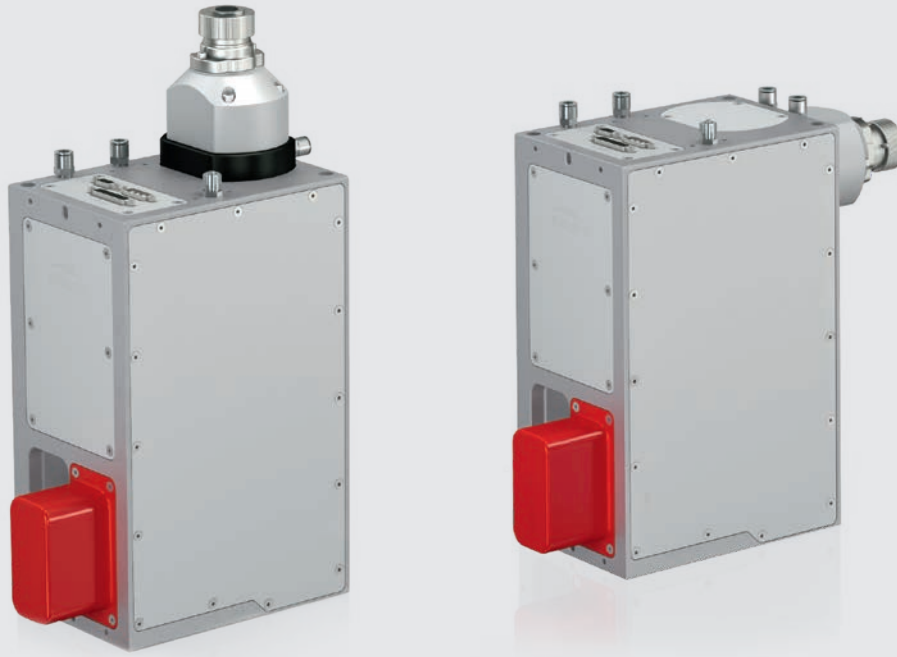


AXIALSCAN FIBER-20



PRE-FOCUSING-UNIT

FOR INDUSTRIAL MANUFACTURING



- 4-times productivity by quadruple design with 100 % overlapping above the production panel
- Dust proof and tailored to the requirements of industrial powder bed machines
- 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 200 x 200 mm² to 850 x 850 mm²

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 and from above. The attached, horizontally mounted fiber collimator enables connection of the laser fiber without beam path alignment and allows very compact dimensions with low height. As well asymmetrical, optical output apertures as intermeshing mechanics allow 100 % overlapping of working fields at lowest working distance. Camera and welding monitoring systems can be adapted to the process light output without aberrations. The AXIALSCAN FIBER-20 is completely dust-proof and is therefore ideal for use in a harsh industrial environment.

CONFIGURABLE THROUGH AND THROUGH

Spot sizes, deflection angles, working distances and working field sizes can be configured individually in a wide range. We would also be happy to help you put together the perfect configuration for your application.

TYPICAL APPLICATIONS

The AXIALSCAN FIBER-20 is the result of our continuous and heavily application-oriented enhancement of the AXIALSCAN model range for fiber-coupled laser applications; ideal for powder-bed machines in additive manufacturing or for e-mobility welding applications with single mode lasers. 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-20

GENERAL SPECIFICATIONS

Power supply	Voltage	+48 V	Standard	HPS*	
	Current	4 A, RMS, max. 8 A			
	Ripple/ Noise	Max. 200 mVpp, @ 20 MHz bandwidth			
Ambient temperature		+15°C to +35°C	Deflection (optical) configurable (rad)	± 0.393	± 0.393
Storage temperature		-10°C to +60°C	Resolution XY2-100-E 16 Bit	12 µrad	12 µrad
Humidity		≤ 80 % non-condensing	Resolution RL3-100 / SL2-100 20 Bit	0.76 µrad	0.76 µrad
IP Code		64	Repeatability (RMS)	< 2.0 µrad	< 0.4 µrad
Interface signals	Digital	RL3-100 protocol 20 Bit and XY2-100 protocol 16 Bit or SL2-100 protocol 20 Bit	Position noise (RMS)	< 3.2 µrad	< 2.0 µrad
			Temperature Drift	Max. Gaindrift ¹	15 ppm/K
			Max. Offsetdrift ¹	10 µrad/K	15 µrad/K
			Long-term drift 8 h without water temperature control ¹	< 60 µrad	< 50 µrad
			Long-term drift 8 h with water temperature control ^{1,2}	< 40 µrad	< 30 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.

* High Performance System

APERTURE DEPENDENT SPECIFICATIONS – MECHANICAL DATA

Deflection unit	AXIALSCAN FIBER-20	
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 ¹	1/e ² full angle	1/e ² 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

¹ Optical sets optimized for maximum beam divergence

MIRROR VARIATIONS

Wavelengths	Substrate
1,060 nm – 1,080 nm	QU
1,060 nm – 1,090 nm + 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-20 QU	AXIALSCAN FIBER-20 SC	AXIALSCAN FIBER-20 SC HPS*
Tuning	VC	H	H
Processing speed [rad/s]	55	30	30
Positioning speed [rad/s] ¹	55	30	30
Tracking error deflection unit [ms]	0.280 ²	0.155 ²	0.175 ³
Step response time at 1% of full scale [ms] ⁴	0.7	0.54	0.54
Tracking error focusing unit [ms]	1.5	1.5	1.5
Speed of moving lens [mm/s]	880	880	880

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

⁴ 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-20, deflection 45°, Working field size 400 mm x 400 mm (field factor = 4), Positioning speed 30 rad/s => 30 x 0.12 m/s x 4 = 14.4 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-20 deflection units offer the option of water cooling (W) of the electronic components and galvanometer scanner along with air-cooling [A] for the SC-deflection mirrors > 1 kW laser power (not required for quartz mirrors). This ensures constant working conditions and excellent long-term stability.

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 FLUSHING

Specifications	
Compressed air ¹	Clean air free of water and oil

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

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-20

Field size [mm x mm]	200 x 200	300 x 300	400 x 400	500 x 500	600 x 600	700 x 700	800 x 800
Working distance [mm] ¹	195	318	442	566	689	813	937
Spot diameter [µm] ²	35	51	67	82	98	114	131
Free focus range [mm]	4	40	105	207	355	561	844

¹ From the bottom edge of deflection unit to the processing field. ² Beam quality M² = 1 @ typical beam divergence.

Note: Lower beam divergences will cause bigger spot diameters

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PRE-FOCUSING-UNIT

FOR INDUSTRIAL MANUFACTURING

OPTICS SPECIFICATIONS

Lasers	Fiber Laser infrared 1,060 – 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]	2,000 W for single / multi mode	2,000 W for single / multi mode

QU = quartz, SC = silicon carbide

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-20
Process light output wavelength [nm]	400 – 900 + 1,300 – 2,100

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Headquarters:
RAYLASE GmbH
Wessling, Germany
☎ +49 8153 9999 699
✉ info@raylase.de

Subsidiary China:
RAYLASE Laser Technology (Shenzhen) Co.
Shenzhen, China
☎ +86 755 28 24 8533
✉ info@raylase.cn

Subsidiary USA:
RAYLASE Laser Technology Inc.
Newburyport, MA, USA
☎ +1 978 255 1672
✉ info@raylase.com

