



new dimensions – optics in motion

The dynamic focusing units of the varioSCAN and varioSCAN_{de}i series enable exceptionally precise, high-performance positioning of the laser focus along the optical axis.

In XY scan systems, the varioSCAN can replace costly flat field objectives. Therefore, the varioSCAN is an ideal solution in applications for which standard flat field objectives are unavailable. The varioSCAN can also extend XY scan systems into 3D beam deflection systems. The laser focus is guided along the contour of the workpiece being processed, thus enabling processing in three dimensions. The varioSCAN_{FLEX} additionally allows continuously adjusting the image field size, working distance and spot size.

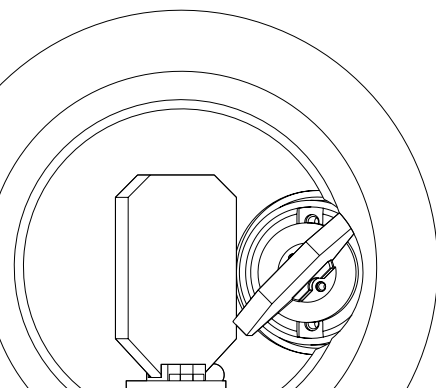
The high-end member of the varioSCAN series of focusing units is the varioSCAN_{de}i. It is equipped with a digital linear encoder.

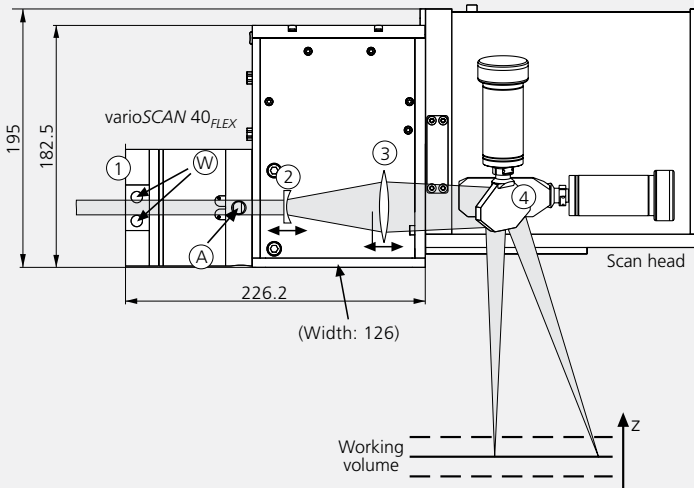
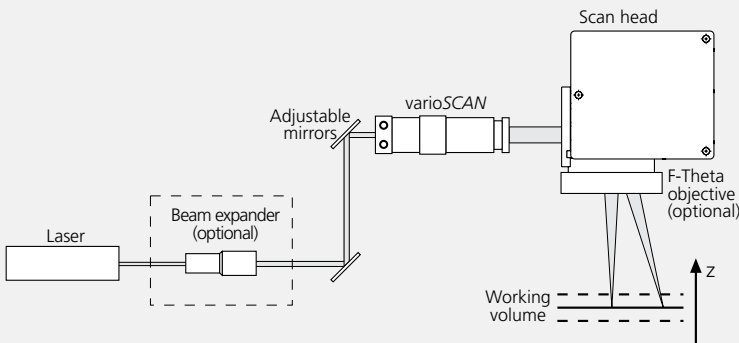
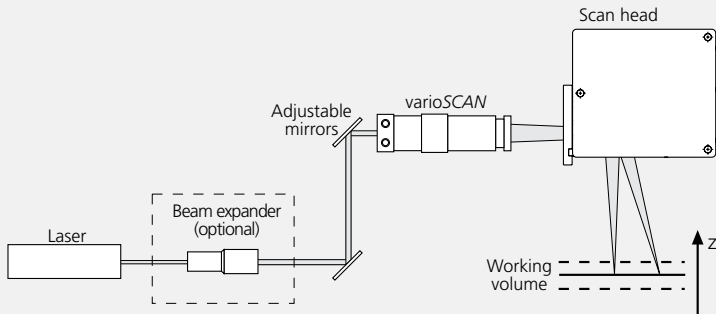
The varioSCAN_{de}i offers double the maximum travel of conventional varioSCANs and much lower tracking error, resulting in a larger focus-shift range and better spot quality. Its accuracy, speed, resolution and linearity, too, are clearly superior to those of all other varioSCAN units, while substantially eliminating the effects of drift.

In addition, the varioSCAN_{de}i delivers all advantages of *iDRIVE* technology: extensive flexibility, high dynamic performance, real-time querying of actual position and other status parameters, etc.

Typical Applications:

- Drilling, cutting, welding
- Laser deep engraving
- Rapid prototyping, rapid tooling
- Microstructuring
- 3D workpiece processing





Legend

- 1 Water-cooled aperture
 - 2 Linear motor with diverging optic
 - 3 Focusing optic
 - 4 Motorized deflection mirrors
 - A Connection for cooling air
 - W Connections for cooling water
- all dimensions in mm

How it Works

During the scanning process, a diverging optic in the varioSCAN and varioSCAN_{de}i is positioned with high dynamics along the optical axis with respect to a stationary focusing optic. This produces a change in the system's overall focal length, synchronized with the mirror motion. The varioSCAN and varioSCAN_{de}i focusing unit can thereby expand 2D scan systems into 3-axis scan systems. In 2D applications, the varioSCAN and varioSCAN_{de}i can replace costly flat field objectives. In 3D beam deflection systems it enables processing in three dimensions.

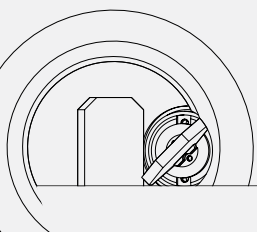
The focusing optic of the varioSCAN 40_{FLEX} is motor-driven, enabling continuously variable image field sizes and working distances. The varioSCAN 40_{FLEX}'s housing contains all optical components and the electronics.

For scan systems with apertures exceeding 40 mm, SCANLAB offers the varioSCAN 60, 60i, 80 and 80i and the varioSCAN FC.

Control

The varioSCAN_{de}i is equipped with a digital standard interface and is easily controlled – even synchronously with a 2D scan system – via SCANLAB's RTC4 or RTC5 PC interface board.

The varioSCAN is available for digital and analog-based control.



Optics

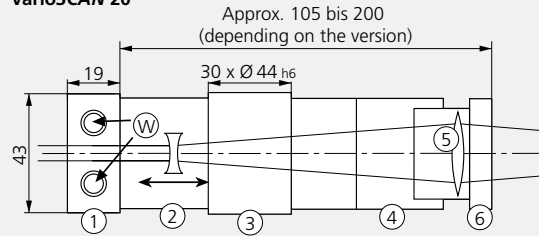
SCANLAB offers – for varioSCAN, varioSCAN_{de}i and the whole scan system – optical configurations for a wide variety of working distances, image field sizes, beam diameters, wavelengths and laser powers for optimally tuning the system to the customer’s particular application. Thus, a maximum image field size is achieved with the minimum spot size.

The varioSCAN 40 and varioSCAN_{de}40i allows the customer to self-install various exchangeable optics sets. The varioSCAN 40’s and varioSCAN_{de}40i’s integrated air and water cooling ensure operation at very high laser powers. The varioSCAN_{de}20i is equipped with a water-cooled entrance aperture.

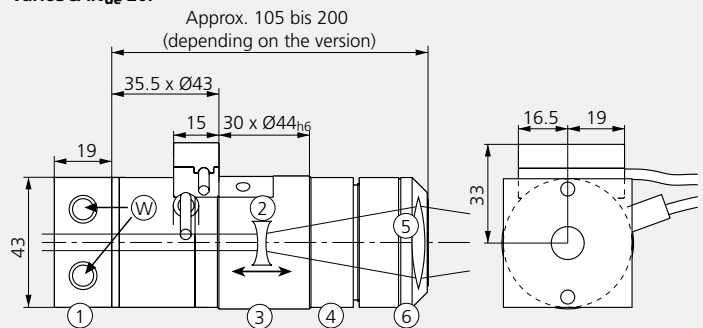
Options

- varioSCAN 20 also available with water cooling (standard for varioSCAN_{de}i systems)

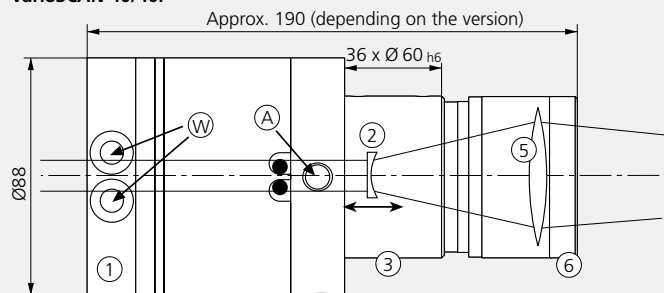
varioSCAN 20



varioSCAN_{de} 20i



varioSCAN 40/40i



Legend

- 1 Water-cooled aperture (optional for varioSCAN 20)
- 2 Linear motor with diverging optic
- 3 Clamping surface
- 4 Objective adapter
- 5 Focusing optic
- 6 Focusing ring
- A Connection for cooling air
- W Connections for cooling water

all dimensions in mm

Typical 3-Axis Scan System Optical Configurations

	varioSCAN _{de} 20i	Nd:YAG x 3	varioSCAN _{de} 40i	varioSCAN 40 _{FLEX} / varioSCAN _{de} 40i _{FLEX}
Laser	Nd:YAG	Nd:YAG x 3	CO ₂	CO ₂
Wavelength	1064 nm	355 nm	10.6 µm	10.6 µm
XY scan unit	10 mm aperture	14 mm aperture	30 mm aperture	30 mm aperture
Flat field objective	with f = 160 mm	without	without	without
Image field size	(110 x 110) mm ²	(600 x 600) mm ²	(500 x 500) mm ²	(200 x 200) mm ² to (2000 x 2000) mm ² [e.g. ⁽¹⁾ (600 x 600) mm ²]
Focus range in z direction	± 32 mm	± 80 mm	± 70 mm	± 2 mm to ± 400 mm [e.g. ⁽¹⁾ ± 40 mm]
Focus diameter (1/e²)	< 35 µm (M ² = 1)	< 70 µm (M ² = 1)	570 µm (M ² = 1)	200 µm (M ² =1) to 1.8 mm (M ² =1) [e.g. ⁽¹⁾ 550 µm (M ² =1)]
Beam expansion factor	2.8	3.8	2.05	2.4 to 1.9 [e.g. ⁽¹⁾ 2.1]
Average focus shift per lens travel	16 mm/mm	71 mm/mm	40 mm/mm	-
Focal length varioSCAN	-	(1390 ± 143) mm	(850 ± 118) mm	(395 ± 18) mm to (2850 ± 600) mm [e.g. ⁽¹⁾ (940 ± 60) mm]
Max. laser power cw	60 W	25 W	2000 W	500 W

⁽¹⁾ Example for a possible position of the focusing unit

Type-Dependent Specifications

	varioSCAN _{de} 20i	varioSCAN 20	varioSCAN _{de} 40i / 40i _{FLEX}	varioSCAN 40 / 40 _{FLEX}
Beam input aperture	up to max. 8 mm	up to max. 8 mm	up to max. 16 mm	up to max. 16 mm
Output aperture	up to max. 20 mm	up to max. 20 mm	up to max. 40 mm	up to max. 40 mm
Motor specifications				
Maximum lens travel	±2 mm	±1 mm	±3 mm	±1.5 mm
Tracking error	0.55 ms	0.9 ms	0.7 ms	1.4 ms
Typical travel speed	≤280 mm/s	≤140 mm/s	≤140 mm/s	≤100 mm/s
Repeatability	< 0.5 µm	< 1 µm	< 0.5 µm	< 1 µm
Nonlinearity	0.05 % FS	1.5 % FS	0.05 % FS	1.5 % FS
Long-term drift (over 8 hours, at constant environmental conditions)	< 3 µm	< 6 µm	< 3 µm	< 10 µm
Power requirements	30 V DC (29-33V), max. 1.5 A each	±(15+1.5) V DC, max. 1.5 A each	30 V DC (29-33V), max. 1.5 A each	±(15+1.5) V DC, max. 1.5 A each
Electrical connections	XY2-100 Enhanced, SL2-100	XY2-100 Standard, SL2-100 or analog ⁽²⁾	XY2-100 Enhanced, SL2-100 or optical data transfer ⁽³⁾	XY2-100 Standard, SL2-100, optical data transfer ⁽³⁾ or analog ⁽²⁾
Boards included	DSCB + interface board	SSV30	DSCB + interface board	SSV30
Weight (depending on optical configuration)	500 g to 700 g	500 g to 700 g	approx. 2.4 kg / 5.0 kg ⁽⁴⁾	approx. 2.4 kg / 4.4 kg ⁽⁴⁾

⁽²⁾ analog version: input signals alternatively: ±4.8 V; ±9.6 V / ±4.8 mA; ±9.6 mA; output signals: TTL level

⁽³⁾ optical data transfer only with varioSCAN 40_{FLEX} and 40i_{FLEX}; additional step motor inputs and limit-switch output signals

⁽⁴⁾ higher value with FLEX housing

Common Specifications

Operating temperature	25 °C ± 10 °C
Installation	horizontal position, electrically insulated, thermally connected

