dynamic and precise laser focussing

The varioSCAN II focusing unit enables highly dynamic and exceptionally precise positioning of the laser focus along the beam direction.

The z-axis enable 2D scan systems to execute 3D processing or replace costly objectives for providing a plane focusing surface.

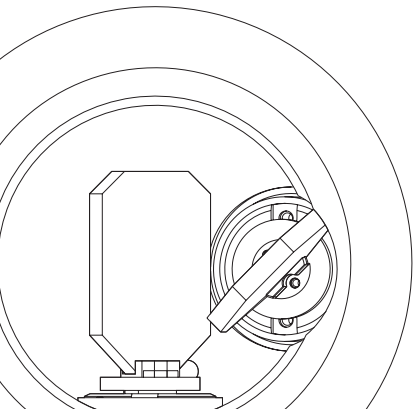
The product series offers a wide range of different sizes, optics designs and functional upgrades (e.g. integrated encoder). The system design is tailor-made for the customer's application.

Key features

- Any mounting orientation
- Compact construction in high quality design
- Wide range of optical configurations for all typical laser wavelengths
- Configurations suited for high power lasers

Typical applications

- 3D micromachining
- Additive manufacturing
- Laser cutting
- Laser marking
- Microstructuring



Features of the vario*SCAN* II Series

The new system configuration has been completely overhauled compared to the previous tried-and-tested vario*SCAN* series. Furthermore, the construction of the vario*SCAN* II has been optimized for technical cleanliness in order to meet the performance requirements for many applications, which are growing ever stricter.

New bearing technology enables the vario*SCAN* II to be installed in any orientation. The dynamics and drift specifications now apply to all install orientations.

The vario*SCAN* II replaces the previous vario*SCAN* as a drop-in replacement: The motor dimensions, clamping surface and electrical interfaces have not been changed.

The optics designs have also been overhauled. New lens designs with better imaging quality, low-absorption optics and/or high-quality coatings have been added.

All vario*SCAN* II systems can be controlled using the RTC cards as usual.

vario*SCAN* II configurations

- **Two motor sizes**
  '20' or '40' for different beam diameters and laser powers
- **Position detection**
  Analog position detector in vario*SCAN* II, digital encoder in vario*SCAN*$_{de}$ II
- **Optical configuration**
  Wide range of designs for all typical wavelengths, as well as customer-specific designs
- **eBox**
  Electronics housing with integrated controller card and interface card

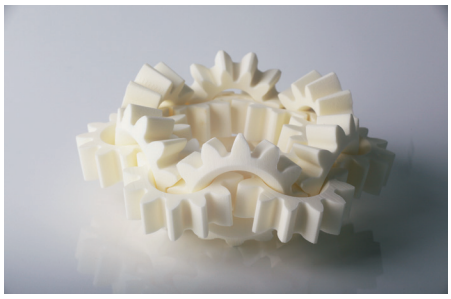
Advantages of the vario*SCAN*$_{de}$ II with encoder*

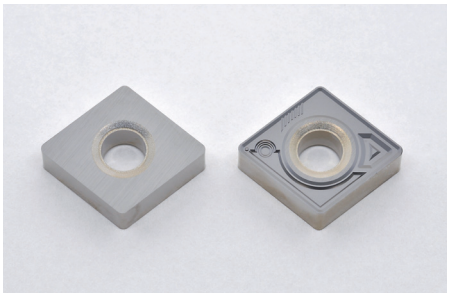
- **Higher dynamics**
  Tracking error reduced by up to 50%
- **Larger z-shift**
  Focus shift has been doubled
- **Improved position stability**
  Reduction in long-term drift of up to 66 %
- **i*DRIVE* technology**
  Current position and other statuses can be read back in real time

* Compared to the vario*SCAN* II with analog position detector

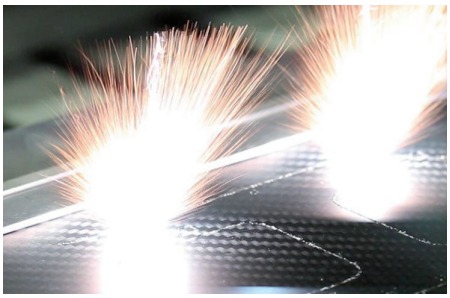
Typical Applications

Laser marking


Additive manufacturing (3D printing)


3D deep engraving

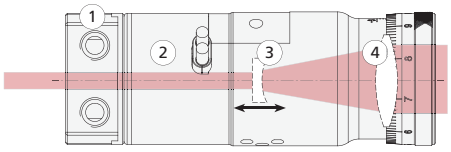

3D micromachining


Laser cutting


Textile processing

The Functional Principle Behind z-axis and Optics Design

The vario*SCAN* II motors are based on a voice-coil principle, in which a lens is moved independently of the coil current applied. Together with the scan lens, which is mounted in a fixed position, this results in a shifting of the focus along the optical axis.

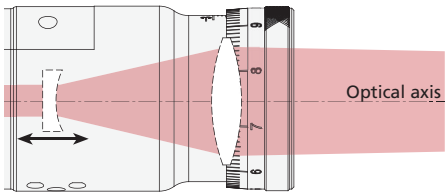


Legend

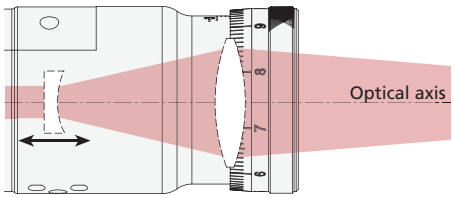
1 Water-cooled entrance aperture (optional)
2 Motor
3 Movable diverging optics
4 Focusing optics

The optical designs ('types') of the vario*SCAN* II systems have been developed to be application-specific.

The optics design takes into account the following parameters: Wavelength, z-shift, beam diameter, required beam expansion factor and laser power.

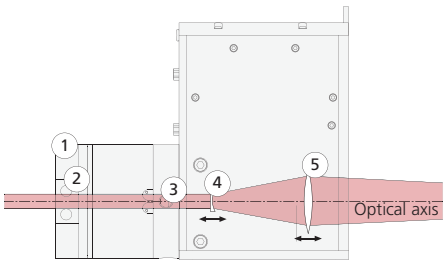


'F-theta' beam path
(with f-theta objective, type **FT**)



'PRe-focus' beam path
(with pre-focusing, type **PR**)

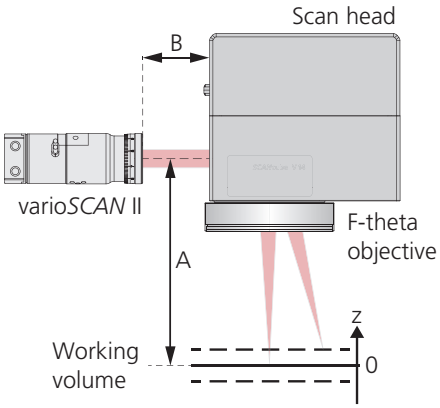
In the vario*SCAN* II FLEX models, all lenses can be moved using a motor. The user therefore benefits from additional flexibility of adjusting both the image field and working distance.



Legend

1 Water-cooled entrance aperture
2 Cooling water connections
3 Cooling air connection
4 Movable diverging optics
5 Movable focusing optics

The Application Determines the Optics Configuration

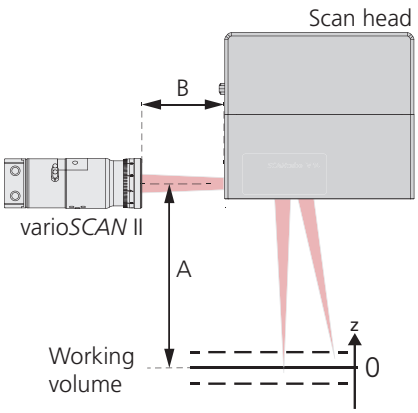


vario*SCAN* II – Type FT

- System configuration with f-theta objective for focusing
- The optical design slightly adjusts the divergence of the laser beam
- Intended use of the vario*SCAN* II: z-shift, defocus

Typical design parameters

- Small spot sizes
- Small focal lengths
- Small image fields
- Telecentric applications



vario*SCAN* II – Type PR

- System configuration without f-theta objective
- vario*SCAN* II is designed so that it focuses directly ('PRe-focus')
- Intended use of the vario*SCAN* II: Focusing, flat-field correction, optional z-shift, defocus

Typical design parameters

- Large beam diameter
- Large working distances
- Large image fields

vario*SCAN* II 20 & vario*SCAN*$_{de}$ II 20i

Features

The vario*SCAN* II 20 and vario*SCAN* II 20i stand out from the crowd, in particular thanks to the following characteristics:

- Fast dynamics
- Compact design
- Wavelengths down to the UV

A water-cooled entrance aperture made of aluminum or stainless steel is also optionally available.

Typical applications

- Laser marking
- 3D micromachining

vario*SCAN* II 40 & vario*SCAN*$_{de}$ II 40i

Features

The ‘40’ series has been optimized for maximum laser power in terms of its mechanical design as well as its available optics configurations:

- Water-cooled entrance aperture
- Air cooling for optics chamber
- Low-absorption optics

The cooling aperture is made of aluminum as standard; it is also optionally available in a stainless steel design.

Typical applications

- Additive manufacturing
- Laser cutting

vario*SCAN* II 40 FLEX & vario*SCAN*$_{de}$ II 40i FLEX

Features

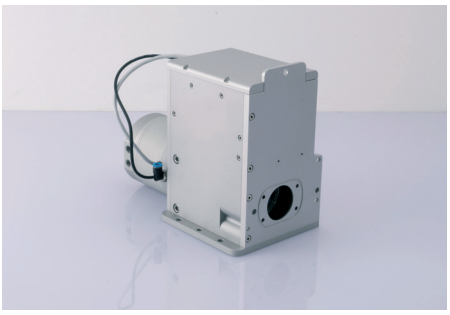
The FLEX variant is a special version within the ‘40’ series.

- Image field size and working distance can be variably adjusted using the motorized, movable focusing optics
- All optical components, as well as the electronics that are part of the vario*SCAN* II, are included in the FLEX housing

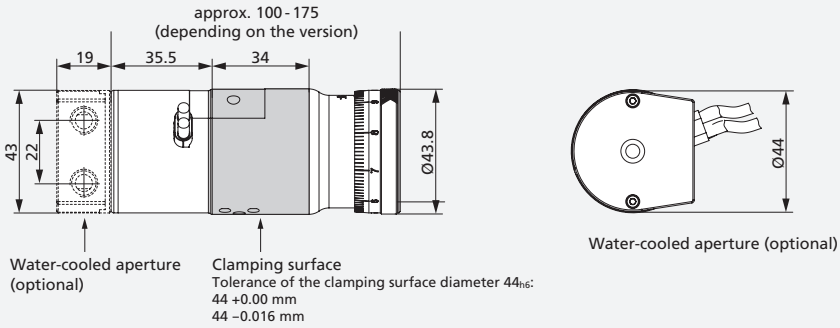
The cooling aperture is identical to the vario*SCAN* II 40 design; it is made of aluminum and also available in stainless steel.

Typical applications

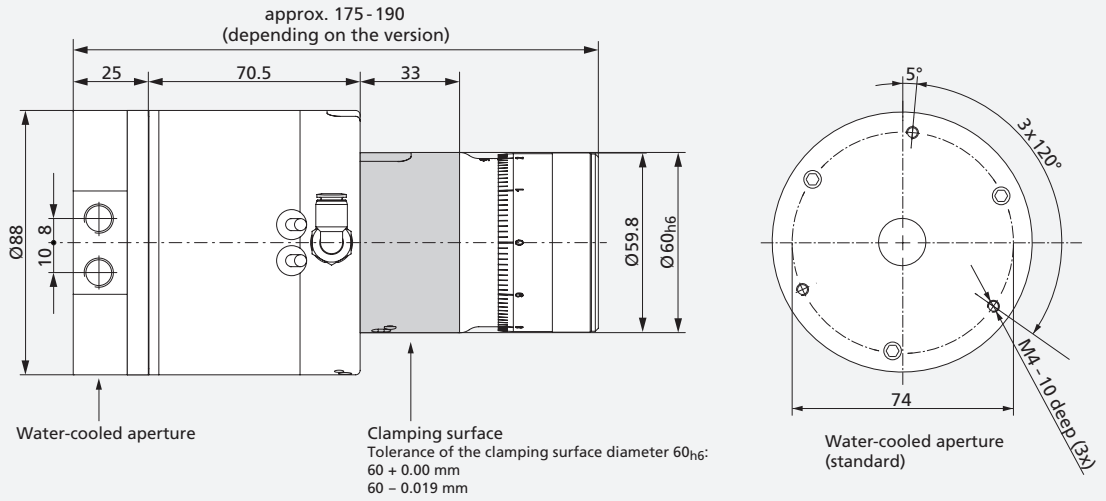
- Textile processing
- Laser cutting



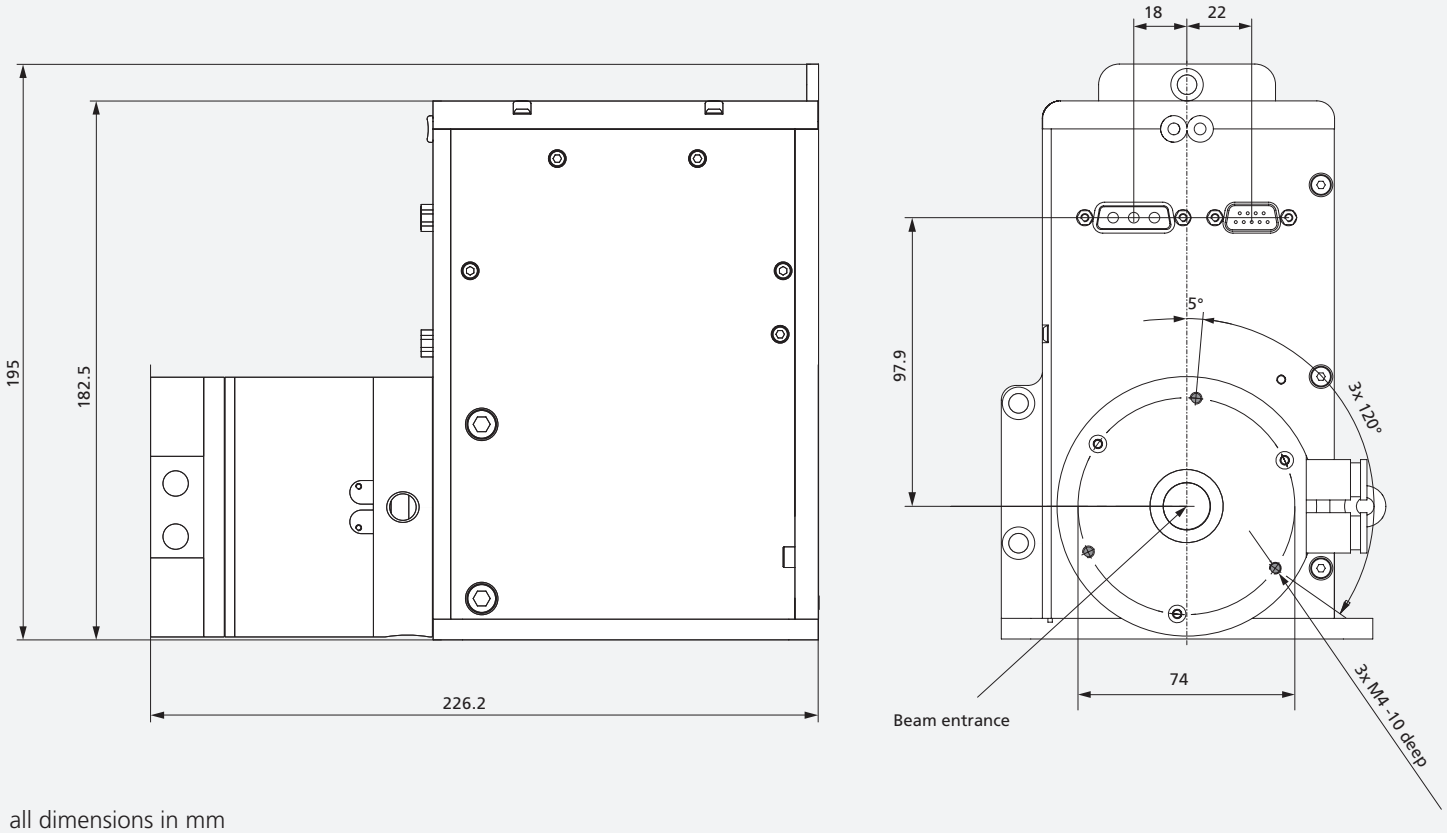
vario*SCAN* II 20 & vario*SCAN*$_{de}$ II 20i



vario*SCAN* II 40 & vario*SCAN*$_{de}$ II 40i



vario*SCAN* II 40 FLEX & vario*SCAN*$_{de}$ II 40i FLEX



all dimensions in mm

Specifications

Dynamic and motor	**vario*SCAN* II 20**	**vario*SCAN*$_{de}$ II 20i**	**vario*SCAN* II 40 (FLEX)**	**vario*SCAN*$_{de}$ II 40i (FLEX)**
Tracking error [ms]	0.90	0.55	1.40	0.70
Motor[1]				
Max. travel of the moving lens [mm]	± 1	± 2	± 1.5	± 3
Typ. speed of the moving lens [mm/s]	≤ 140	≤ 280	≤ 100	≤ 140
Long-term drift (> 8h) [µm]	< 6	< 3	< 10	< 3
Repeatability [µm]	< 1	< 0.5	< 1	< 0.5

Optics and mechanics	**vario*SCAN* II 20 vario*SCAN*$_{de}$ II 20i**	**vario*SCAN* II 40 vario*SCAN*$_{de}$ II 40i**	**vario*SCAN* II 40 FLEX vario*SCAN*$_{de}$ II 40i FLEX**
Common optics[2]			
Aperture [mm]	4 – 7	8 – 18	16
Typ. exit beam diameter [mm]	≤ 20	≤ 40	≤ 40
Typ. wavelengths [nm] [3]	257 – 266, 335 – 360, 1020 – 1090, 10600	515 – 532, 1030 – 1090, 9400 – 10600	9300 – 10600
Beam expansion factor	2 – 5	1.4 – 3.8	2 – 2.5
Max. laser power cw [W][4]	25 (UV), 200 (green), 250 (IR), 200 (CO_2)	1000 (IR), 2000 (CO_2)	500 (CO_2)
Mechanics			
Weight [kg]	0.5 – 0.7	approx. 2.4	approx. 4.4
System cooling	Optional: Water cooled entrance aperture	Air cooling & water cooled entrance aperture	Air cooling & water cooled entrance aperture

Electronics and general	**vario*SCAN* II 20 vario*SCAN* II 40 FLEX**	**vario*SCAN*$_{de}$ II 20i vario*SCAN*$_{de}$ II 40i FLEX**
Power supply (requirements)	± (15 + 1.5) V DC, max. 1.5 A	30 V DC (29 - 33 V), max. 1.5 A
Interfaces	SL2-100, XY2-100, analog	SL2-100, XY2-100 Enhanced
Installation	Clamping, electrically insulated, thermally connected	
Operating temperature	25°C ± 10°C	

(1) All specifications mentioned refer exclusively to the motor only. The influence of these specifications on the actual positioning of the laser beam in the processing field/volume depends on the specific optical configuration.
(2) A specific type design is defined from the specifications given.
(3) Coatings for double & multiple wavelengths are available on request.
(4) Higher laser powers are dependent on laser beam diameter, beam quality and cooling options.

Example applications	**Laser marking**	**Micromaterial-processing**	**Additive Manufacturing**	**Textile processing**
Configuration				
Typ. scan head apertur [mm]	10	14	30	30
vario*SCAN* II type	20-20 FT	20-133 FT	40-116 PR	40-89-PR (FLEX)
Aperture diameter [mm]	5	7	16	16
Beam expansion factor	2.8	2.0	2.0	2.0 – 2.5
Coating: Wavelength [nm]	1020 – 1090	1020 – 1090	1030 – 1090	10600
FT: Objective focal length [mm] PR: medium back focal length [mm]	163	100	850	370 – 2015
Square image field edge length [mm]	95	50	500	180 – 1400
Focus shift / mm [mm]	17.1	2.2	23.5	11,3 – 600
Focus shift (for vario*SCAN*$_{de}$ II) [mm]	± 32	± 4	± 20	0

SCANcalc App
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Google Play

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