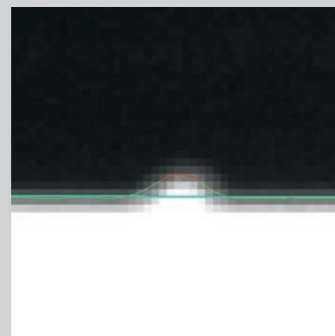


The VISOR® Solar sensor operates accurately and reliably even in fast-cycle processes.



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

HIGHLIGHTS OF VISOR® SOLAR SENSOR

- Simple integration
- Precise position detection down to $\pm 50 \mu\text{m}$
- Edge defects can be detected up to a depth of 0.50 mm
- Differentiation between C-shaped and V-shaped edge defects
- Detection of holes
- Transport belts can be masked via software
- Short cycle time from 60 ms
- Reliable operation, even in daylight
- No backlight necessary
- Low space requirement: operating distance from 360 mm

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

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

Vision Sensors and Systems – Product Overview				
	Firmware Option	Focal length	Integrated illumination	Page
VISOR® Solar sensor				
V10-SO-S1-xxx	Standard	6	White LEDs	68
V10-SO-A1-xxx	Advanced	6	White or infrared LEDs	70
V10-SO-A1-xxx	Advanced	12	White or infrared LEDs	72

Standard vision sensor for wafer and cell inspection, 6 mm



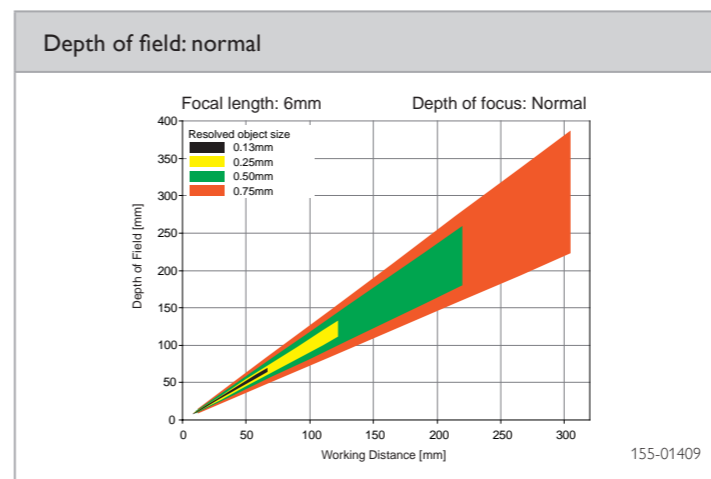
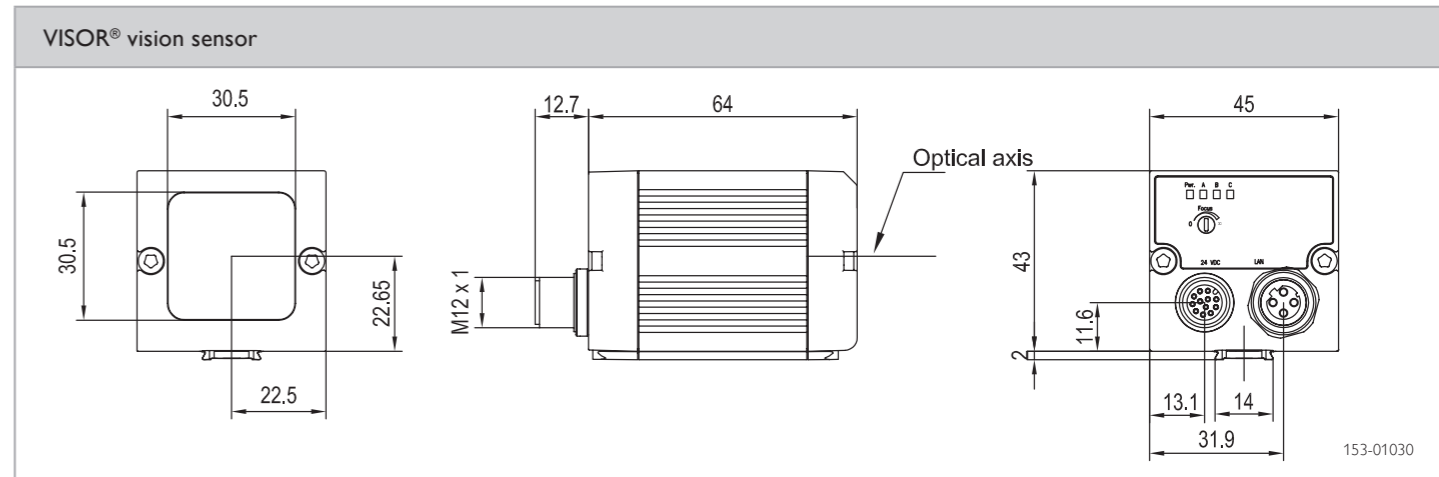
PRODUCT HIGHLIGHTS

- Automatic detection of wafer and cell geometry
- Suitable for frontlit and backlit applications
- Simple sensor optimisation regarding evaluation speed and test precision (sub-pixel process)
- Detection of holes/cracks and breakouts
- Distortion correction

Optical data		Functions	
Resolution	736 x 480 pixels	Number of jobs / detectors	2 / 32
CMOS	1/3", monochrome	Detectors	Wafers, contrast, brightness, grey level
Integrated lens, focal length	6 mm, adjustable focal position	Properties	Wafers: localisation and examination of wafers Grey threshold, brightness: evaluation of brightness Contrast: evaluation of contrast
Adjustment range	6 mm to infinity	Typical cycle times	Typ. 100 ms wafer Typ. 2 ms brightness Typ. 2 ms contrast Typ. 2 ms grey threshold
Integrated illumination	White LEDs		
Minimum field of view, X x Y	5 x 4 mm ²		
Electrical data		Mechanical data	
Operating voltage, +U _B	18 ... 26.4V DC ¹	Dimensions	65 x 45 x 45 mm ³ (without plug)
Current consumption (without illumination and I/O)	≤ 120 mA	Enclosure rating	IP 67
Current consumption (without I/O)	≤ 200 mA	Material, housing	Aluminium, plastic
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection of all outputs	Material, front screen	Plastic
Readiness delay	Ca. 13 s after Power on	Ambient temperature: operation	0 ... +50 °C ²
Outputs	PNP / NPN (switchable)	Ambient temperature: storage	-20 ... +60 °C ²
Max. output current (per output)	50 mA, 100 mA (pin 12)	Weight	Ca. 160 g
Inputs	PNP/NPN High > U _B -1V, Low < 3V	Plug connections	Supply and I/O M12, 12-pin Ethernet M12, 4-pin
Input resistance	> 20 kOhm	Vibration and impact resistance	EN 60947-5-2
Encoder input	High > 4V		
Interfaces:VISOR® V10-SO-Standard	Ethernet (LAN), EtherNet/IP		
Inputs/outputs	2 inputs, 4 outputs, 2 selectable inputs/outputs		

¹ Max. ripple < 5V_{SS} ² 80 % air humidity, non-condensing

Illumination	Depth of field	Part number	Article number
White	Normal	V10-SO-S1-W6	535-91049



Accessories	
Connection cables	From Page 670
Illumination	From Page 663
Brackets	From Page 642
Interface accessories	From Page 674



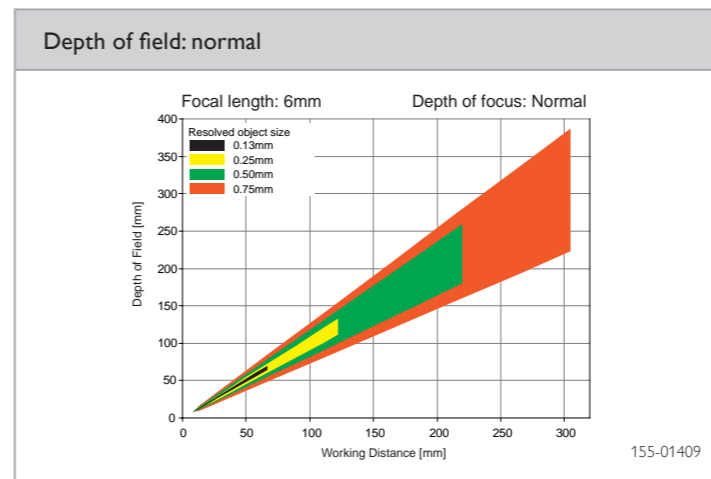
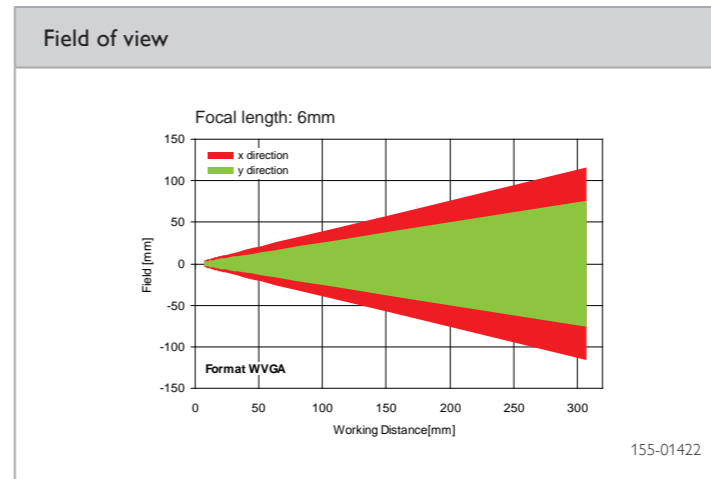
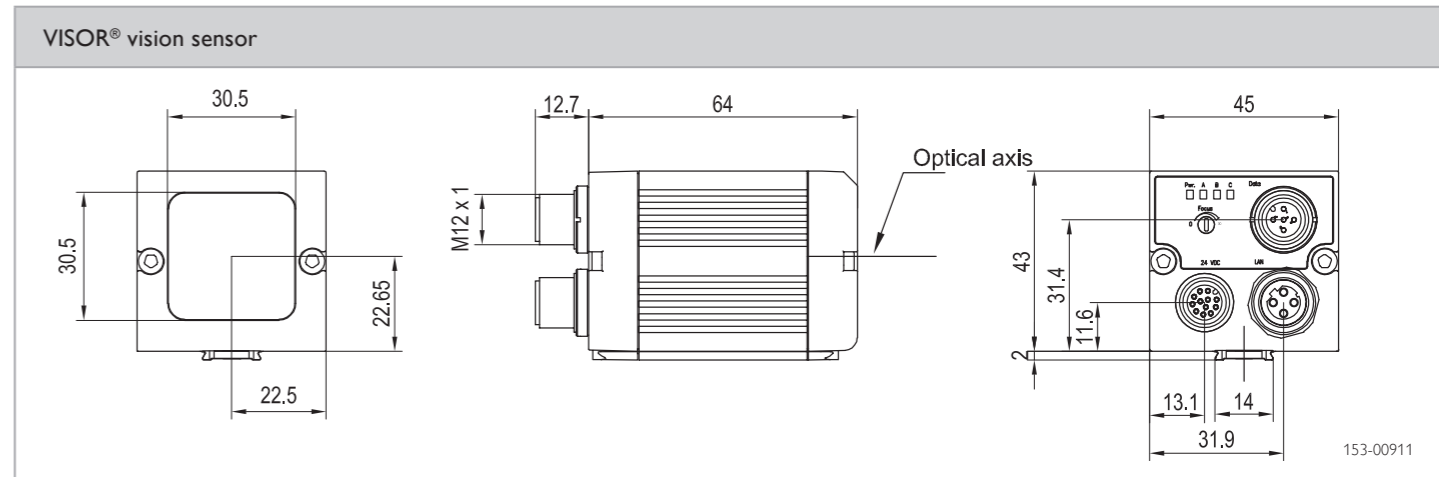
PRODUCT HIGHLIGHTS

- Automatic detection of wafer and cell geometry
- Suitable for frontlit and backlit applications
- Simple sensor optimisation regarding evaluation speed and test precision (sub-pixel process)
- Detection of holes/cracks and breakouts
- Distortion correction
- Examination and position detection of busbars

Optical data		Functions	
Resolution	736 x 480 pixels	Number of jobs / detectors	n / n
CMOS	1/3", monochrome	Detectors	Wafers, busbars, pattern comparison, contrast, brightness, grey level
Integrated lens, focal length	6 mm, adjustable focal position	Properties	Position tracking Wafers incl. busbars: localisation of wafers or busbars and examination of wafers Pattern comparison: teach-in and detection of patterns Grey threshold, brightness: evaluation of brightness Contrast: evaluation of contrast
Adjustment range	6 mm to infinity	Typical cycle times	Typ. 100 ms wafers Typ. 20 ms pattern comparison Typ. 2 ms brightness Typ. 2 ms contrast Typ. 2 ms grey threshold
Integrated illumination	White, infrared LEDs		
Minimum field of view, X x Y	5 x 4 mm ²		
Electrical data		Mechanical data	
Operating voltage, +U _B	18 ... 26.4 V DC ¹	Dimensions	65 x 45 x 45 mm ³ (without plug)
Current consumption (without illumination and I/O)	≤ 120 mA	Enclosure rating	IP 67
Current consumption (without I/O)	≤ 200 mA	Material, housing	Aluminium, plastic
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection of all outputs	Material, front screen	Plastic
Readiness delay	Ca. 13 s after Power on	Ambient temperature: operation	0 ... +50 °C ²
Outputs	PNP / NPN (switchable)	Ambient temperature: storage	-20 ... +60 °C ²
Max. output current (per output)	50 mA, 100 mA (pin 12)	Weight	Ca. 160 g
Inputs	PNP/NPN High > U _B -1V, Low < 3V	Plug connections	Supply and I/O M12, 12-pin Ethernet M12, 4-pin Data M12, 5-pin
Input resistance	> 20 kOhm	Vibration and impact resistance	EN 60947-5-2
Encoder input	High > 4V		
Interfaces: VISOR® V10-SO-Advanced	Ethernet (LAN), RS422, EtherNet/IP		
Inputs/outputs	2 inputs, 4 outputs, 4 selectable inputs/outputs		

¹ Max. ripple < 5 V_{SS} ² 80 % air humidity, non-condensing

Illumination	Depth of field	Part number	Article number
White	Normal	V10-SO-A1-W6	535-91051
Infrared	Normal	V10-SO-A1-I6	535-91053



Accessories	
Connection cables	From Page 670
Illumination	From Page 663
Brackets	From Page 642
Interface accessories	From Page 674

Advanced vision sensor for wafer and cell inspection, 12 mm



PRODUCT HIGHLIGHTS

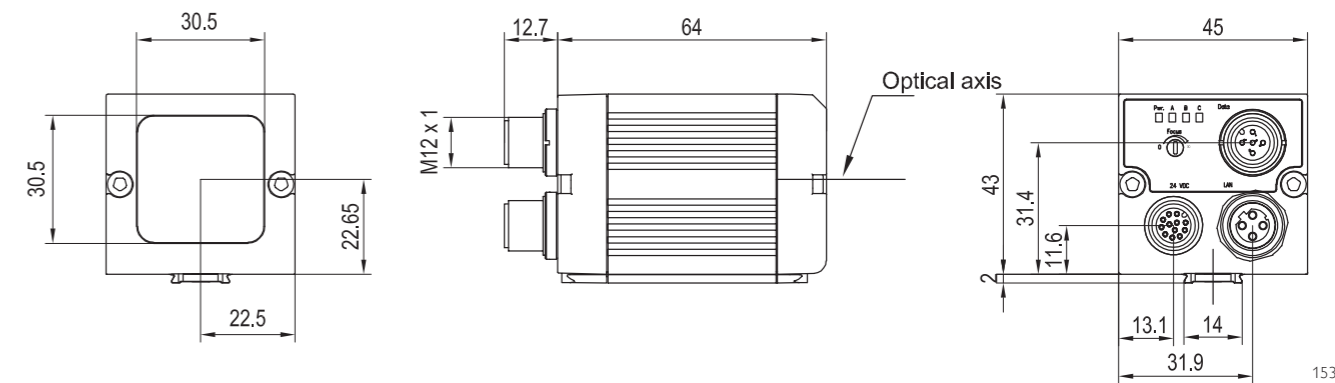
- Automatic detection of wafer and cell geometry
- Suitable for frontlit and backlit applications
- Simple sensor optimisation regarding evaluation speed and test precision (sub-pixel process)
- Detection of holes/cracks and breakouts
- Distortion correction
- Examination and position detection of busbars

Optical data		Functions	
Resolution	736 x 480 pixels	Number of jobs / detectors	n / n
CMOS	1/3", monochrome	Detectors	Wafers, busbars, pattern comparison, contrast, brightness, grey level
Integrated lens, focal length	12 mm, adjustable focal position	Properties	Position tracking Wafers incl. busbars: localisation of wafers or busbars and examination of wafers Pattern comparison: teach-in and detection of patterns Grey threshold, brightness: evaluation of brightness Contrast: evaluation of contrast
Adjustment range	30 mm to infinity	Typical cycle times	Typ. 100 ms wafer Typ. 20 ms pattern comparison Typ. 2 ms brightness Typ. 2 ms contrast Typ. 2 ms grey threshold
Integrated illumination	White, infrared LEDs		
Minimum field of view, X x Y	8 x 6 mm ²		
Electrical data		Mechanical data	
Operating voltage, +U _B	18 ... 26.4V DC ¹	Dimensions	65 x 45 x 45 mm ³ (without plug)
Current consumption (without illumination and I/O)	≤ 120 mA	Enclosure rating	IP 67
Current consumption (without I/O)	≤ 200 mA	Material, housing	Aluminium, plastic
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection of all outputs	Material, front screen	Plastic
Readiness delay	Ca. 13 s after Power on	Ambient temperature: operation	0 ... +50 °C ²
Outputs	PNP / NPN (switchable)	Ambient temperature: storage	-20 ... +60 °C ²
Max. output current (per output)	50 mA, 100 mA (pin 12)	Weight	Ca. 160 g
Inputs	PNP/NPN High > U _B -1V, Low < 3V	Plug connections	Supply and I/O M12, 12-pin Ethernet M12, 4-pin Data M12, 5-pin
Input resistance	> 20 kOhm	Vibration and impact resistance	EN 60947-5-2
Encoder input	High > 4V		
Interfaces: VISOR® V10-SO-Advanced	Ethernet (LAN), RS422, EtherNet/IP		
Inputs/outputs	2 inputs, 4 outputs, 4 selectable inputs/outputs		

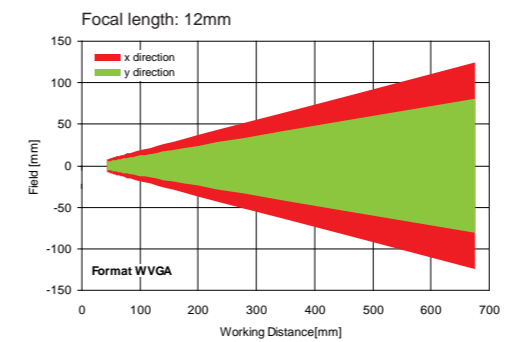
¹ Max. ripple < 5V_{SS} ² 80 % air humidity, non-condensing

Illumination	Depth of field	Part number	Article number
White	Normal	V10-SO-A1-W12	535-91052
Infrared	Normal	V10-SO-A1-I12	535-91054

VISOR® vision sensor

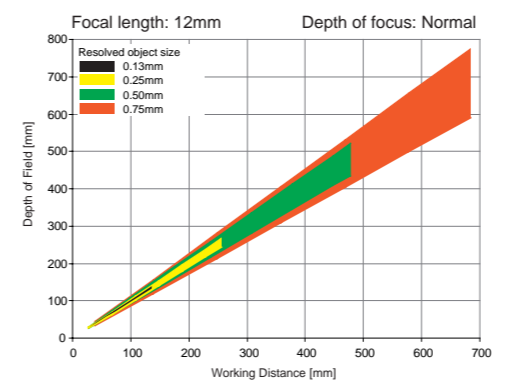


Field of view



155-01423

Depth of field: normal



155-01410

Accessories

Connection cables	From Page 670
Illumination	From Page 663
Brackets	From Page 642
Interface accessories	From Page 674