

AXIALSCAN-30 DIGITAL II



3-AXIS DEFLECTION UNITS

FOR CHALLENGING INDUSTRIAL APPLICATIONS

**DIGITAL
CONTROL**



- For large areas with small spot sizes and 3D applications
- Control via SL2-100 protocol 20 bit or XY2-100 protocol 16 bit
- Digitally controlled high-speed Z-axis
- Greatly reduced power loss and minimal heat development thanks to digital PWM output stages
- Variable processing fields (mm x mm): 100 x 100 to 1,800 x 1,800

LARGE PROCESSING FIELDS WITH THE SMALLEST SPOT SIZES

YOUR BENEFITS

The AXIALSCAN-30 deflection units with the LT-II-15 digital linear translator module not only offers the smallest spot diameters with large processing areas, but also flexibility, high deflection speed, long-term stability and exceptionally low drift values at 20 bit position resolution. Heat development is greatly reduced thanks to the PWM output stages used.

INTERFACES

Deflection units are compatible with both XY2-100 (16 bit) and SL2-100 (20 bit). The units are controlled digitally using a control card, such as SP-ICE-3 or SP-ICE-1 PCIe PRO.

DEFLECTION MIRRORS AND LENSES

Lenses, protective glass and deflection mirrors are available for all standard laser beam sources.

TYPICAL APPLICATIONS

By means of different tunings a wide range of applications can be optimally realized. Vector Tuning for material treatment like cutting, welding and 3D applications. Fast vector tuning especially for fast scribing and structuring in "on the fly" applications. Hatching tuning in Additive Manufacturing powder bed processes.

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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	+30 V or +48 V
	Current	4 A, RMS, max. 10 A
	Ripple/Noise	Max. 200 mVpp, @ 20 MHz bandwidth
Ambient temperature	+15°C to +35°C	
Storage temperature	-10°C to +60°C	
Humidity	≤ 80 % non-condensing	
IP Code	54	

Interface signals	Digital	XY2-100-Enhanced protocol SL2-100 protocol
Resolution XY2-100-E 16-Bit		12 µrad
Resolution SL2-100 20-Bit		0.76 µrad
Total weight		approx. 13 kg
Max. input aperture		15 mm
Tracking error LT-II-15		1.3 ms
Speed of moving lens		880 mm/s

TYPE DEPENDENT SPECIFICATIONS - DEFLECTION UNIT

Deflection unit	SUPERSCAN IV-30 QU	SUPERSCAN IV-30 SI	SUPERSCAN IV-30 SC	SUPERSCAN V-30 SC	
Mechanical data:					
Mirror size [mm]	30	30	30	30	
Beam displacement [mm]	35.4	36.0	36.0	35.7	
Weight [kg]	approx. 5.5	approx. 5.5	approx. 5.5	approx. 5.5	
Galvo-Scanner specific data:					
Typical deflection [rad]	± 0.393	± 0.393	± 0.393	± 0.393	
Repeatability RMS [µrad]	< 2.0	< 2.0	< 2.0	< 0.4	
Max. Gain drift [ppm/K] ¹	15	15	15	8	
Max. Offset drift [µrad/K] ¹	10	10	10	15	
Long-term drift 8 h without water tempering [µrad] ¹	< 60	< 60	< 60	< 50	
Long-term drift 8 h with water tempering [µrad] ^{1, 2}	< 40	< 40	< 40	< 30	
Dynamic data:					
Tuning	VC	VC	VC	FV	H
Processing speed [rad/s] ³	30 @ 30 V 50 @ 48 V	35 @ 30 V 55 @ 48 V	40 @ 30 V 65 @ 48 V	30 @ 30 V 50 @ 48 V	30 @ 30V 30 @ 48V
Positioning speed [rad/s] ³	30 @ 30 V 50 @ 48 V	35 @ 30 V 55 @ 48 V	40 @ 30 V 65 @ 48 V	30 @ 30 V 50 @ 48 V	30 @ 30V 30 @ 48V
Tracking error [ms]	0.48 ⁴	0.43 ⁴	0.30 ⁴	0.24 ⁴	0.25 ⁵
Step response time at 1% of full scale [ms] ⁶	1.2	1.0	0.8	0.65	0.66

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.

³ See "Calculation speed in field".

⁴ Calculation acceleration time approx. 1.8 x tracking error.

⁵ Calculation acceleration time approx. 1.7x tracking error.

⁶ Setting to 1/5,000 of full scale.

Calculation speed in field

1 rad/s @ ± 0.393 rad deflection (45°) ≈ 0.12 m/s for 100 mm working field size

Example: AXIALSCAN-30 with SUPERSCAN IV-30-SC, Working field size 400 mm x 400 mm (≈ field factor = 4), Positioning speed 65 rad/s:

⇒ 65 x 0.12 m/s x 4 = 31.2 m/s. Note: Lower speeds may be produced by the linear translator module, depending on which control card is used, the laser job, field size and optical configuration.

TYPE DEPENDENT SPECIFICATIONS – TUNING

Tuning	Description
Vector tuning (VC)	Optimized Tuning for a wide range of applications with emphasis on processing speed
Fast Vector Tuning (FV)	Optimized tuning for the best combination of high dynamic performance and high speed
Hatching (H)	Optimized tuning for high precision beam deflection and fastest beam direction change during hatching

Deflection mirrors and protective glass:

Protective glass and scan mirrors are available for all standard laser types, wavelengths, power densities, focal lengths and processing areas.

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 and SUPERSCAN V deflection units provide two types of water-connections for the electronic components and galvanometer scanners: straight (W) connectors and 90° (W2) connectors along with air-cooling (A) of the deflection mirrors. This ensures constant working conditions and excellent long-term stability, thus guaranteeing reliable operation even in high power laser applications.

The SUPERSCAN IV and SUPERSCAN V deflection units can also be operated without temperature control by cooling water. In consequence the drift values may increase. Thanks to the minimized heat development in the new linear translators, water cooling is no longer required in these modules.

WATER TEMPERATURE CONTROL

Specifications		Flow rate	Pressure drop
Water ¹	Clean tap water with additives	2 l/min	0.4 bar
Temperature	22°C – 28°C	4 l/min	0.8 bar
Max. water pressure	< 3 bar	6 l/min	1.2 bar

¹ **Caution:** When using cooling water including deionised 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 (Additiv)

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

CONFIGURATION EXAMPLES: AXIALSCAN-30 (BO100) FOR $\lambda = 10,600$ NM

Field size [mm x mm]	100 x 100	200 x 200	300 x 300	400 x 400	500 x 500
Distance D [mm] ¹	177	131	114	105	99
Working distance [mm] ²	74	198	321	445	569
Spot diameter $1/e^2$ [μm] ³	108	194	280	366	452
Free focus range [mm]	2	34	111	249	473

CONFIGURATION EXAMPLES: AXIALSCAN-30 (BO250) FOR $\lambda = 10,600$ NM

Field size [mm x mm]	250 x 250	500 x 500	750 x 750	1,000 x 1,000	1,250 x 1,250	1,500 x 1,500
Distance D [mm] ¹ CBO* / CBOV2	162 / 136	123 / 98	110 / 86	104 / 80	100 / 76	96 / 73
Working distance [mm] ²	259	569	878	1,188	1,497	1,806
Spot diameter $1/e^2$ [μm] ³ CBO* / CBOV2	237 / 227	471 / 462	706 / 696	941 / 931	1,176 / 1,165	1,411 / 1,395
Free focus range [mm] CBO* / CBOV2	8 / 8	173 / 190	602 / 679	1,000 / 1,000	1,250 / 1,250	1,500 / 1,500

CONFIGURATION EXAMPLES: AXIALSCAN-30 (BO260) FOR $\lambda = 1,064$ NM

Field size [mm x mm]	260 x 260	300 x 300	400 x 400	500 x 500	600 x 600
Distance D [mm] ¹	141	134	122	115	110
Working distance [mm] ²	272	321	445	569	693
Spot diameter $1/e^2$ [μm] ³	25	29	38	47	56
Free focus range [mm]	42	66	157	299	511

¹ Front end of the linear translator up to the interior of the housing plate; length may vary depending on laser divergence and lens tolerances.

² From the bottom edge of deflection unit or the output plate to the processing field. ³ Input beam quality: $M^2 = 1.0$.

LENSE SPECIFICATIONS

Laser	Nd:YAG	CO ₂
Wavelength [nm]	1,064	10,600
Coating	Anti-Reflex-Coating	Anti-Reflex-Coating
Max. laser power, cw [W]	1,000 ¹	500 ²

¹ QU-Mirror ² SI/SC-Mirror

Optional versions with motorized linear translator for field size adjustment are available on request.

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