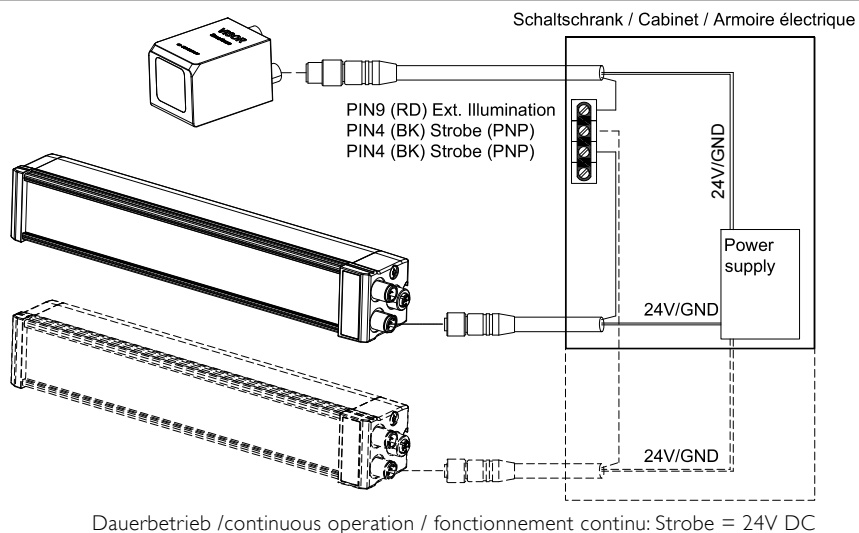


155-01926

Wiring



Connection illumination - sensor







155-01906

# Accessories

## Cables

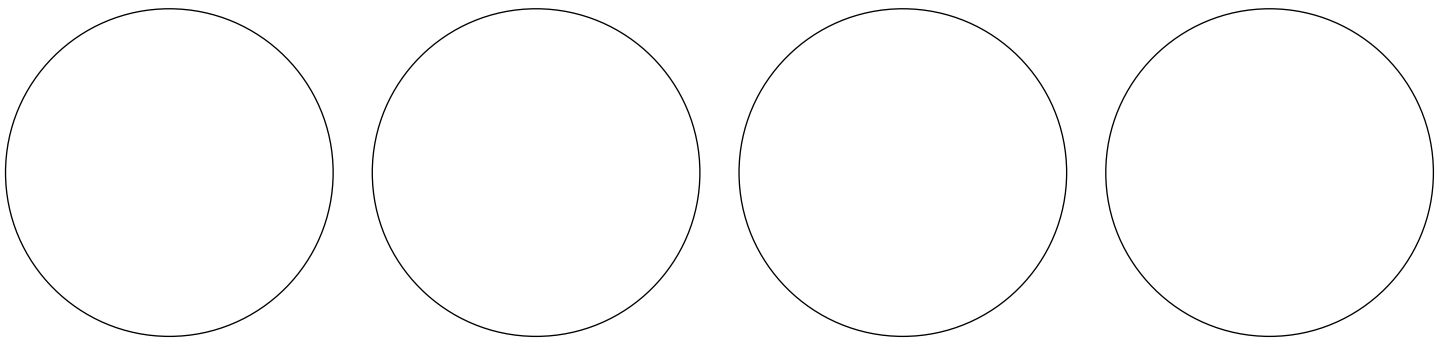


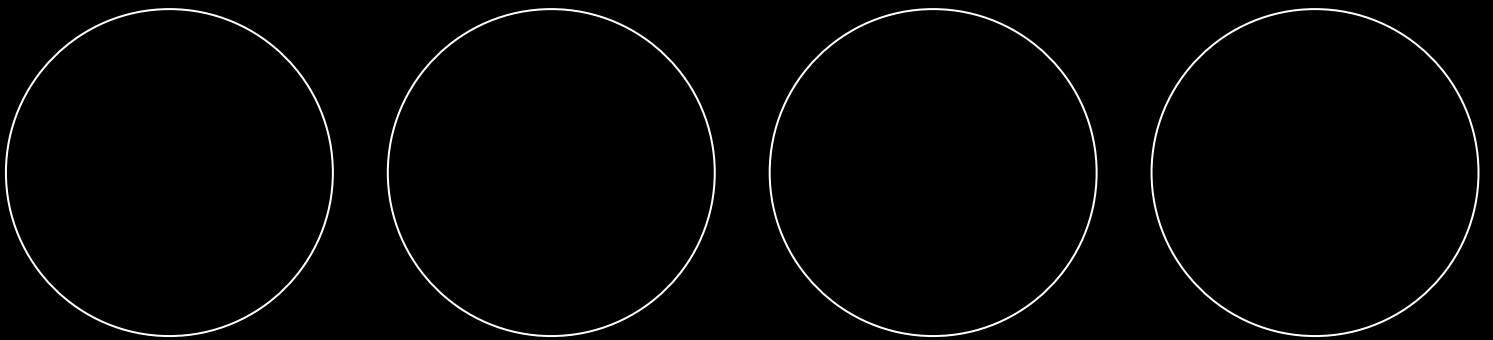
- Cables
- Converters
- Power supply units and switching devices

Straight connectors	90° connectors	90° connectors with LED	Shielded connectors
			

Part number	Article number	Description
<b>M12, 4-pin</b>		
L4F/L4M-b-coded-0,48 PUR	902-51739	Connection cable FR 85, M12 (angled, a-coded) to M12 (straight, b-coded), 0.48 m, suitable for drag chains
L4F/L4M-b-coded-0,53 PUR	902-51825	Connection cable FR 85, M12 (angled, a-coded) to M12 (straight, b-coded), 0.53 m, suitable for drag chains
L4F/L4M-b-coded-0,48-X02 PUR	902-51823	Connection cable FR 85, M12 (angled, a-coded) to M12 (straight, b-coded), PINs 2 & 4 interchanged, suitable for drag chains
<b>Power supply and I/O cables for V10, V20</b>		
C L12FG-S-20m-PUR	902-51805	Power - I/O, cable, 20 m, M12, straight, 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
<b>Ethernet cables for V10, V20</b>		
CI L4MG/RJ45G-GS-20m-PUR	902-51820	Ethernet, cable, 20m, M12, straight connector, 4-pin / RJ45 shielded
CI L4MW/RJ45G-GS-20m-PUR	902-51822	Ethernet, cable, 20m, M12, angled connector, 4-pin / RJ45 shielded

For further accessories see SensoPart's Complete Catalogue, chapter Accessories, or [www.sensopart.com](http://www.sensopart.com)





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