



## smart scanning

SCANLAB's intelliSCAN 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.

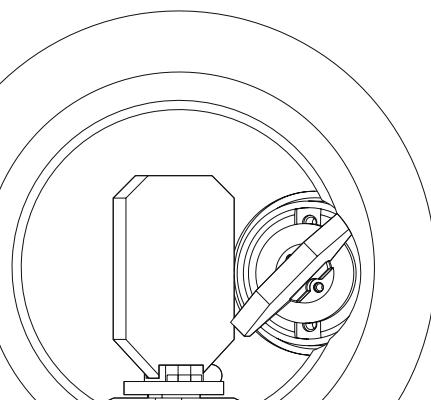
### Key Features

- 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

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

### Typical Applications

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



## Range of intelliSCAN Product Lines

- **intelliSCAN**  
(10, 14, 20 and 30 mm apertures)
- **intelliSCAN III**  
(10, 14, 20 and 30 mm apertures)
- **intelliSCAN<sub>se</sub>**  
(10, 14, 20 and 30 mm apertures)
- **intelliSCAN<sub>de</sub>**  
(14, 20 and 30 mm apertures)

### Advantages of intelliSCAN 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 iDRIVE 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

- varioSCAN: Extension into a 3-axis scan system
- excelliSHIFT: 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
- Flexible calibration solutions: correXion pro, CALsheet



Laser drilling/Laser cutting



3D laser sintering



Marking

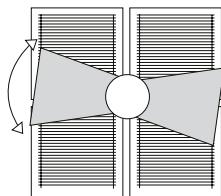
## Scan Heads with Analog Position Detectors

intelliSCAN and intelliSCAN 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 (dynAXIS and dynAXIS 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.

### intelliSCAN III Scan Heads

intelliSCAN III scan heads take advantage of dynAXIS 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

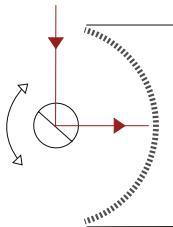
intelliSCAN<sub>de</sub> and intelliSCAN<sub>se</sub>

### 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.

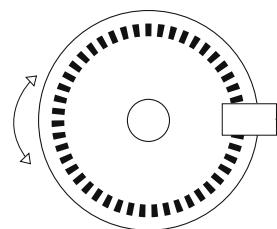
Compared to analog position detectors, they are characterized by:

- 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



### de-encoder Technology

- Galvanometer scanners based on digital encoder disk with radial graduated scale

### intelliSCAN<sub>se</sub> scan heads

- The dynAXIS<sub>se</sub> 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

### intelliSCAN<sub>de</sub> scan heads

- Very low dither and lowest drift values with highest linearity
- Industrial proven digital encoder technology

## 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 iDRIVE technology – such as the intelliSCAN – 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.

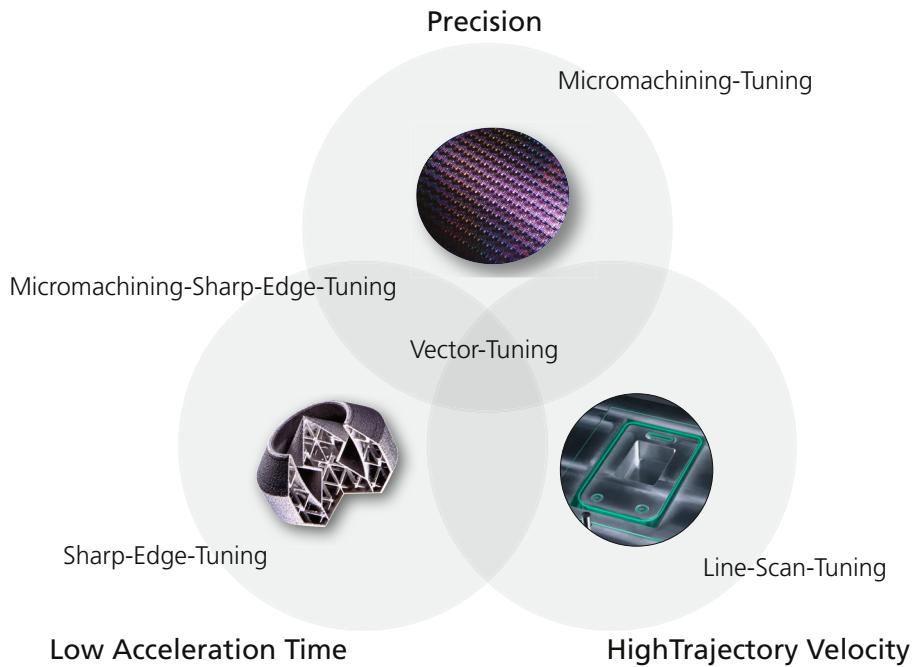
Application-specific tunings bring increased speed and positioning accuracy. The digitally implemented output stages reduce heat generation, leading to improved temperature stability.

## 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.

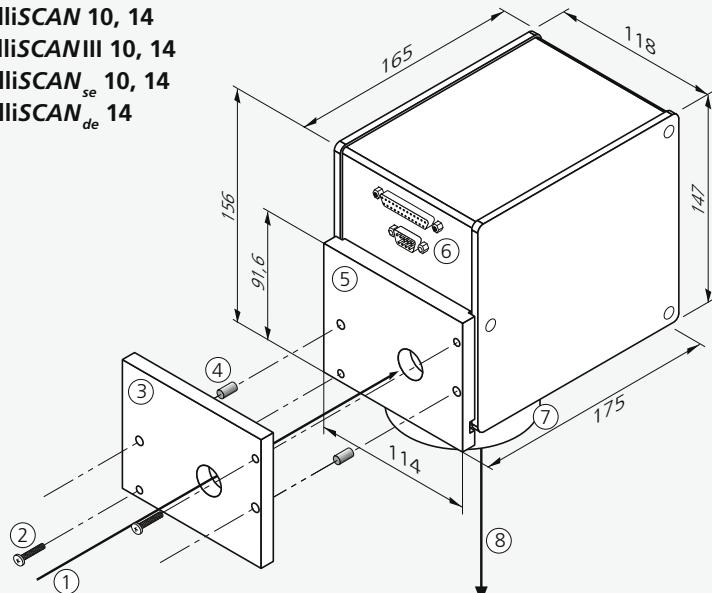


## Overview of selected tunings

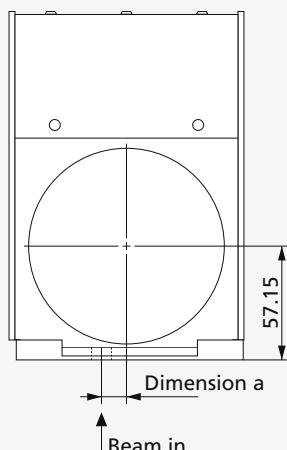
Some tunings aren't available for every aperture and variant!

| 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 |

**intelliSCAN 10, 14**  
**intelliSCAN III 10, 14**  
**intelliSCAN<sub>se</sub> 10, 14**  
**intelliSCAN<sub>de</sub> 14**

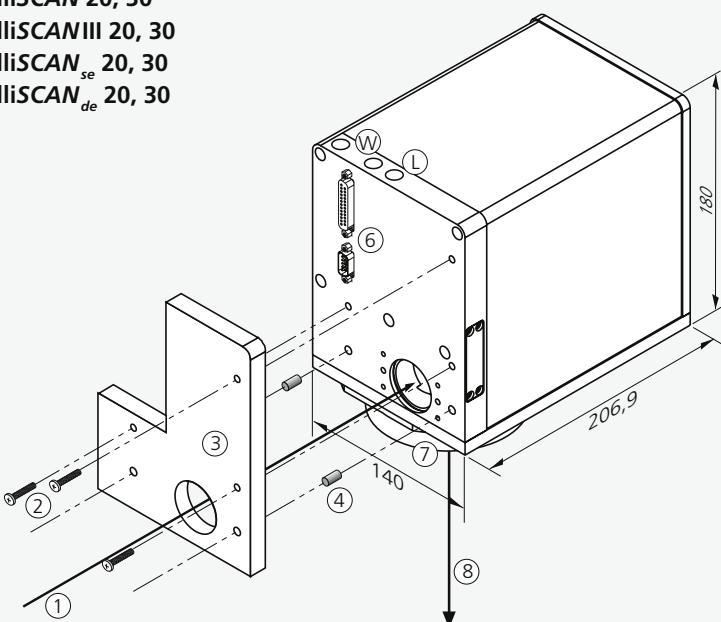


**Beam exit side**

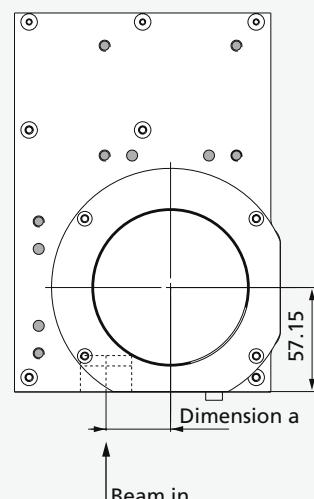


Denoted dimensions refer to the standard housing type (with standard mounting bracket). Variations in size and form are possible; also housings with water cooling have other dimensions.

**intelliSCAN 20, 30**  
**intelliSCAN III 20, 30**  
**intelliSCAN<sub>se</sub> 20, 30**  
**intelliSCAN<sub>de</sub> 20, 30**



**Beam exit side**



## Legend

- |                                      |                         |                                 |
|--------------------------------------|-------------------------|---------------------------------|
| 1 Beam in                            | 5 Mounting bracket      | A Connection for cooling air    |
| 2 Screws (M6 threads)*               | 6 Electrical connectors | W Connections for cooling water |
| 3 Flange *                           | 7 Objective             |                                 |
| 4 Alignment pins (6 <sub>h6</sub> )* | 8 Beam out              |                                 |
- (\* not included)

all dimensions in mm

## Dimensions

| Aperture                               | 10 mm        | 14 mm        | 20 mm          | 30 mm          |
|--|--------------|--------------|----------------|----------------|
| <b>Beam displacement (dimension a)</b> | 12.56 mm     | 16.42 mm     | 25.25 mm       | 35.53 mm       |
| <b>Weight</b>                          | approx. 3 kg | approx. 3 kg | approx. 5.8 kg | approx. 5.8 kg |

# Specifications

## Dynamics (for selected tunings)

|   | <b>intelliSCAN 10</b>  | <b>intelliSCAN 14</b>  | <b>intelliSCAN 20</b>  | <b>intelliSCAN 30</b>  |
|---|--|--|--|--|
| <b>Product line</b>                     | intelliSCAN<br>intelliSCAN III<br>intelliSCAN <sub>se</sub><br>intelliSCAN <sub>de</sub> |
| <b>Aperture [mm]</b>                    | 10   | 14   | 20   | 30   |
| <b>Tuning</b>                           | Fast Vector  | Sharp Edge   | Fast Vector  | Fast Vector  |
| <b>Tracking error [ms]</b>              | 0.11   | 0.15   | 0.32   | 0.55   |
| <b>Typical speeds<sup>(1)</sup></b>     |  |  |  |  |
| 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  |
| <b>Step response time<sup>(2)</sup></b> |  |  |  |  |
| 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  |

<sup>(1)</sup> with F-Theta objective, f = 160 mm    <sup>(2)</sup> settling to 1/1000 of full scale

## Precision & Stability (tuning dependent)

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

<sup>(3)</sup> 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    <sup>(4)</sup> at constant ambient temperature and load; achievable even under varying load when equipped with temperature-controlled water cooling

<sup>(5)</sup> for intelliSCAN III 20 und 30: T-Offset < 20 µrad/K and T-Gain < 15 ppm/K    <sup>(6)</sup> for micromachining tuning    <sup>(7)</sup> intelliSCAN<sub>se</sub> 10: 2.0

<sup>(8)</sup> for intelliSCAN<sub>se</sub> 20 and 30: T-Offset < 20 µrad/K    <sup>(9)</sup> for intelliSCAN<sub>se</sub> 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 <sup>(10)(11)</sup> |
|---------------------------------------|

### Interface

|                              |
|------------------------------|
| SL2-100,<br>XY2-100 Enhanced |
|------------------------------|

### Operating temperature [°C]

|         |
|---------|
| 25 ± 10 |
|---------|

<sup>(10)</sup> max. 6 A for aperture 20 and 30    <sup>(11)</sup> 48 V also possible for customer-specific systems

(all angles are in optical degrees)

