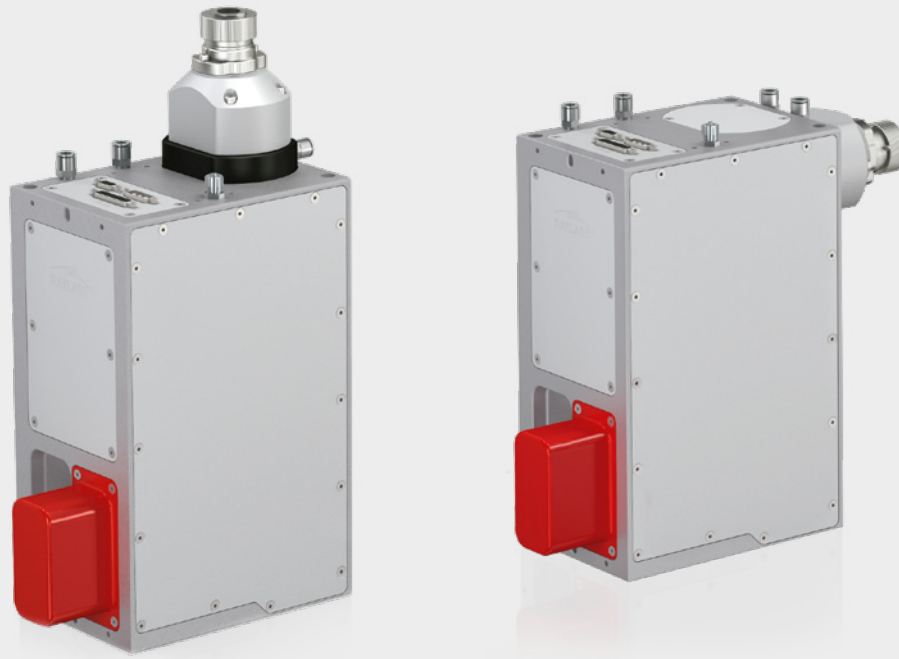


# AXIALSCAN FIBER-30



PRE-FOCUSING-UNIT

FOR INDUSTRIAL MANUFACTURING



- 4-times productivity by quadruple design with 100 % overlapping above the production panel
- Dust-proof with additional, quickly exchangeable protective window
- Easy system integration with direct laser-fiber connection and multiple mounting possibilities
- "On-Axis" quality control by integrated process-monitoring interface
- Large, pre-adjustable processing field sizes from 250 x 250 mm<sup>2</sup> to 850 x 850 mm<sup>2</sup>

## HIGHLY PRACTICAL, EASILY INTEGRATED

### YOUR BENEFITS

The deflection system can be easily integrated into any laser system by means of various mechanical interfaces below, to the side (robot flange is possible) and from above. The integrated fiber collimator enables connection of the laser fiber without beam path alignment and allows very compact dimensions with low height. A second external protective window can be quickly and easily replaced. Camera and welding monitoring systems can be adapted to the process light output without aberrations. The AXIALSCAN FIBER-30 is completely dust-proof and is therefore ideal for use in a harsh industrial environment.

### CONFIGURABLE THROUGH AND THROUGH

Suitable mirrors are available both for high-performance welding applications with laser power in the multi-kilowatt range and for highly dynamic applications. Optical configurations are available for all standard beam parameters of lasers and their fibers. We would also be happy to help you put together the perfect configuration for your application.

### TYPICAL APPLICATIONS

The AXIALSCAN FIBER-30 is the result of our continuous and heavily market-oriented enhancement of the AXIALSCAN model range for fiber-coupled laser applications; ideal for welding in the e-mobility market with optional laser beam modulation or for powder-bed machines in additive manufacturing (LPBF). Combined into a "quadruple design", the productivity of one AM machine is boosted four-fold for each processing field. The integrated process light output enables the connection of application-appropriate process monitoring sensors, thereby allowing quality parameters to be guaranteed and documented.

### 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 customer.

# AXIALSCAN FIBER-30

## GENERAL SPECIFICATIONS

Power supply	Voltage	+48 V
	Current	4 A, RMS, max. 8 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		64
Interface signals	Digital	RL3-100 protocol 20 Bit and XY2-100 protocol 16 Bit or SL2-100 protocol 20 Bit

	Standard	HPS*
Typical deflection (optical)	± 0.393 rad	± 0.393 rad
Resolution XY2-100-E 16 Bit	12 µrad	12 µrad
Resolution RL3-100 / SL2-100 20 Bit	0.76 µrad	0.76 µrad
Repeatability (RMS)	< 2.0 µrad	< 0.4 µrad
Position noise (RMS)	< 3.2 µrad	< 1.0 µrad
Temperature Drift	Max. Gaindrift <sup>1</sup>	15 ppm/K
	Max. Offsetdrift <sup>1</sup>	10 µrad/K
Long-term drift 8 h without water temperature control <sup>1</sup>	< 60 µrad	< 50 µrad
Long-term drift 8 h with water temperature control <sup>1,2</sup>	< 40 µrad	< 30 µrad

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

<sup>2</sup> After 60 min warm-up, under varying process loads, with water temperature control set for ≥ 2 l/min and 22°C water temperature.

\* High Performance System

## APERTURE DEPENDENT SPECIFICATIONS – MECHANICAL DATA

Deflection unit	AXIALSCAN FIBER-30	
Laser fiber socket	QBH	
Position of fiber socket	optional above (T) or behind (R)	
Weight [kg]	approx. 12	
Dimensions excluding fiber socket and electrical plug connections (L x W x H) [mm]	270.0 x 140.0 x 320.0	
	Typ. beam divergence	max. beam divergence
Optical sets for fiber coupling <sup>1</sup>	1/e <sup>2</sup> full angle	1/e <sup>2</sup> full angle
Single-mode laser, fiber core 10 µm or multi-mode laser BPP approx. 3.5 mm x mrad, fiber core 100 µm	140 mrad	150 mrad
Single-mode laser, fiber core 14 µm	100 mrad	110 mrad
Single-mode laser, fiber core 20 µm	80 mrad	90 mrad
Single-mode laser, fiber core 30 µm	50 mrad	64 mrad
Ring-mode laser	fiber core 16 µm <sup>2</sup>	115 mrad
	fiber core 47 µm <sup>2</sup>	168 mrad

<sup>1</sup> Optical sets optimized for maximum beam divergence <sup>2</sup> measured with 2nd moment method

## MIRROR VARIATIONS

Wavelengths	Substrate
1,060 nm – 1,080 nm	QU
1,060 nm – 1,090nm + AL	SC

QU = quartz, SC = silicon carbide

## TYPE DEPENDENT SPECIFICATIONS – TUNING

Tuning	Description
Vector-Tuning (VC)	Optimized tuning for a wide range of applications with emphasis on processing speed
Hatching Tuning (H)	Optimized tuning for high precision beam deflection and fastest beam direction change during hatching

## TYPE DEPENDENT SPECIFICATIONS – DYNAMIC DATA

Deflection unit	AXIALSCAN FIBER-30 QU	AXIALSCAN FIBER-30 SC	AXIALSCAN FIBER-30 SC HPS*
Tuning	VC	H	VC
Processing speed [rad/s]	50	30	65
Positioning speed [rad/s] <sup>1</sup>	50	30	65
Tracking error deflection unit [ms]	0.48 <sup>2</sup>	0.23 <sup>2</sup>	0.3 <sup>2</sup>
Step response time at 1% of full scale [ms] <sup>4</sup>	1.2	0.7	0.8
Tracking error focusing unit [ms]	1.5	1.5	1.5
Speed of moving lens [mm/s]	880	880	880

<sup>1</sup> See "Calculation of speed". <sup>2</sup> Calculation acceleration time approx. 1.8 x tracking error. <sup>3</sup> Calculation acceleration time approx. 1.7x tracking error

<sup>4</sup> Settling to 1/5,000 of full scale. \* HPS = High Performance System

### Calculation of maximum speed in field:

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

Example: AXIALSCAN FIBER-30 QU, Working field size 400 mm × 400 mm (field factor = 4), Positioning speed 50 rad/s => 50 × 0.12 m/s × 4 = 24 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.

### Options:

AXIALSCAN FIBER-30 deflection units offer the option of water cooling (W) of the electronic components and galvanometer scanner along with air-cooling [A] for the deflection mirrors (> 2 kW laser power for SC-mirrors and > 3 kW laser power for QU-mirrors).

This ensures constant working conditions and excellent long-term stability and guarantees reliable operation of high-power laser applications.

AXIALSCAN FIBER-30 deflection units can also be operated without water cooling. Without water cooling, drift values may increase.

### Option of additional protective window:

Each AXIALSCAN FIBER can be equipped with an optional extra protective window. This external protective window is housed under a flap and is quickly replaced.

This ensures fast and easy replacement of the protective window under harsh conditions in dusty environments. This means that all cleaning of the protective window is done externally and the system is operational again after a very short time.

## AIR COOLING

Specifications	
Compressed air <sup>1</sup>	Clean air free of water and oil

<sup>1</sup> ISO 8573-1:2010 [1:0(0.05):0(0.005)]

Flow rate	Pressure drop
approx. 20 l/min	1.0 bar – 1.5 bar

## WATER TEMPERATURE CONTROL

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

<sup>1</sup> **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.

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

### 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

## CONFIGURATION EXAMPLES – AXIALSCAN FIBER-30

Field size [mm x mm]	250 x 250	300 x 300	400 x 400	500 x 500	600 x 600	700 x 700	800 x 800
Working distance [mm] <sup>1</sup>	256	318	442	566	689	813	937
Spot diameter 1/e <sup>2</sup> [µm] <sup>2</sup>	32	38	49	60	72	83	94
Free focus range [mm]	25	48	117	224	377	591	885

<sup>1</sup> From the bottom edge of deflection unit to the processing field. <sup>2</sup> Beam quality M<sup>2</sup> = 1 @ typical beam divergence 100 mrad, fiber core diameter 14 µm

**Note:** Lower beam divergences will cause bigger spot diameters

## OPTICS SPECIFICATIONS

Laser	Fiber Laser infrared 1,060 nm – 1,080 nm	Fiber Laser infrared 1,060 nm – 1,090 nm
Coating / Wavelength [nm]	QU 1,060 – 1,080	SC 1,060 – 1,090 + AL
Max. laser power, cw [W]	6,000 W	6,000 W

QU = quartz, air cooling > 3,000 W laser power recommended SC = silicon carbide, air cooling > 2,000 W laser power mandatory

## PROCESS MONITORING

Every AXIALSCAN FIBER is equipped with a dust-proof optical output for process light radiation. Both very short wavelengths below the laser wavelength and long-wave thermal radiation are transferred externally. This means that various sensors can be connected, e.g. cameras for position detection, weld quality monitoring and pyrometers.

AXIALSCAN FIBER-30	
Process light output wavelengths [nm]	400 – 900 + 1,300 – 2,100

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