

200 rad/s

SUPERSCAN IV SOLAR



2-AXIS DEFLECTION UNITS

FOR CHALLENGING INDUSTRIAL APPLICATIONS

DIGITAL
CONTROL



- High speed scanning up to 66 m/s* to ensure high throughput > 3,600 wafer per hour
- High accuracy $\pm 15 \mu\text{m}^*$ to ensure high cell efficiency
- Equipped with dynamic optimized mirrors to ensure the highest possible productivity

* with $f = 330 \text{ mm}$ f-theta lens

FAST AND PRECISE LASER PROCESSING OF SOLAR CELL

YOUR BENEFITS

The SUPERSCAN IV-15's model-based, digital control offers extremely high speeds up to 200 rad/s, which really come into play in extreme fast, but precise-applications. Special mirror substrates with coatings also for short wavelengths enable small spot diameters even in large processing fields.

CONFIGURABLE THROUGH AND THROUGH

Lenses, protective glass, and mirror substrates and coatings are available for all standard laser types, wavelengths, power densities, focal lengths and processing areas. This allows to handle a wide range of tasks with best quality and optimized throughput. We would be happy to provide a customized configuration of the SUPERSCAN IV for your application. We would also be happy to help you put together the perfect configuration for your application.

TYPICAL APPLICATIONS

In particular, the wafer structuring in solar industry is a natural application. Speed and dynamic responses are guaranteed, thanks to digital control and powerful PWM output stages. When combined with our camera adapter and MVC components, the SUPERSCAN IV SOLAR becomes the ideal precision tool with process monitoring.

INNOVATION AND QUALITY

Innovation and maintaining high product quality standards are our priorities at RAYLASE. All our products are developed, built and tested in our own laboratories and production facilities. Through our world-wide support network we can offer best maintenance and rapid service for our customers.

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GENERAL SPECIFICATIONS

Power supply	Voltage	+ 48 V	Typical deflection	± 0.393 rad		
	Current	2 A RMS, max. 5 A		Resolution XY2-100-E 16-Bit	12 µrad	
	Ripple/ Noise	Max. 200 mVpp, @ 20 MHz bandwidth		Resolution SL2-100 20-Bit	0.76 µrad	
Ambient temperature	+15°C to +35°C		Repeatability (RMS)	< 2.0 µrad		
Storage temperature	-10°C to +60°C		Position noise (RMS)	< 4.5 µrad		
Humidity	≤ 80 % non-condensing		Temperature Drift	Max. Gaindrift ¹	15 ppm/K	
IP Code	64			Max. Offsetdrift ¹	10 µrad/K	
Interface signals	Digital	XY2-100-Enhanced protocol SL2-100 protocol	Long-term drift 8 h without water temperature control ¹			< 60 µrad
			Long-term drift 8 h with water temperature control ^{1,2}			< 40 µrad

¹ Angles optical. Drift per axis, after 30 min warm-up, at constant ambient temperature and process stress.

² After 30 min warm-up, under varying process loads, with water temperature control set for ≥ 2 l/min and 22°C water temperature.

APERTURE DEPENDENT SPECIFICATIONS – MECHANICAL DATA

Deflection unit	SUPERSCAN IV-15	SUPERSCAN IV-20
Input aperture [mm]	15	20
Beam displacement [mm]	18.1 (QU), 18.0 (SC)	26.0 (QU, SC)
Weight (without objective) [kg]	approx. 3.2	approx. 5.5
Dimension (L x W x H) [mm]	170.0 x 125.0 x 117.5	203.0 x 159.0 x 150.0

MIRROR VARIATIONS

Wavelengths	Substrate 15 mm	Substrate 20 mm
343 nm	SC	SC
355 nm	QU, SC	SC
515 nm	SC	–
532 nm	QU, SC	SC
1,030 nm, 1,070 nm	SC	–
1,064 nm	QU, SC	SC
1,060–1,080 nm	QU	–

QU = quartz; SC = silicon carbide

TYPE DEPENDENT SPECIFICATIONS – TUNING

Tuning	Description
Precision Line Tuning (PL)	Optimized tuning for long vectors with high marking speed and very precise beam deflection.
Wafer Tuning (W)	Optimized tuning for long vectors at highest speeds and precise beam deflection.

TYPE DEPENDENT SPECIFICATIONS – DYNAMIC DATA

Deflection unit	SUPERSCAN IV-15 QU		SUPERSCAN IV-15 SC		SUPERSCAN IV-20 SC	
	W	PL	W	PL	W	PL
Tuning	W	PL	W	PL	W	PL
Processing speed [rad/s] ¹	200	110	200	110	160	200 ²
Positioning speed [rad/s] ¹	200	110	200	110	160	200 ²
Tracking error [ms]	0.30 ⁴	0.30 ⁵	0.20 ⁶	0.30 ⁵	0.20 ⁶	400 ⁷
Step response time at 1% of full scale [ms] ³	0.65	0.80	0.50	0.80	0.50	1.00

¹ See "Calculation of speed". ² When using the SP-ICE-3 control card and RAYGUIDE software ³ Settling to 1/5,000 of full scale.

⁴ Calculation acceleration time approx. 2.3 x tracking error. ⁵ Calculation acceleration time approx. 2.6 x tracking error.

⁶ Calculation acceleration time approx. 2.4 x tracking error. ⁷ Calculation acceleration time approx. 2.75 x tracking error

Calculation of speed

Speed in working field = Focal length F-Theta lens x Positioning speed:

Example 1: SUPERSCAN IV-15 SC with F-Theta Lens f = 254 mm, processing speed 200 rad/s

$$v = 254/1,000 \times 200 = 50 \text{ m/s}$$

Example 2: SUPERSCAN IV-20 SC with F-Theta Lens f = 330 mm, processing speed 200 rad/s

$$v = 330/1,000 \times 200 = 66 \text{ m/s}$$

Mirrors and Lenses: Scan mirrors and objectives with optimized mounts are available for all typical laser types, wavelengths, power densities, focal lengths and working fields. Customer specific configurations are also possible. Please contact the RAYLASE support team for specific information and possible combinations on +49 8153 9999 699 or support@raylase.de.

Options: The SUPERSCAN IV SOLAR deflection units provide water temperature control (W) for the electronic components and galvanometer scanners. This ensures constant working conditions and excellent long-term stability, thus guaranteeing reliable operation even in high power laser applications. The SUPERSCAN IV SOLAR deflection units can also be operated without temperature control (N). In consequence the drift values may increase.

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WATER TEMPERATURE CONTROL

Specifications	
Water ¹	Clean tap water with additives
Temperature	22°C – 28°C
Max. water pressure	< 3 bar

Flow rate	Pressure drop
2 l/min	0.4 bar
4 l/min	0.8 bar
6 l/min	1.2 bar

¹ **Caution:** When using cooling water, even if it is deionized water, suitable additives must be used to prevent the growth of algae and protect the aluminium parts against corrosion.

Additive recommendations (Please consult your additive supplier for dosage information):

Standard industrial applications: Products of company NALCO, e.g. CCL105 (Premix) or TRAC105A_B (Additive)

Food & beverage, packaging applications: Polypropylene glycol of company Dow Chemical, e.g. DOWCAL N

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