



- optical 3D sensor
- measuring principle
- scanning device
- high speed camera
- point evaluation
- SDK
- evaluation algorithms
- optional evaluation algorithms
- optional profile averaging
- scanning increments
- stative
- system software
- evaluation software
- simplified automation
- optional software modules

specification

- high performance sensor with manual objective turret for up to 4 objectives
- coherence scanning (white-light) interferometer
- piezo stage with close loop capacity gauge control
- 400 μm scanning range / 50 nm linearity
- 1920 x 1200 pixel / 169 fps and acceleration up to 3.2 kfps with decimation
- massive parallel in real time on the GPGPUs
- (general purpose graphic processing unit / programmable high performance graphic boards)
- software libraries in C++ and C# with sample application and source code
- control of all sensor functions
- VSI (vertical scanning interferometry). EPSI (extended phase shift interferometry)
- HD-EPSI (high density – extended phase shift interferometry) with small scanning increments
- automated averaging over up to 40 single scans for noise reduction
- variable optimization between speed and resolution

optional system components

- manual and motorized positioning axis. granite portals and tip tilt compensations
- smartVIS3D – user interface for measurements
- MountainsMap® - stitching, visualization and evaluation of 3D point clouds
- IO module for the start of predefined measuring and evaluation processes
- smartSTITCH – with heigh and angle compensation / optimized stitching of nano structures
- smartLAYER – evaluation of coating thickness



smart WLI system performance and configuration

increment	17 nm*	67 nm	201 nm
scanning speed full resolution	2.85 $\mu\text{m/s}$	11.4 $\mu\text{m/s}$	37.2 $\mu\text{m/s}$
repeatability RMS**	0.15 nm	0.02 nm	0.03 nm
topography reproducibility***	0.15 nm	0.2 nm	0.3 nm
1- σ repeatability 245 nm step height	0.6 nm	0.4 nm	0.3 nm
1- σ repeatability 20 μm step height	20 nm	15 nm	10 nm
1- σ repeatability 100 μm step height	40 nm	30 nm	20 nm

* requires optional HD-EPSI

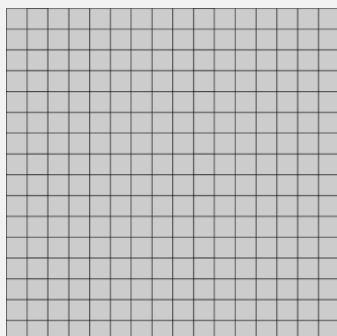
** 1- σ repeatability S_q / single scan. without phase or profile averaging. laboratory conditions. 1 million points after 3x3 denoising filter

*** $S_q/\sqrt{2}$ – profile difference of 2 scans. single scan. without profile averaging. laboratory conditions. 1 million points after 3x3 denoising filter

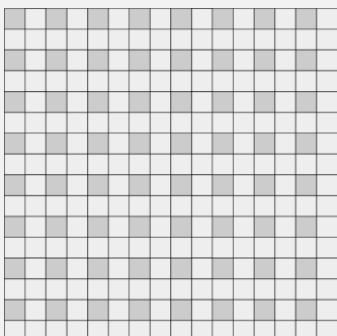
	standard objectives 2D localization				interference objectives for 3D measurements			
available objectives	2.5x	5x	5x	10x	20x	50x	100x	115x**
aperture	0.075	0.13	0.13	0.3	0.4	0.55	0.7	0.8
working distance / mm	8.8	22.5	9.3	7.4	4.7	3.4	2	0.7
measuring area / mm ²	7.3 x 4.6	3.7 x 2.3	3.7 x 2.3	1.8 x 1.2	0.9 x 0.6	0.37 x 0.23	0.18 x 0.12	0.16 x 0.1
sampling interval / μm	3.8	1.9	1.9	0.96	0.48	0.19	0.1	0.08
optical resolution / Rayleigh criterion	4.23	2.44	2.44	1.06	0.79	0.58	0.45	0.4
optical resolution / Sparrow criterion	3.26	1.9	1.9	0.81	0.61	0.44	0.35	0.31



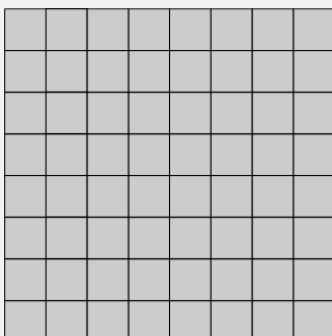
smart WLI acceleration through decimation and AOI



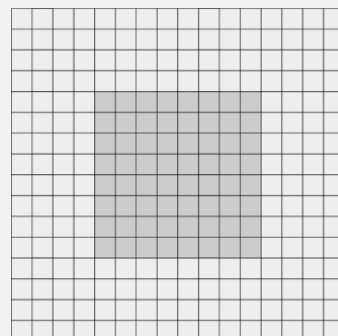
1920 x 1200 pixel / partial area



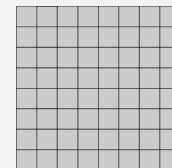
active pixel – decimation 2 x 2



result: 960 x 600 Pixel



active pixel



result

step height*	scanning speed** - $\mu\text{m/s}$					
	17 nm	70 nm	200 nm	600 nm	1000 nm	
1920 x 1200 / full resolution	3	11	34	102	170	
960 x 600 / decimation	9	36	108	324	540	
1200 x 900 / AOI	6	24	72	216	360	
800 x 600 / AOI	12	48	144	432	720	
640 x 480 / AOI	17	69	206	618	1030	
400 x 300 / AOI	31	123	368	1104	1840	
240 x 180 / AOI	42	168	504	1512	2520	
1920 x 36 / AOI	55	219	658	1974	3290	

*selection of possible step heights

**higher scanning speed cause higher noise levels



smartWLI sensor dimensions and connections

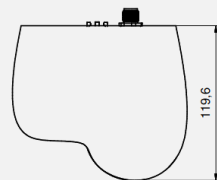
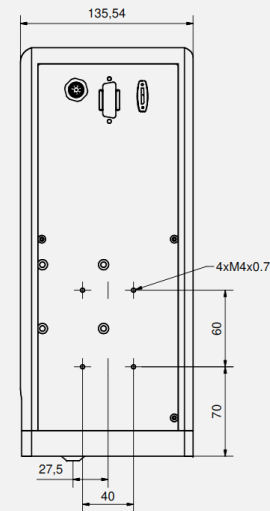
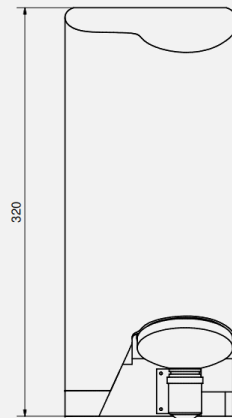
sensor dimensions

height	320 mm
width	135,54 mm
depth	119,6 mm
weight *	4 kg

connectivity - cables

cable length	3 m (optional up to 7 m)
camera	USB 3.0
piezo	special connector
power supply	HR-10A-7P-6s
trigger	HR25-7TP-8S
power consumption	3 – 7 W
LED	up to 4 W
spectrum	green / $\lambda \approx 520 \text{ nm}$

* without objective and cables





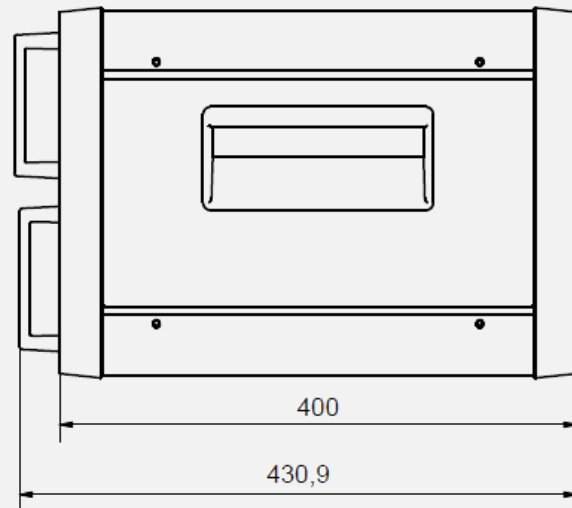
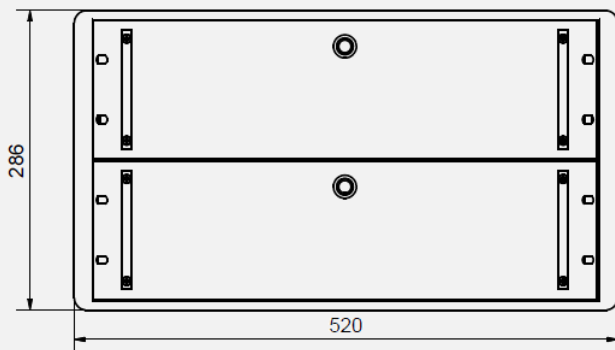
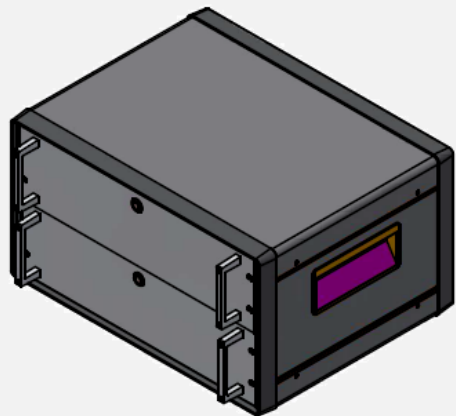
controller

key features

housing	industrial 19" rack / 6 height units	
power supply	100 – 240 V AC / 50-60 Hz	
LED	LED controller	
piezo	piezo control unit	
stages	optional controller for motorized xyz stages	
	standard PC	optional high performance PC
operating system	Windows 10/11	Windows 10/11
CPU	Core i5	Core i9
RAM	16 GB	64 GB
SSD	1 TB	1 TB
	GPGPU	GPGPU
FP 32 (float)	16 TFLOPS	82 TFLOPS
memory	12 GB / GDDR6	24 GB / GDDR6
	optional components	
	27" monitor, keyboard, mouse	
	environmental conditions	
humidity	up to 80% / non-condensing	
operation temperature	10 - 35 °C	

controller dimensions

height	286 mm
width	520 mm
depth	430.9 mm
weight	app. 25 kg



modification date

December 11, 2023

disclaimer

changes are subject to technical progress