smart scanning

SCANLAB's intelli*SCAN* **scan heads** stand out with variant diversity and high dynamics. They're among the **2D scan systems** that enable deflecting and positioning of laser beams in the working plane.

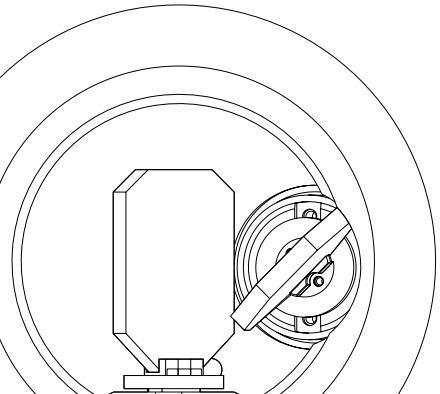
The intelli*SCAN* series allows versatile and flexible usage. It's designed for tasks with very high scan requirements across a broad variety of application areas.

Key Features

- Highest dynamic performance
- Maximum flexibility due to switchable tunings
- Ideal adaptability enabled by a multitude of variants
- Comprehensive diagnostic and monitoring functions
- High long-term stability
- Water & air cooling option

Typical Applications

- Additive manufacturing (3D printing)
- Materials processing, micro-structuring
- Marking, welding, drilling
- Processing-on-the-fly



SCANLAB
innovators for industry

Range of intelli*SCAN* Product Lines

- **intelli*SCAN***
  (10, 14, 20 and 30 mm apertures)
- **intelli*SCAN* III**
  (10, 14, 20 and 30 mm apertures)
- **intelli*SCAN*$_{se}$**
  (10, 14, 20 and 30 mm apertures)

Advantages of intelli*SCAN* series

- Variant diversity
  (customer-specific tunings, assorted housings and cooling methods)
- High extendibility
  (e.g. z-axes, camera adapter)
- Application-specific and customer-specific tunings
- Lower heat generation due to digital control

Advantages of i*DRIVE* technology

- Digital servo electronics provides improved dynamics and higher marking quality
- Up to three switchable tunings reduce process times
- Comprehensive diagnostics and communication possibilities between the scan system and RTC
- Acquisition of all key state variables in real time

Options & Variants

Housing Variants

- Standard water cooling (optional 10 mm and 14 mm aperture)
- Standard air cooling (20 mm and 30 mm aperture)
- Available as a scan module without housing (not all apertures)

Extensions

- vario*SCAN* II: Extension into a 3-axis scan system
- excelli*SHIFT*: Extension into a high-speed, 3-axis scan system
- Camera adapter for optical process monitoring

Optics

- Over 50 standard coatings for various wavelengths (UV to infrared)
- Extensive variety of objectives
- High-performance variants with light-weight mirrors
- Customer-specific variants possible

Control Boards

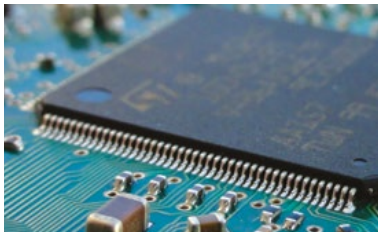
- RTC5 and RTC6 (PCIe, Ethernet)

Software

- Application-specific and customer-specific tunings (servo algorithms and parameter sets) available
- laserDESK: professional software for laser marking and materials processing
- Calibration solutions: CalibrationLibrary

Laser drilling/Laser cutting

3D laser sintering


Marking

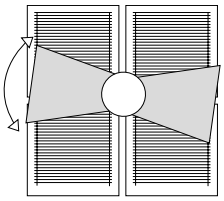
Scan Heads with Analog Position Detectors

intelli*SCAN* and intelli*SCAN* III

Analog Position Detectors

The position detector (PD, angle transmitter) is a critical galvanometer scanner component that determines the entire scan system's accuracy.

SCANLAB's standard portfolio of galvanometer scanners with analog optical position detectors currently comprises two product generations (dyn*AXIS* and dyn*AXIS* 3). Both of them work according to the same shadowing principle.



Analog Technology

- Working principle of an analog position detector with proportionate shadowing of different photo diodes.

intelli*SCAN* III Scan Heads

intelli*SCAN* III scan heads take advantage of dyn*AXIS* 3 galvanometer scanners.

Among them, the lighting of the position detector was optimized.

With the following benefits:

- Highest dynamic performance
- Low drift values
- Very good linearity

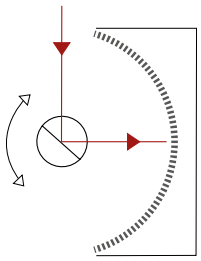
Scan Heads with Digital Encoders

Digital encoder technology

The scan heads with digital encoder technology achieve superior positioning accuracy and long-term stability thus they are especially suited for high-end applications.

Compared to analog position detectors, they are characterized by:

- Highest precision due to the PD signal's low noise (lowest dither values)
- Very high long-term stability and Linearity
- Ideal for applications that demand highest throughput and precision
- SL2-100 interface supports 20-bit resolution with a SCANLAB RTC5/RTC6 control board
- Ensures highest processing accuracy thanks to excellent noise immunity



se-encoder Technology

- Interferometric principle of operation
- SCANLAB patented technology employs a "light pointer encoder" with reduced inertia mirror at rotor end

intelli*SCAN*$_{se}$ scan heads

- The dyn*AXIS*$_{se}$ galvanometer scanners used here deliver superlative precision
- Best quality with a very good price/performance ratio
- Fastest scan head with 10 mm aperture and digital encoder

Principle

Tuning refers to a scan system's dynamics configuration. It's a fine adjustment of the digital servo control that determines the scan system's dynamic reactions while driven with a scan pattern.

Digital systems with i*DRIVE* technology – such as the intelli*SCAN* – can store up to three tunings in memory. Switching between those tunings is possible even during marking.

Always the ideal tuning

Special tunings can optimize scan systems to meet diverse requirements, such as for vectors, jumps or micro-machining.

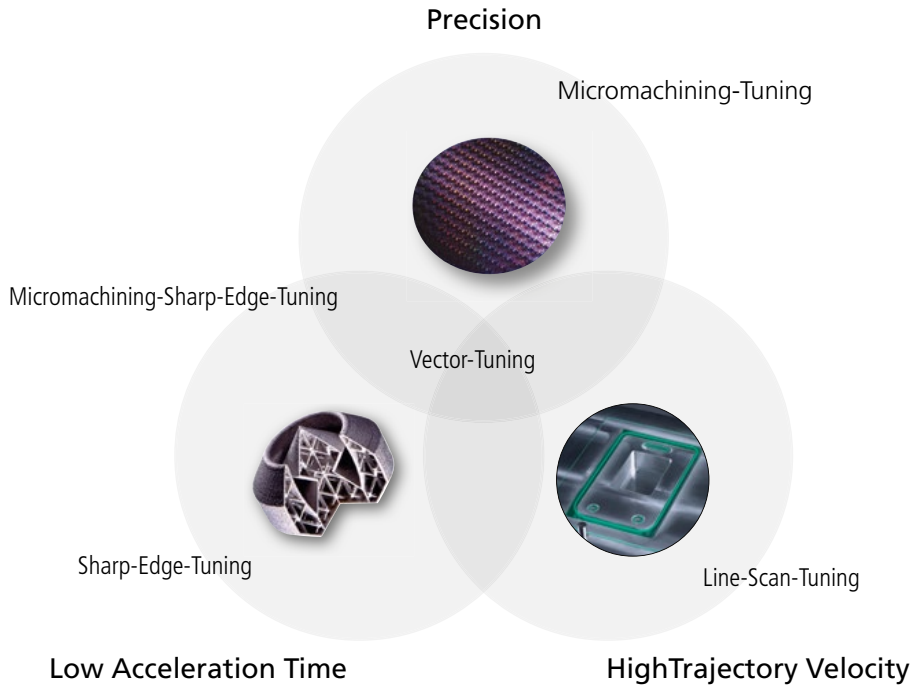
Application-specific tunings bring increased speed and positioning accuracy. The digitally implemented output stages reduce heat generation, leading to improved temperature stability.

What kinds of tunings are available?

Most tunings are characterized by tracking error and maximum speed.

Low tracking error facilitates spatially-small/intricate marking, but accompanied by limited maximum speed. In contrast, elevating speed will also increase tracking error.

Jump tuning is a special case where jump times are minimized for long jumps, resulting in complete elimination of constant tracking error. Jump tuning is particularly well-suited for drilling applications.

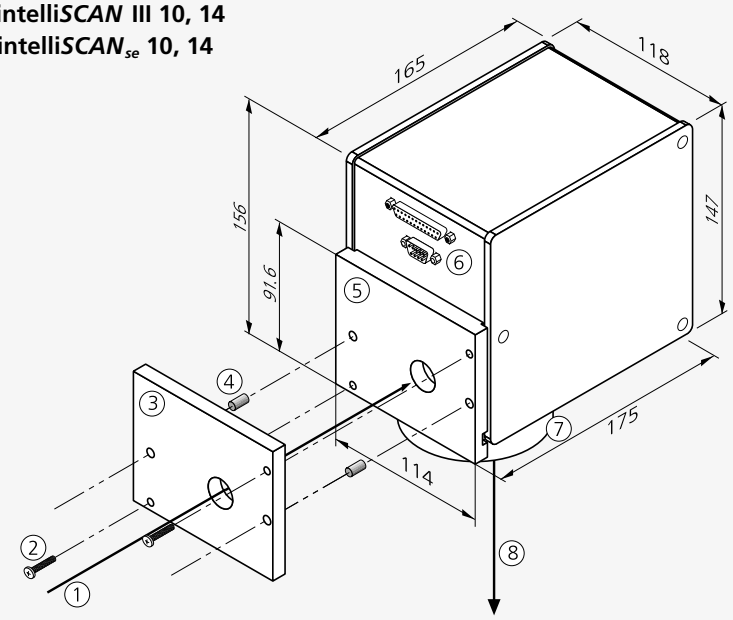


Overview of selected tunings

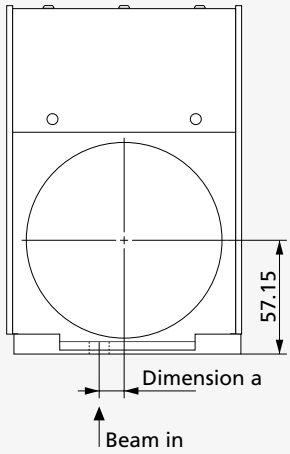
Some tunings aren't available for every aperture and variant!

Tuning	Optimized for	Application
Fast vector tuning	balanced optimum of all parameters in a wide range of applications	vector marking
Step tuning	minimal step response time	drilling, perforating
Sharp edge tuning	low acceleration time, small edge rounding	micro structures
Micromachining tuning	low dither, low line waviness	vector marking, micro structures
Micromachining-sharp edge tuning	low acceleration time, low dither	micro structures
Line scan tuning	highest marking speed (limitation: higher acceleration time)	ultrashort pulse laser processing

intelli*SCAN* 10, 14
intelli*SCAN* III 10, 14
intelli*SCAN*$_{se}$ 10, 14

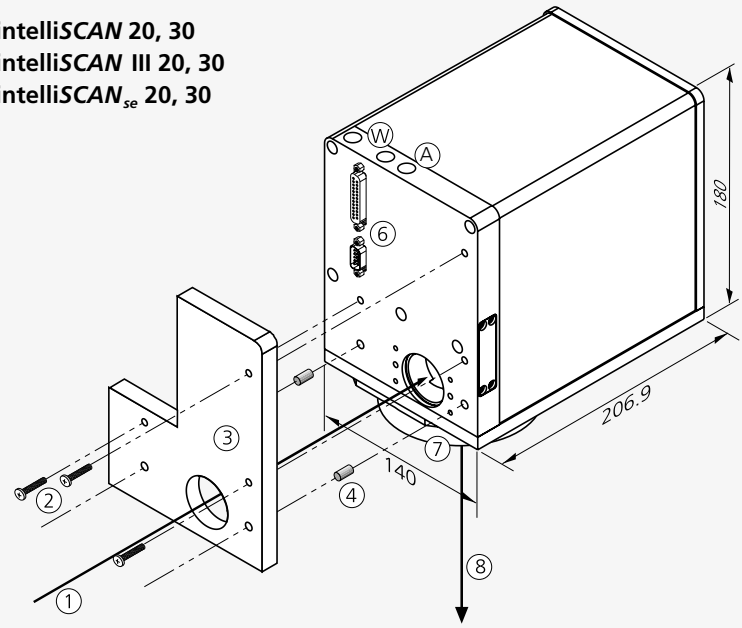


Beam exit side

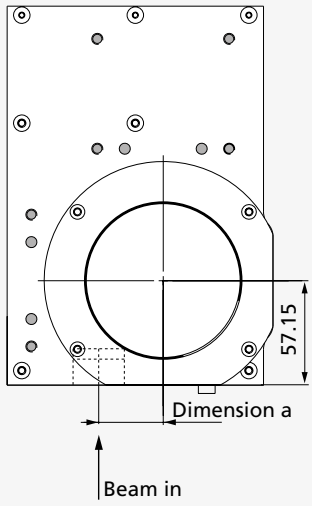


Denoted dimensions refer to the **standard housing type** (with standard mounting bracket). Variations in size and form are possible; also housings with water cooling have other dimensions.

intelli*SCAN* 20, 30
intelli*SCAN* III 20, 30
intelli*SCAN*$_{se}$ 20, 30



Beam exit side



Legend

1 Beam in
2 Screws (M6 threads) *
3 Flange *
4 Alignment pins (6_{h6}) *
(* not included)

5 Mounting bracket
6 Electrical connectors
7 Objective
8 Beam out

A Connection for cooling air
W Connections for cooling water

all dimensions in mm

Dimensions

Aperture	10 mm	14 mm	20 mm	30 mm
Beam displacement (dimension a)	12.56 mm	16.42 mm	25.25 mm	35.53 mm
Weight	approx. 3 kg	approx. 3 kg	approx. 5.8 kg	approx. 5.8 kg

Specifications

Dynamics (for selected tunings)

	intelli*SCAN* 10	**intelli*SCAN* 14**	**intelli*SCAN* 20**	**intelli*SCAN* 30**
Product line	intelli*SCAN* intelli*SCAN* III intelli$SCAN_{se}$	intelli*SCAN* intelli*SCAN* III intelli$SCAN_{se}$	intelli*SCAN* intelli*SCAN* III intelli$SCAN_{se}$	intelli*SCAN* intelli*SCAN* III intelli$SCAN_{se}$
Aperture [mm]	10	14	20	30
Tuning	Fast Vector	Sharp Edge	Fast Vector	Fast Vector
Tracking error [ms]	0.11	0.15	0.32	0.55
Typical speeds [1]				
Marking speed [m/s]	3.5	2.0	1.0	0.7
Positioning speed [m/s]	12.0	5.0	11.0	9.0
Writing speed [cps]				
good writing quality [cps]	1080	680	340	220
high writing quality [cps]	760	480	230	150
Step response time [2]				
1 % of full scale [ms]	0.40	0.45	0.70	1.1
10% of full scale [ms]	1.1	3.0	1.9	2.5

[1] with F-Theta objective, f = 160 mm [2] settling to 1/1000 of full scale

Precision & Stability (tuning dependent)

	intelli*SCAN*	**intelli*SCAN* III**	**intelli$SCAN_{se}$**
Repeatability (RMS) [µrad]	< 2	< 2	< 0.4
Positioning resolution [bit] [3]	18	18	20
Nonlinearity	< 3.5 mrad/44°	< 0.9 mrad / 44°	< 0.5 mrad/44°
Temperature drift			
Offset [µrad/K]		< 15 [5]	< 15 [8]
Gain [ppm/K]		< 25 [5]	< 8
Long-term drift			
8-h-drift (after 30 min warm-up) [4]	< 0.6 mrad		
Offset [µrad]		< 100	< 20 [9]
Gain [ppm]		< 100	< 20 [9]
24-h-drift (after 3 h warm-up) [4]			
Offset [µrad]		< 100	< 20 [9]
Gain [ppm]		< 100	< 25 [9]
Dither (position noise, RMS) [µrad]	< 5 [6]	< 5 [6]	< 1.6 [7]

[3] based on the full angle range (e.g. positioning resolution 2.8 µrad for angle range ±0,36 rad), resolutions better than 16 bit (11 µrad) only together with SL2-100 interface [4] at constant ambient temperature and load; achievable even under varying load when equipped with temperature-controlled water cooling
[5] for intelli*SCAN* III 20 und 30: T-Offset < 20 µrad/K and T-Gain < 15 ppm/K [6] for micromachining tuning [7] intelli$SCAN_{se}$ 10: 2.0
[8] for intelli$SCAN_{se}$ 20 and 30: T-Offset < 20 µrad/K [9] for intelli$SCAN_{se}$ 20 and 30: values for Long-term drift (8h and 24h): Offset < 30 µrad and Gain < 30 ppm

Common Specifications

Optical performance	
Typical scan angle [rad]	±0.35
Gain error [mrad]	< 5
Zero offset [mrad]	< 5
Power requirements	30 V DC, max. 3 A [10] [11]
Interface	SL2-100, XY2-100 Enhanced
Operating temperature [°C]	25 ± 10

[10] max. 6 A for aperture 20 and 30 [11] 48 V also possible for customer-specific systems

(all angles are in optical degrees)

SCANcalc App

Google Play App Store

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