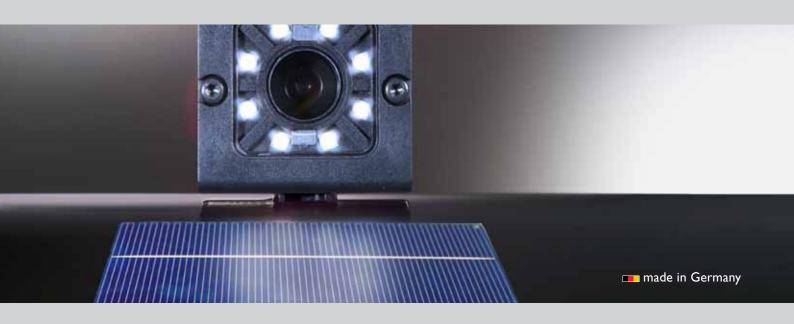
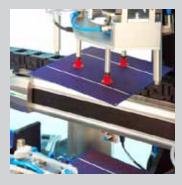
# VISOR® Solar sensor for inspecting solar cells

Focusing on what matters





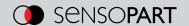
The VISOR® Solar sensor operates accurately and reliably even in fast-cycle processes



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

### HIGHLIGHTS OF VISOR® SOLAR SENSOR

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



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

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

VISOR® Solar sensor – Pr	oduct Overview				
	Firmware Option	Resolution	Focal length	Integrated illumination	Page
V20-SO-A2-xxx	Advanced	1280 × 1024 pixels	12 mm	White, red or infrared LEDs	100
V20-SO-A2-xxx	Advanced	1280 × 1024 pixels	C-mount	None	102
V10-SO-S1-xxx	Standard	736 × 480 pixels	6 mm	White LEDs	104
V10-SO-A1-xxx	Advanced	736 × 480 pixels	6 mm	White or infrared LEDs	106
V10-SO-A1-xxx	Advanced	736 × 480 pixels	12 mm	White or infrared LEDs	108
V10-SO-A1-xxx	Advanced	736 x 480 pixels	C-mount	None	110

Advanced vision sensor for wafer and cell inspection, 12 mm











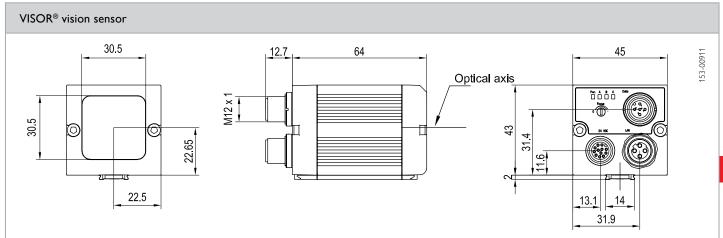
- Automatic detection of wafer and cell geometry
- Suitable for frontlit and backlit applications
- Simple sensor optimisation regarding evaluation speed and test precision (sub-pixel process)
- Detection of holes/cracks and breakouts
- Distortion correction
- Examination and position detection of busbars

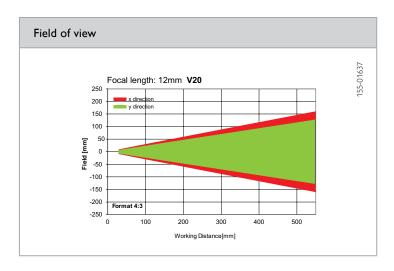
Optical data		Functions	
Resolution	1280 x 1024 pixels	Number of jobs / detectors	max. 255 / max. 255
CMOS	1/1.8", monochrome	Detectors	Wafers, pattern comparison, contras
Integrated lens, focal length	12 mm, adjustable focal position		brightness, grey level, calliper
Adjustment range	30 mm to infinity	Properties	Position tracking; Wafers incl. busbar
Integrated illumination	White, red, infrared LEDs		localisation of wafers or busbars and examination of wafers; Calliper:
Minimum field of view, X x Y	16 x 13 mm <sup>2</sup>		distance between edges; Pattern comparison: teach-in and detection of patterns grey threshold, brightnes evaluation of brightness; contrast: evaluation of contrast
		Typical cycle times <sup>2</sup>	Typ. 100 ms wafer Typ. 8 ms calliper Typ. 20 ms pattern comparison Typ. 2 ms brightness Typ. 2 ms contrast Typ. 2 ms grey threshold
Electrical data		Mechanical data	
	18 26.4V DC <sup>1</sup>	Mechanical data  Dimensions	65 × 45 × 45 mm³ (without plug)
Operating voltage, +U <sub>B</sub> Current consumption	18 26.4 V DC¹ ≤ 120 mA		65 × 45 × 45 mm³ (without plug)  IP 67
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O)		Dimensions	
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O)  Current consumption (without I/O)	≤ 120 mA ≤ 200 mA	Dimensions Enclosure rating	IP 67
Operating voltage, +U <sub>B</sub> Current consumption	≤ 120 mA ≤ 200 mA Reverse-polarity protection, U <sub>B</sub> /	Dimensions Enclosure rating Material, housing	IP 67 Aluminium, plastic
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs	Dimensions Enclosure rating Material, housing Material, front screen	IP 67 Aluminium, plastic Plastic
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits Power On Delay	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight	IP 67 Aluminium, plastic Plastic 0 +50° C³ -20 +60° C³ Ca. 160 g
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage	IP 67 Aluminium, plastic Plastic 0 +50° C³ -20 +60° C³ Ca. 160 g Supply and I/O M12, 12-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs Max. output current (per output)	≤ 120 mA  Severse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight	IP 67 Aluminium, plastic Plastic 0 +50° C³ -20 +60° C³ Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs  Max. output current (per output) Inputs	≤ 120 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight Plug connections	IP 67 Aluminium, plastic Plastic 0 +50° C³ -20 +60° C³ Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin Data M12, 5-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs Max. output current (per output) Inputs Input resistance	≤ 120 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V  > 20 kOhm	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight	IP 67 Aluminium, plastic Plastic 0 +50° C³ -20 +60° C³ Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs  Max. output current (per output) Inputs	≤ 120 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight Plug connections	IP 67 Aluminium, plastic Plastic 0 +50° C³ -20 +60° C³ Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin Data M12, 5-pin

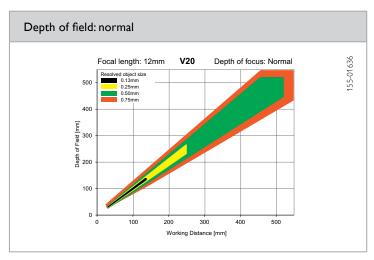
 $<sup>^{1}</sup>$  Max. ripple < 5 V<sub>ss</sub>  $^{2}$  with VGA-resolution (640 x 480 pixels)  $^{3}$  80 % air humidity, non-condensing

Illumination	Part number	Article number
White	V20-SO-A2-W12	536-91028
Red	V20-SO-A2-R12	536-91029
Infrared	V20-SO-A2-I12	536-91030









Accessories	
Connection cables	From Page A-34
Illumination	From Page A-27
Brackets	From Page A-4
Interface accessories	From Page A-38

### Advanced vision sensor for wafer and cell inspection, C-mount











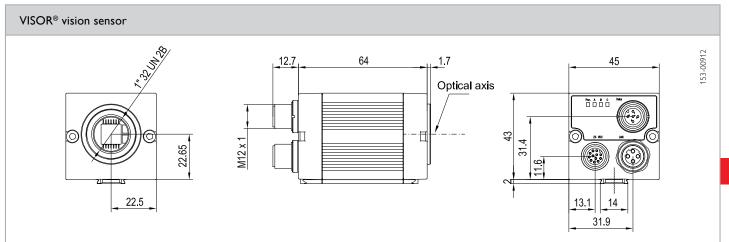
- Automatic detection of wafer and cell geometry
- Suitable for frontlit and backlit applications
- Simple sensor optimisation regarding evaluation speed and test precision (sub-pixel process)
- Detection of holes/cracks and breakouts
- Distortion correction
- Examination and position detection of busbars

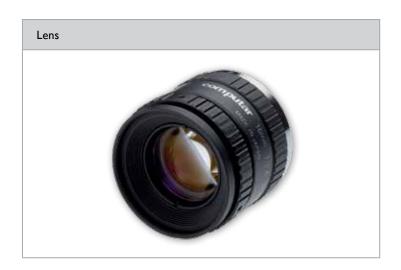
Optical data		Functions	
Resolution	1280 x 1024 pixels	Number of jobs / detectors	max. 255 / max. 255
CMOS	1/1.8", monochrome	Detectors	Wafers, pattern comparison, contras
Integrated lens, focal length	C-Mount		brightness, grey level, calliper
Adjustment range	Dependent on lens	Properties	Position tracking;Wafers incl. busbar
Integrated illumination	None		localisation of wafers or busbars and examination of wafers; Calliper:
Minimum field of view, X xY	Dependent on lens		distance between edges; Pattern comparison: teach-in and detection of patterns grey threshold, brightnes evaluation of brightness; contrast: ev luation of contrast
		Typical cycle times <sup>2</sup>	Typ. 100 ms wafer Typ. 8 ms calliper Typ. 20 ms pattern comparison Typ. 2 ms brightness Typ. 2 ms contrast Typ. 2 ms grey threshold
Electrical data		Mechanical data	
Electrical data  Operating voltage, +U <sub>B</sub>	18 26.4V DC <sup>1</sup>	Mechanical data  Dimensions	$65 \times 45 \times 45 \text{ mm}^3$ (without plug)
Operating voltage, +U <sub>B</sub> Current consumption	18 26.4 V DC¹ ≤ 120 mA		65 × 45 × 45 mm³ (without plug) IP 65³
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O)	≤ 120 mA	Dimensions	
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O)  Current consumption (without I/O)	≤ 120 mA ≤ 200 mA	Dimensions Enclosure rating	IP 65 <sup>3</sup>
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O)	≤ 120 mA ≤ 200 mA Reverse-polarity protection, U <sub>B</sub> /	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation	IP 65 <sup>3</sup> Aluminium, plastic Plastic 0 +50 °C <sup>4</sup>
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage	IP 65 <sup>3</sup> Aluminium, plastic Plastic 0 +50 °C <sup>4</sup> -20 +60 °C <sup>4</sup>
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits Power On Delay	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight	IP 65 <sup>3</sup> Aluminium, plastic Plastic 0 +50 °C <sup>4</sup> -20 +60 °C <sup>4</sup> Ca. 160 g
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs	≤ 120 mA  Severse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage	IP 65 <sup>3</sup> Aluminium, plastic Plastic 0 +50 °C <sup>4</sup> -20 +60 °C <sup>4</sup> Ca. 160 g Supply and I/O M12, 12-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs Max. output current (per output)	≤ 120 mA  Severse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight	IP 65 <sup>3</sup> Aluminium, plastic  Plastic  0 +50 °C <sup>4</sup> -20 +60 °C <sup>4</sup> Ca. 160 g  Supply and I/O M12, 12-pin  Ethernet M12, 4-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs  Max. output current (per output) Inputs	≤ 120 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight Plug connections	IP 65 <sup>3</sup> Aluminium, plastic Plastic 0 +50 °C <sup>4</sup> -20 +60 °C <sup>4</sup> Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin Data M12, 5-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits Power On Delay Outputs Max. output current (per output) Inputs Input resistance	≤ 120 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V  > 20 kOhm	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight	IP 65 <sup>3</sup> Aluminium, plastic  Plastic  0 +50 °C <sup>4</sup> -20 +60 °C <sup>4</sup> Ca. 160 g  Supply and I/O M12, 12-pin  Ethernet M12, 4-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs  Max. output current (per output) Inputs	≤ 120 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight Plug connections	IP 65 <sup>3</sup> Aluminium, plastic Plastic 0 +50 °C <sup>4</sup> -20 +60 °C <sup>4</sup> Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin Data M12, 5-pin

 $<sup>^{1}</sup>$  Max. ripple < 5 V  $_{SS}$   $^{2}$  With VGA-resolution (640 x 480 Pixel)  $^{3}$  With LPT45 C-mount protective casing  $^{4}$  80 % air humidity, non-condensing

Part number	Article number
V20-SO-A2-C	536-91031







	LO C 8	LO C 12	LO C 16	LO C 25	LO C 35	LO C 50	LO C 75
Focal length Article number	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm
	526-51513	526-51514	526-51515	526-51516	526-51525	526-51113	526-51116

Accessories	
Connection cables	From Page A-34
Illumination	From Page A-27
Lenses	From Page A-25
Brackets	From Page A-4
Interface accessories	From Page A-38

Standard vision sensor for wafer and cell inpection, 6 mm











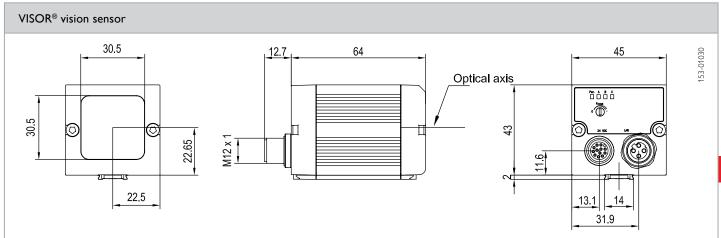
- Automatic detection of wafer and cell geometry
- Suitable for frontlit and backlit applications
- Simple sensor optimisation regarding evaluation speed and test precision (sub-pixel process)
- Detection of holes/cracks and breakouts
- Distortion correction

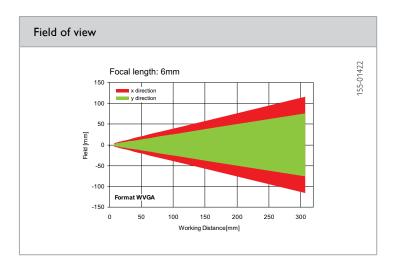
Optical data		Functions	
Resolution	736 × 480 pixels	Number of jobs / detectors	8 / 32
CMOS	1/3", monochrome	Detectors	Wafers, contrast, brightness, grey leve
Integrated lens, focal length	6 mm, adjustable focal position	Properties	Wafers: localisation and examination of wafers
Adjustment range	6 mm to infinity	_	Grey threshold, brightness:
Integrated illumination	White LEDs		evaluation of brightness
Minimum field of view, X x Y	5 x 4 mm <sup>2</sup>		Contrast: evaluation of contrast
		Typical cycle times	Typ. 100 ms wafer
			Typ. 2 ms brightness
			Typ. 2 ms contrast Typ. 2 ms grey threshold
			Typ. 2 ms grey direshold
Electrical data		Mechanical data	
Operating voltage, +U <sub>R</sub>	18 26.4V DC <sup>1</sup>	Dimensions	65 × 45 × 45 mm³ (without plug)
Current consumption	≤ 120 mA	Enclosure rating	IP 67
(without illumination and I/O)		Material, housing	Aluminium, plastic
Current consumption (without I/O)	≤ 200 mA	Material, front screen	Plastic
Protective circuits	Reverse-polarity protection, $U_{_{\rm B}}$ /	Ambient temperature: operation	0 +50 °C²
	short-circuit protection of all outputs	Ambient temperature: storage	-20 +60 °C²
Power On Delay	Ca. 13 s after Power on	Weight	Ca. 160 g
Outputs	PNP / NPN (switchable)	Plug connections	Supply and I/O M12, 12-pin
Max. output current (per output)	50 mA, 100 mA (pin 12)		Ethernet M12, 4-pin
Inputs	PNP/NPN High $> U_B-1 \text{ V, Low} < 3 \text{ V}$	Vibration and impact resistance	EN 60947-5-2
Input resistance	> 20 kOhm		
Interfaces	Ethernet (LAN), EtherNet/IP, PROFINET		
Inputs/outputs	2 inputs, 4 outputs, 2 selectable inputs/outputs		

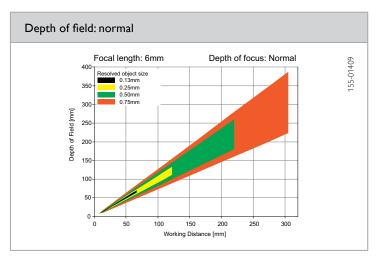
 $<sup>^{1}</sup>$  Max. ripple  $< 5 V_{SS}$   $^{2}$  80 % air humidity, non-condensing

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









Accessories	
Connection cables	From Page A-34
Illumination	From Page A-27
Brackets	From Page A-4
Interface accessories	From Page A-38

### Advanced vision sensor for wafer and cell inspection, 6 mm











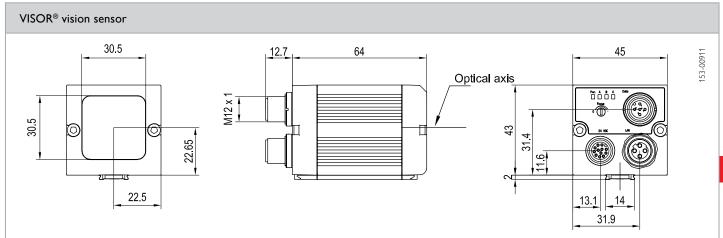
- Automatic detection of wafer and cell geometry
- Suitable for frontlit and backlit applications
- Simple sensor optimisation regarding evaluation speed and test precision (sub-pixel process)
- Detection of holes/cracks and breakouts
- Distortion correction
- Examination and position detection of busbars

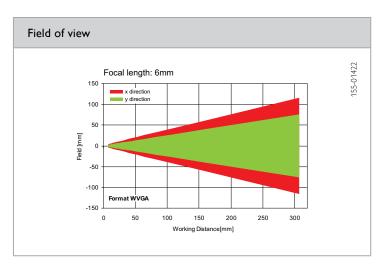
Optical data		Functions	
Resolution	736 x 480 pixels	Number of jobs / detectors	max. 255 / max. 255
CMOS	1/3", monochrome	Detectors	Wafers, busbars, pattern comparisor
Integrated lens, focal length	6 mm, adjustable focal position		contrast, brightness, grey level, callip
Adjustment range	6 mm to infinity	Properties	Position tracking Wafers incl. busbar
Integrated illumination	White, infrared LEDs		localisation of wafers or busbars and examination of wafers; Calliper:
Minimum field of view, X x Y	5 × 4 mm <sup>2</sup>		distance between edges; Pattern cor parison: teach-in and detection of pa terns; Grey threshold, brightness: evaluation of brightness Contrast: evaluation of contrast
		Typical cycle times	Typ. 100 ms wafer Typ. 8 ms calliper Typ. 20 ms pattern comparison Typ. 2 ms brightness Typ. 2 ms contrast
			Typ. 2 ms grey threshold
Electrical data		Mechanical data	iyp. 2 ms grey threshold
<b>Electrical data</b> Operating voltage, $+U_8$	18 26.4V DC <sup>1</sup>	Mechanical data  Dimensions	65 x 45 x 45 mm³ (without plug)
Operating voltage, +U <sub>B</sub> Current consumption	18 26.4V DC¹ ≤ 120 mA		
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O)	≤ 120 mA	Dimensions	65 × 45 × 45 mm³ (without plug)
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O)  Current consumption (without I/O)	≤ 120 mA ≤ 200 mA	Dimensions Enclosure rating	65 × 45 × 45 mm³ (without plug) IP 67
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O)  Current consumption (without I/O)	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> /	Dimensions Enclosure rating Material, housing	65 × 45 × 45 mm³ (without plug)  IP 67  Aluminium, plastic
Operating voltage, +U <sub>8</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs	Dimensions Enclosure rating Material, housing Material, front screen	65 × 45 × 45 mm³ (without plug)  IP 67  Aluminium, plastic  Plastic
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits Power On Delay	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on	Dimensions  Enclosure rating  Material, housing  Material, front screen  Ambient temperature: operation	65 × 45 × 45 mm³ (without plug)  IP 67  Aluminium, plastic  Plastic  0 +50 °C²
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)	Dimensions  Enclosure rating  Material, housing  Material, front screen  Ambient temperature: operation  Ambient temperature: storage	65 × 45 × 45 mm³ (without plug) IP 67 Aluminium, plastic Plastic 0 +50 °C² -20 +60 °C² Ca. 160 g Supply and I/O M12, 12-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs Max. output current (per output)	≤ 120 mA  Severse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight	65 × 45 × 45 mm³ (without plug) IP 67 Aluminium, plastic Plastic 0 +50 °C² -20 +60 °C² Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs  Max. output current (per output) Inputs	≤ 120 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V	Dimensions  Enclosure rating  Material, housing  Material, front screen  Ambient temperature: operation  Ambient temperature: storage  Weight  Plug connections	65 × 45 × 45 mm³ (without plug)  IP 67  Aluminium, plastic  Plastic  0 +50 °C²  -20 +60 °C²  Ca. 160 g  Supply and I/O M12, 12-pin  Ethernet M12, 4-pin  Data M12, 5-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs Max. output current (per output) Inputs Input resistance	≤ 120 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V  > 20 kOhm	Dimensions Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight	65 × 45 × 45 mm³ (without plug) IP 67 Aluminium, plastic Plastic 0 +50 °C² -20 +60 °C² Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin
Operating voltage, +U <sub>B</sub> Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs  Max. output current (per output) Inputs	≤ 120 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V	Dimensions  Enclosure rating  Material, housing  Material, front screen  Ambient temperature: operation  Ambient temperature: storage  Weight  Plug connections	65 × 45 × 45 mm³ (without plug)  IP 67  Aluminium, plastic  Plastic  0 +50 °C²  -20 +60 °C²  Ca. 160 g  Supply and I/O M12, 12-pin  Ethernet M12, 4-pin  Data M12, 5-pin

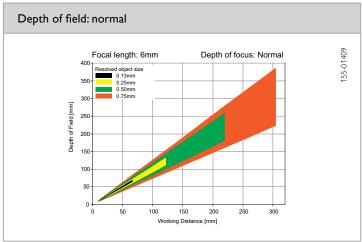
 $<sup>^{1}</sup>$  Max. ripple  $\leq$  5  $V_{SS}$   $^{2}$  80 % air humidity, non-condensing

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 A-34	
Illumination	From Page A-27	
Brackets	From Page A-4	
Interface accessories	From Page A-38	

### Advanced vision sensor for wafer and cell inspection, 12 mm











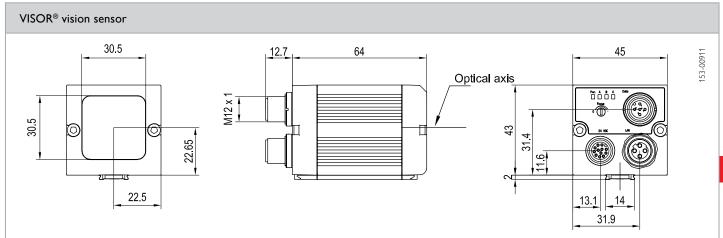
- Automatic detection of wafer and cell geometry
- Suitable for frontlit and backlit applications
- Simple sensor optimisation regarding evaluation speed and test precision (sub-pixel process)
- Detection of holes/cracks and breakouts
- Distortion correction
- Examination and position detection of busbars

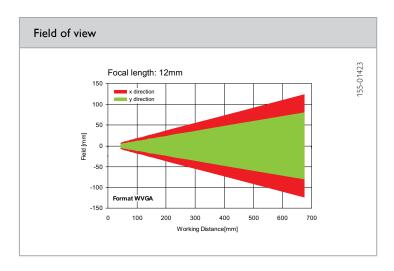
Optical data		Functions			
Resolution	736 x 480 pixels	Number of jobs / detectors	max. 255 / max. 255		
CMOS	1/3", monochrome	Detectors	Wafers, busbars, pattern comparisor		
Integrated lens, focal length	12 mm, adjustable focal position		contrast, brightness, grey level, callipe		
Adjustment range	30 mm to infinity	Properties	Position tracking Wafers incl. busbar		
Integrated illumination	White, infrared LEDs		localisation of wafers or busbars and examination of wafers; Calliper:		
Minimum field of view, X x Y	8 x 6 mm <sup>2</sup>		distance between edges; Pattern col parison: teach-in and detection of parison: teach-in and detection of parison; Grey threshold, brightness: evaluation of brightness Contrast: evaluation of contrast		
		Typical cycle times	Typ. 100 ms wafer Typ. 8 ms calliper Typ. 20 ms pattern comparison Typ. 2 ms brightness Typ. 2 ms contrast Typ. 2 ms grey threshold		
Electrical data		Mechanical data			
Operating valtage III	10 07 17 15 61	Dimensions			
Operating voltage, +U <sub>B</sub>	18 26.4 V DC <sup>1</sup>	Diriensions	65 × 45 × 45 mm³ (without plug)		
Current consumption	18 26.4 V DC¹ ≤ 120 mA	Enclosure rating	65 x 45 x 45 mm <sup>3</sup> (without plug)  IP 67		
Current consumption (without illumination and I/O)	≤120 mA				
Current consumption (without illumination and I/O) Current consumption (without I/O)	≤ 120 mA ≤ 200 mA	Enclosure rating	IP 67		
Current consumption (without illumination and I/O)	≤ 120 mA ≤ 200 mA Reverse-polarity protection, U <sub>B</sub> /	Enclosure rating Material, housing	IP 67 Aluminium, plastic Plastic 0 +50 °C²		
Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs	Enclosure rating Material, housing Material, front screen	IP 67 Aluminium, plastic Plastic		
Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on	Enclosure rating Material, housing Material, front screen Ambient temperature: operation	IP 67 Aluminium, plastic Plastic 0 +50 °C²		
Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)	Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage	IP 67 Aluminium, plastic Plastic 0 +50 °C² -20 +60 °C² Ca. 160 g Supply and I/O M12, 12-pin		
Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs Max. output current (per output)	≤ 120 mA  ≤ 200 mA  Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)	Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight	IP 67 Aluminium, plastic Plastic 0 +50 °C² -20 +60 °C² Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin		
Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs Max. output current (per output) Inputs	≤ 120 mA  Severse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V	Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight Plug connections	IP 67 Aluminium, plastic Plastic 0 +50 °C² -20 +60 °C² Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin Data M12, 5-pin		
Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs Max. output current (per output) Inputs Input resistance	≤ 120 mA  Severse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V  > 20 kOhm	Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight	IP 67 Aluminium, plastic Plastic 0 +50 °C² -20 +60 °C² Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin		
Current consumption (without illumination and I/O) Current consumption (without I/O) Protective circuits  Power On Delay Outputs Max. output current (per output) Inputs	≤ 120 mA  Severse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs  Ca. 13 s after Power on  PNP / NPN (switchable)  50 mA, 100 mA (pin 12)  PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V	Enclosure rating Material, housing Material, front screen Ambient temperature: operation Ambient temperature: storage Weight Plug connections	IP 67 Aluminium, plastic Plastic 0 +50 °C² -20 +60 °C² Ca. 160 g Supply and I/O M12, 12-pin Ethernet M12, 4-pin Data M12, 5-pin		

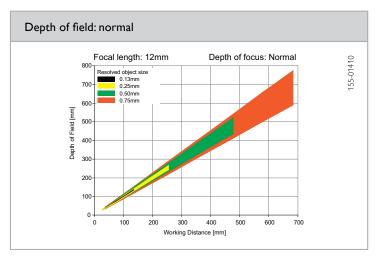
 $<sup>^{1}</sup>$  Max. ripple  $\leq$  5  $V_{ss}$   $^{-2}$  80 % air humidity, non-condensing

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









Accessories		
Connection cables	From Page A-34	
Illumination	From Page A-27	
Brackets	From Page A-4	
Interface accessories	From Page A-38	

### Advanced vision sensor for wafer and cell inspection, C-mount











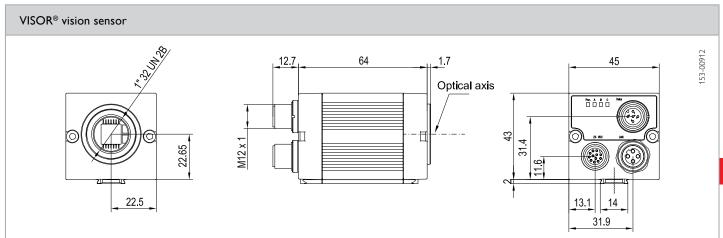
- Automatic detection of wafer and cell geometry
- Suitable for frontlit and backlit applications
- Simple sensor optimisation regarding evaluation speed and test precision (sub-pixel process)
- Detection of holes/cracks and breakouts
- Distortion correction
- Examination and position detection of busbars

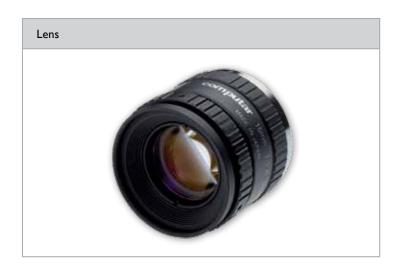
Optical data		Functions			
Resolution	736 x 480 pixels	Number of jobs / detectors	max. 255 / max. 255		
CMOS	1/3", monochrome	Detectors	Wafers, pattern comparison, contras		
Integrated lens, focal length	C-Mount		brightness, grey level, calliper		
Adjustment range	Dependent on lens	Properties	Position tracking; Wafers incl. busbars		
Integrated illumination	None		localisation of wafers or busbars		
Minimum field of view, X xY	Dependent on lens		and examination of wafers; Calliper: distance between edges; Pattern comparison: teach-in and detection of patterns grey threshold, brightnes evaluation of brightness; contrast: ev luation of contrast		
		Typical cycle times	Typ. 100 ms wafer Typ. 8 ms calliper Typ. 20 ms pattern comparison Typ. 2 ms brightness Typ. 2 ms contrast Typ. 2 ms grey threshold		
Electrical data		Mechanical data			
Operating voltage, +U <sub>B</sub>	18 26.4V DC <sup>1</sup>	Dimensions	$65 \times 45 \times 45 \text{ mm}^3 \text{ (without plug)}$		
Current consumption	≤ 120 mA	Enclosure rating	IP 65 <sup>2</sup>		
(without illumination and I/O)	1200	Material, housing	Aluminium, plastic		
Current consumption (without I/O)	≤ 200 mA	Material, front screen	Plastic		
Protective circuits	Reverse-polarity protection, U <sub>B</sub> / short-circuit protection of all outputs	Ambient temperature: operation	0 +50 °C³		
	Ca. 13 s after Power on	Ambient temperature: storage	-20 +60 °C³		
Payron On Dalay	Ca. 13 Sailer Fower on	Weight	Ca. 160 g		
Power On Delay	DNID / NIDNI (quitabable)		C		
Outputs	PNP / NPN (switchable)	Plug connections	Supply and I/O M12, 12-pin		
Outputs Max. output current (per output)	50 mA, 100 mA (pin 12)	Plug connections	Ethernet M12, 4-pin		
Outputs  Max. output current (per output)  Inputs	50 mA, 100 mA (pin 12) PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V		Ethernet M12, 4-pin Data M12, 5-pin		
Outputs  Max. output current (per output)  Inputs  Input resistance	50 mA, 100 mA (pin 12) PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V > 20 kOhm	Plug connections  Vibration and impact resistance	Ethernet M12, 4-pin		
Outputs  Max. output current (per output)  Inputs	50 mA, 100 mA (pin 12) PNP/NPN High > U <sub>B</sub> -1 V, Low < 3 V		Ethernet M12, 4-pin Data M12, 5-pin		

 $<sup>^{1}</sup>$  Max. ripple  $< 5 \, \rm V_{ss}$   $^{2}$  With LPT45 C-mount protective casing  $^{3}$  80 % air humidity, non-condensing

Part number	Article number
V10-SO-A1-C	535-91050







	LO C 8	LO C 12	LO C 16	LO C 25	LO C 35	LO C 50	LO C 75
Focal length	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm
Article number	526-51513	526-51514	526-51515	526-51516	526-51525	526-51113	526-51116

Accessories			
Connection cables	From Page A-34		
Illumination	From Page A-27		
Lenses	From Page A-25		
Brackets	From Page A-4		
Interface accessories	From Page A-38		