

IF-SENSORR25

HOW TO ACHIEVE STABLE 3D MEASUREMENT IN PRODUCTION

THE SYSTEM

Optical 3D measurement sensor

IF-SensorR25 is a solid optical 3D measurement instrument for automated form and roughness measurement in production. The sensor is integrated into a production line and delivers high resolution, repeatable and traceable results when measuring surface characteristics in the μm or sub- μm range. This resolution can hardly be achieved by conventional 2D solutions or tactile techniques.

THE BENEFITS

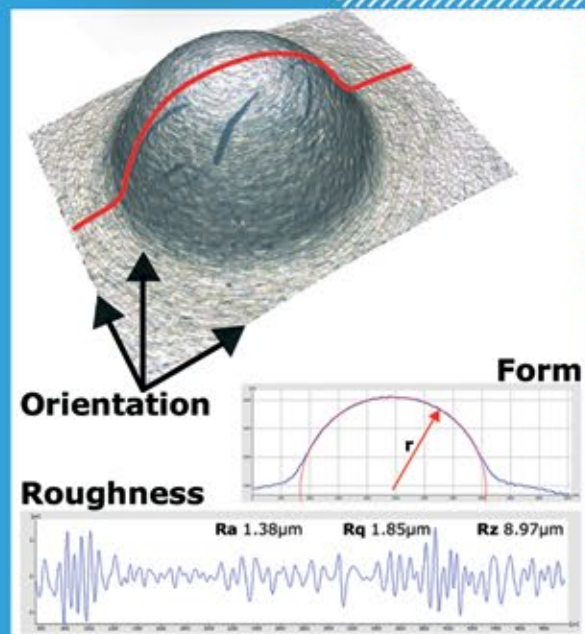
A measurement procedure from development to production

The robust technology of Focus-Variation delivers high resolution results with high repeatability in research and production. Therefore IF-SensorR25 is a platform that enables the use of the same measurement process both in-line and in the lab. Standardized interfaces (QDAS) support an easy and quick integration into production allowing comparable in-line and lab measurements.

THE APPLICATION

Measurement of surface quality and finest form tolerances

IF-SensorR25 is a measurement system for quality assurance in serial production. It is suitable for numerous materials including composite materials. The modular design allows arbitrary extensions of hard- and software for new and/or complex measurement tasks. In the field of EDM, the sensor can be implemented directly in a Makino machining center to perform in-machine measurement. This "closed loop manufacturing" production concept enables 3D measurement of components directly in the machine, enabling up to a fourfold increase in machining accuracy.



GENERAL SPECIFICATIONS

Measurement principle	non-contact, optical, three-dimensional, based on Focus-Variation
Positioning volume (Z)	25 mm (mot.)
Ring light illumination	white LED high-power ring light, 24 segments
Positioning help	coaxial laser beam
Dimensions (W x D x H)	126 mm x 153 mm x 202 mm, ControlServerHP: 190 mm x 500 mm x 450 mm
Mass	4 kg
ControlServerHP	12 Core, 32 GB, 24" HD LED Monitor
Measurement object	surface texture: surface topography Ra above 0.009 μm with λ_c 2 μm ; depending on surface structure

OBJECTIVE SPECIFIC FEATURES

Objective magnification (*)		10x	20x	50x	2xSX	5xSX	10xSX	20xSX	50xSX
Working distance	mm	17.5	13	10.1	34	34	33.5	20	13
Lateral measurement range (X,Y) (X x Y)	mm mm ²	2 4	1 1	0.4 0.16	10 100	4 16	2 4	1 1	0.4 0.16
Measurement point distance	μm	1	0.5	0.2	5	2	1	0.5	0.2
Finest lateral topographic resolution	μm	2	1	0.64	10	4	2	1	0.64
Measurement noise	nm	40	20	10	1240	180	45	25	15
Vertical resolution	nm	100	50	20	3500	510	130	70	45
Vertical measurement range	mm	16	12	9	25	25	25	19	12
Measurement speed		≤ 1.7 million measurement points/sec.							

(*) Objectives with longer working distance available upon request

RESOLUTION AND APPLICATION LIMITS

Objective magnification		10x	20x	50x	2xSX	5xSX	10xSX	20xSX	50xSX
Min. measurable height	nm	100	50	20	3500	510	130	70	45
Max. measurable height	mm	16	12	9	25	25	25	19	12
Height step accuracy (1mm)	%	0.5							
Min. measurable roughness (Ra)	μm	0.3	0.15	0.08	n.a.	n.a.	0.45	0.25	0.15
Min. measurable roughness (Sa)	μm	0.15	0.075	0.05	n.a.	n.a.	0.25	0.1	0.08
Min. measurable radius	μm	5	3	2	20	10	5	3	2
Min. measurable wedge angle	$^\circ$	20							
Max. measurable slope angle	$^\circ$	87							

ACCURACY

Flatness deviation	2 mm x 2 mm with 10x objective	U = 0.1 μm
Max. deviation of a height step measurement	height step 1000 μm height step 100 μm height step 10 μm height step 1 μm	$E_{\text{Unit, St, ODS, MPE}} = 1 \mu\text{m}, \sigma = 0.1 \mu\text{m}$ $E_{\text{Unit, St, ODS, MPE}} = 0.4 \mu\text{m}, \sigma = 0.05 \mu\text{m}$ $E_{\text{Unit, St, ODS, MPE}} = 0.3 \mu\text{m}, \sigma = 0.025 \mu\text{m}$ $E_{\text{Unit, St, ODS, MPE}} = 0.15 \mu\text{m}, \sigma = 0.01 \mu\text{m}$
Profile roughness	Ra = 0.5 μm	U = 0.04 $\mu\text{m}, \sigma = 0.002 \mu\text{m}$
Area roughness	Sa = 0.5 μm	U = 0.03 $\mu\text{m}, \sigma = 0.002 \mu\text{m}$
Distance measurement	XY up to 2 mm	$E_{\text{Bl, Tr, ODS, MPE}} = 0.8 \mu\text{m}$
Wedge angle	$\beta = 70^\circ - 110^\circ$	U = 0.15 $^\circ, \sigma = 0.02^\circ$
Edge radius	R = 5 $\mu\text{m} - 20 \mu\text{m}$ R > 20 μm	U = 1.5 $\mu\text{m}, \sigma = 0.15 \mu\text{m}$ U = 2 $\mu\text{m}, \sigma = 0.3 \mu\text{m}$

$E_{\text{Unit, St, ODS, MPE}}$ & $E_{\text{Bl, Tr, ODS, MPE}}$ conform to ISO 10360-8

SOFTWARE

Automation	integrated scripting language; LabVIEW framework; .NET remoting interface; Alicona Inspect Professional (enables GD&T measurement)
------------	--

Initiative Fair Data Sheet
Specifications in blue mark Alicona specific values.