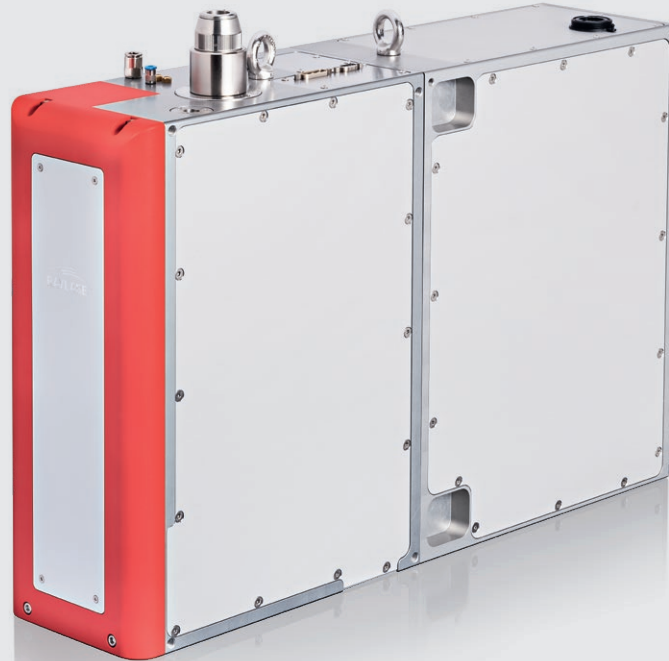


AM-MODULE NEXT GEN



ADDITIVE MANUFACTURING SOLUTIONS

FOR CHALLENGING INDUSTRIAL APPLICATIONS



- Fast beam deflection with uniform power distribution over the entire field
- High dynamic for 3D-Production of metal-parts for working fields from up to 600 mm x 600 mm
- Innovative design for effective full parallelization over the working field
- Direct fibre connection and zoom axis for highly dynamic change of spot size
- On-Axis process monitoring and control using various sensors with focus tracking

THE HIGHLY DYNAMIC SOLUTION FOR ADDITIVE MANUFACTURING

YOUR BENEFITS

The AM-MODULE NEXT GEN for fibre-coupled lasers features homogeneous power density and exceptionally low drift values. It enables ultradynamic, rapid processing with flexible spot diameters. Full digital, model-based control is ensured with absolute precision. Up to 4 modules can be operated simultaneously over one construction field. Direct connection of a photodiode or pyrometer for process control is also possible.

OPTIONS

For more effective process monitoring, the BASE-Module can be expanded with the SENSOR-Module. The 2 integrated sensors not only ensure customized quality control, they also enable archiving and process control. Focus tracking is built-in for one of the sensors. Data can be preprocessed either directly in the expanded camera electronics or on a powerful frame grabber.

TYPICAL APPLICATIONS

The AM-MODULE NEXT GEN is available in 2 variants, as a standard module or a high performance module with fully digitally galvo-scanner. The high performance module is designed for use in the manufacture of ultra-high precision components which must satisfy particularly high safety specifications. This application is of particular interest for users in the aerospace industry, automotive manufacturing and medical engineering.

INNOVATION AND QUALITY

Innovation and quality are the highest priority at RAYLASE. We develop, manufacture and test all of our products in our in-house laboratories and production workshops. For the best possible maintenance and fast service, we offer our customers a worldwide support network.

AM-MODULE NEXT GEN

GENERAL SPECIFICATIONS

Power supply	Voltage	+48 V	Typical deflection	± 0.325 rad	± 0.325 rad	
	Current (BASE-Module)	6 A, RMS, max. 10 A		Resolution RL3-100 20 Bit	0.62 µrad	0.62 µrad
	Ripple/Noise	Max. 200 mVpp, @ 20 MHz bandwidth		Repeatability (RMS)	< 2 µrad	< 0.4 µrad
Ambient temperature	+15°C to +40°C		Position noise (RMS)	< 3.2 µrad	< 2.0 µrad	
Storage temperature	-10°C to +60°C		Temperature drift	Max. Gain drift ¹	15 ppm/K	8 ppm/K
Humidity	≤ 80% non-condensing			Max. Offset drift ¹	10 µrad/K	15 µrad/K
IP-Code	64		Long-term drift 8 h without water temperature control ¹	< 60 µrad	< 50 µrad	
Interface signals	Digital	RL3-100 protocol, 20 Bit	Long-term drift 8 h with water temperature control 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

SPECIFICATIONS LINEAR TRANSLATOR UNIT

Field size (mm x mm) ¹	250 x 250	300 x 300	400 x 400	500 x 500	600 x 600
Mechanical data:					
Working distance (mm) ²	318	392	541	689	838
Spot diameter 1/e ² (µm) ³	33	39	51	63	75
Dynamic data:					
Tracking error focusing unit (ms) ⁴	1.5	1.5	1.5	1.5	1.5
Speed of focusing unit (mm/s)	880	880	880	880	880
Magnification factor spot diameter Single-Mode	1 .. 2	1 .. 2	1 .. 2	1 .. 2	1 .. 2
Magnification factor spot diameter Multi-Mode	1 .. 3	1 .. 3	1 .. 3	1 .. 3	1 .. 3

¹ The processing field is pre-adjusted by RAYLASE in accordance to the customer's requirements. Small machine-specific deviations can be adjusted by software.

² From bottom edge of BASE-MODULE to processing field. ³ Center of working field, beam quality: M² = 1.0. ⁴ Tracking error compensation by SP-ICE-3 control card.

APERTURE DEPENDENT SPECIFICATIONS – MECHANICAL DATA

Deflection unit	SUPERSCAN IV / V -30 Kit
Laser fibre connector ¹	QBH
Weight BASE-Module (without protection window) (kg)	approx. 15
Dimension BASE-Module (L x W x H) (mm) ²	284 x 150 x 393
Weight SENSOR-Module without sensors (kg)	approx. 14
Dimension SENSOR-Module (L x W x H) (mm) ²	315 x 150 x 393
Total dimension (L x W x H) (mm) ²	589 x 150 x 393

¹ Other laser fibre connectors are available on request.

² Length without front panel, width without brackets for fixation from above, height without pin connector.

MIRROR VARIATIONS

Wavelengths	Substrate
1.060 nm – 1.090 nm + AL	SC

TYPE DEPENDENT SPECIFICATIONS – TUNING

Tuning	Description
Hatching Tuning	Optimized for precise beam control and fastest beam direction change at hatching

TYPE DEPENDENT SPECIFICATIONS – DYNAMIC DATA

	Standard	High Performance
Deflection unit	SUPERSCAN IV-30 Kit	SUPERSCAN V-30 Kit
Tuning	Hatching	Hatching
Positioning speed (rad/s) ¹	30	30
Tracking error (ms) ²	0.25	0.25
Step response time at 1 % of full scale (ms) ³	< 0.7	< 0.7

¹ See "Calculation speed in field". ² Calculation of acceleration time approx. 1.7 x tracking error. ³ Setting to 1/5,000 of full scale.

Calculation speed in field

¹ rad/s @ ± 0.325 rad deflection (18.6°) ≈ 0.15 m/s for 100 mm working field size

Example: AM-MODULE NEXT GEN with working field size 400 mm x 400 mm (≈ field factor = 4), Positioning speed 30 rad/s: => 30 x 0.15 m/s x 4 = 18 m/s

Options: The AM-MODULE NEXT GEN provides water connections [W] for the electronic components and galvanometer scanners. Air-cooling [A] of the deflection mirrors > 1 kW laser power is optional available. This ensures constant working conditions and excellent long-term stability, thus guaranteeing reliable operation even in high power laser applications. The AM-MODULE NEXT GEN can also be operated without temperature control by cooling water. In consequence the drift values may increase.

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. 100 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

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 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 (Additive)

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

SPECIFICATIONS SENSOR-MODULE

Specifications high speed camera optical values:	
Illumination wavelength (nm)	640 / 850
Bandwidth illumination wavelength (nm)	< 20
Min. Field size (mm x mm)	250 x 250
Max. Field size (mm x mm)	400 x 400
Number of pixels	1,696 pixel x 1,710 pixel (2.9 MP) configurable
Pixel size (µm)	8.0
Framerate (fps)	540 fps @ 1,696 x 1,710 Pixel to 37,700 fps @ 128 pixel x 128 pixel
Camera interface	CoaXPress
Field of view (mm x mm) ¹	8 x 6
Optical resolution (µm)	15

¹ Field of view valid for laser field 250 mm x 250 mm.

Option: Further camera- and sensortypes available on request.

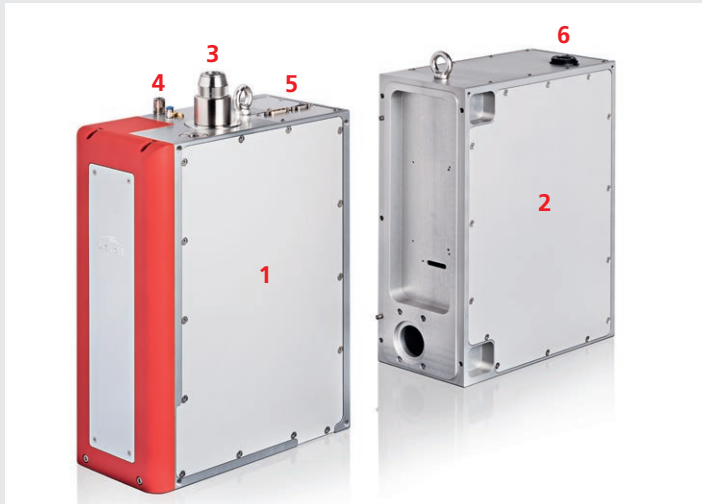
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ADDITIVE MANUFACTURING SOLUTIONS

FOR CHALLENGING INDUSTRIAL APPLICATIONS

SETTING AM-MODULE



- 1 AM-BASE-Module
- 2 High speed camera module or SENSOR-Module
- 3 QBH fibre connector
- 4 Water-cooling
- 5 Power supply & RL3-100 data connection, reverse polarity protected to industrial standards
- 6 Power supply & data connection for high speed camera module / SENSOR-Module

PARALLELIZATION



3D-construction process with 4 AM-MODULES over 1 working field to increase efficiency and quality in the production.

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Headquarters:
RAYLASE GmbH
Wessling, Germany
☎ +49 8153 88 98-0
✉ 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

